Proceeding Fifth Plant Breeding Conference May 27, 2007 (Giza)

Egypt. J. Plant Breed. 11(1): 11-23(2007) Special Issue

APPLICATION OF F_2 BIPARENTAL MATING DESIGN TO PRODUCE NEW COTTON RECOMBINATION

Y.A.M. Soliman , M. A. Abou El-Yazied and A. M. R. Abd El-Bary

Cotton Research Institute, Agricultural Research Center, Egypt.

ABSTRACT

Sixteen male plants of cotton from F_2 population from a cross Giza 86 x Giza 83 were crossed with their pure line parents as females in 2005 season using North Carolina Design III. In 2006 season, 32 biparental hybrids and the two pure line parents were evaluated to investigate genetic variances, heritabilities and genetic correlations between several traits.

The interaction of female x male mean squares was significant for position of first fruiting node, boll weight, lint percentage, seed index, no. of opening bolls /plant and 2.5% Span Length indicating that females behaved differently from male to another and these males differed in their genetic background and proved efficient in evaluating the females .The males mean squares was either larger or less than the mean squares of females for some studied traits .It seems that maternal effect might play some role in the inheritance of these traits. The mean performance overall males showed significant difference for position of the first fruiting node, days to first opening boll and lint percentage when compared with parent Giza 86. Also, it was significant for boll weight and 2.5% span length when compared with the recurrent parent Giza 83.

Highly significant positive additive correlation (R_A) was detected between lint cotton yield/plant and boll weight, and between position of first fruiting node with both lint percentage and seed index, suggesting that direct selection for low position of first fruiting node could lead to increased both lint percentage and seed index. Highly significant positive dominance correlation (R_D) between lint cotton yield/plant with fiber strength and negative (desirable) with days to first opening boll and between boll weight with 2.5% SL, and position of first fruiting node as well as between seed index and days to first flower. These results are of interest in explaining the relative high degree of heterotic association among above pairs of traits added that higher dominance variance than additive variance and larger heritabilities in broad sense than those of narrow sense for these traits. The R_A, R_D values reported herein provides new information that may be useful for cotton breeders attempting to maximize efforts for some studied traits in biparental progenies.

Key words: *Cotton, Genetic variances, Heritabilities, Genetic correlations.*

INTRODUCTION

Building of genetic superiority can be assessed on the basis of progeny performance through reflects break up of linkage groups which may alleviate increase the number of transgrassive segregation, thus biparental mating system was shown to be effective in breaking unfavorable linkage groups and in encouraging desirable recombination of fixable epistasis (Bhullar *et al.* 1978 and Singh and Dwevidi 1978) . Tang *et al.* (1996) reported that dominance variance accounted for the major proportion of phenotypic variance and relatively high broad sense heritability of lint percentage and boll weight. Also, they stated that high significant negative additive, dominance, genotypic, environmental and phenotypic correlations for the previous two traits in Upland cotton. El-Akhedar and El-Lawendy (2006). Found significant positive additive correlation between lint yield/plant and Micronaire reading. El-Harony (1999),studied Biparental progenies of on a cross Giza 85 x Karshinesky-2, he found that females and males were equal in proportion contributions for seed cotton yield/plant, while male contributions was higher than those of females for lint index, seed index and boll weight. He found that females and males mean squares were significant and additive variance accounted the major proportion of the phenotypic variance for seed cotton yield /plant, lint percentage and lint index. Also, he showed high significant positive correlation between lint percentage and lint index and for genotypic and phenotypic correlation between boll weight and lint index. Zeina (2002),studied Biparental on across Giza 88 x Pima S_6 , he found that additive variance was accounted for the largest major proportion of the phenotypic variance for all studied traits, highly significant positive additive, dominance genotypic and phenotypic correlations were obtained for seed cotton yield /plant with lint yield/plant, boll weight and seed index. Soliman (2003) studied three Biparental hybrids in an intra-specific cotton crosses, he found that the additive genetic variance was the major proportion of the phenotypic variance for most traits in all biparental crosses, except for days to first flower and days to first opening boll in cross I.

The main objective of this research was to know the extent of biparental mating system effectiveness in breaking unfavorable linkage groups and estimation the relative size of additive and dominance genetic correlations and heritabilities in both broad and narrow senses among 32 cotton F_2 hybrids population derived from a crossing of Egyptian cotton varieties via, Giza 83 x Giza 86.

MATERIALS AND METHODS

One F_2 population was derived from crossing between two Egyptian cotton varieties namely Giza 86 and Giza 83 (*Gossypium barbadense* L.) in 2005. 16 F_2 plants selected at random and classified into four sets (S = 4) .Each set was crossed as males with the two original pure line parents as females to produce a total of 32 biparental hybrids [North carolina mating system Design III, (Comstock and Robison, 1952)]. In 2006 season 32 biparental hybrids as well as the two parents were grown and evaluated in cotton breeding department, at Sakha Agricultural Research Station in a randomized complete block design with two replicates. Each plot consists of one row. The row was 7 m long and 0.60 m apart. Hills were spaced 0.40m apart and comprised one plant / hill. Normal cultural practices were applied as recommended for ordinary cotton growing cotton Res. Ins. for Sakha region.

Data and measurements were recorded on ten guarded individual plants as follow:

Earliness measurements

1- Position of first fruiting node (P.F.F.N.)
2- Days to first flower (D.F.F.)
3- Days to first opening boll (D.F.O.B.)

Yield and its components

1- Seed cotton yield /plant g. (S.C.Y. /P.)
2- Lint yield /plant g.(L.Y./P.)
3- Boll weight g. (B.W.): The average weight in grams of 10 bolls picked at random from each plant.
4- Lint percentage (L .%)
5- Number of opening bolls /plant (No. O.B. /P.) : calculated by dividing the total of seed cotton yield / plant by boll weight.
6-Seed index (S.I.) (g)

Fiber properties

1- 2.5% span length (2.5% S.L.)(mm): This trait was determined by the digital fibro graph according to the standard method for testing the fiber length ASTM (1) 1447-63.
2- Fiber Fineness (F.F.) (Micronaire reading): This trait was expressed as Micronaire Instrument reading.
3- Fiber Strength (F.S.): It was measured for flat-bundles of fiber using "Pressley" tester at zero gauge length and recoded "Pressley index" values.

Data by individual were subjected to analysis of variance and covariance assuming all genetic components to be random. The form of the analysis of variance is presented in Table 1.

Table 1 . Analysis of variance in 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)	$\sigma^2 e + 2 r \sigma^2 m$
Interaction in Sets	s (m-1)	$\sigma^2 e + r \sigma^2 m l$
Error	s (2m-1)(r-1)	$\sigma^2 e$
Total	2mr-1	

Where:

S = Sets m = male r = Replication

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

r $\sigma^2 m l$ = (M.S. due to interaction / sets – M.S. due to error)/ r = (1/2) $\sigma^2 D$

$\sigma^2 e$ = M. S. due to error / r and refer to environmental variance.

Proportional contribution of males, females and their interaction are presented by the magnitude of sum squares of these genotypes relative to the sum of squares of crosses, the formula given by Singh and Chaudhary (1977) as follows:

Contribution of males $= \frac{SS\ (m)}{SS(Crosses)} x100$

Contribution of females $= \frac{SS\ (f)}{SS(Crosses)} x100$

Contribution of (males ×females) $= \frac{SS\ (m.f)}{SS(Crosses)} x100$

Estimates of genetic correlation coefficients from biparental progenies were calculated according to formula given by **Zhu *et al* (1993)** as follows:

Additive correlation coefficient $(R_A) = \frac{\text{Covariance additive i an j}}{\sqrt{\sigma^2 Ai.\sigma^2 Aj}}$

Dominance correlation coefficient $(R_D) = \frac{\text{Covariance dominance i an j}}{\sqrt{\sigma^2 Di.\sigma^2 Dj}}$

Phenotypic correlation coefficient $(R_P) = \frac{\text{Covariance phenotypic i an j}}{\sqrt{\sigma^2 pi.\sigma^2 pj}}$

Genotypic correlation coefficient $(R_G) = \frac{\text{Covariance genotypic i an j}}{\sqrt{\sigma^2 gi.\sigma^2 gj}}$

Residual correlation coefficient $(R_E) = \frac{\text{Covariance eij}}{\sqrt{\sigma^2 ei.\sigma^2 ej}}$

Significance of correlation coefficients tested by the following formula given by **Steel and Torrie (1960)**

Calculated "t" test values for $t = r\sqrt{\frac{n-2}{1-r2}}$

Calculated "t" values were compared using the tabulated "t" values at both 5% and 1% levels of probability.

Where:

r = Correlation coefficient.

n = Number of sets under study.

RESULTS AND DISCUSSION

Variance

The analysis of variance (Table 2)

Table 2. Mean squares for all studied traits from mating Design III.

S.O.V.	d. f	P.F.F.N.	D.F.F.	D.F.O.B	B.W.	S.C.Y/P.	L.Y./P.	L.%	S.I.	No.o. B/P	2.5% S.L	F.S.	F.F.
Sets	3	0.154	29.68**	14.09**	0.018	498.6*	112.22*	2.905	0.776**	39.48	6.446**	0.457	0.437
Rep/sets	4	0.337	31.11**	3.94	0.074	105.9	21.93	2.310	0.599**	21.08	5.608**	0.316	0.059
Females/sets	4	0.196	6.98	40.05**	0.109	125.6	39.53	2.450	0.680**	17.41	2.098	0.516	0.066
Males/sets	12	0.216	5.78	9.86**	0.107	290.0*	43.12	1.565	0.444**	36.25	3.473	1.222*	0.345*
Interaction	12	0.288*	4.03	3.54	0.220*	252.9*	35.44	2.552*	0.457**	47.68*	3.102*	0.583	0.216
Error	28	0.130	3.36	1.98	0.098	113.7	26.65	1.085	0.119	19.57	1.336	0.424	0.166

*, ** Significant and highly significant at 5% and 1% levels, respectively

showed significant differences among sets for days to first flower, days to first opening boll, seed cotton yield /plant, lint cotton yield /plant, seed index and 2.5% span length , indicating variability available in the genotypes that can be widely utilized . Also, highly significant mean squares of females in sets were obtained for days to first opining boll and seed index. While, mean squares of males in sets were significant for days to first opining boll, seed cotton yield / plant, seed index, fiber strength and fiber fineness. The mean squares due to males was either larger or less than the mean squares of females for most studied traits .It seems that maternal effect might play some role in the inheritance of these traits. The female x male interaction mean squares were significant for position of first fruiting node, boll weight, lint percentage, seed index, no. of opening boll /plant and 2.5% Span length, indicating it behaved some what differently from male to another and these males differed markedly in their genetic background and proved efficient in evaluating the females. On the other hand, these results indicated the breakup of linkage between genetic factors which controlled these traits (Bhullar *et al.* 1978 and Singh and Dwevidi 1978). Inconstant insignificant interaction reflected that the male of female changes were nearly of similar magnitudes in these traits. Lack of significant interaction caused by the parents with equal frequencies of dominant and recessive genes fall in the middle. Similar findings were obtained by El-Harony (1999), Zeina (2002) and Tang *et al.* (1996).

The proportion contribution values of male, female and their interaction to genotypes variance are presented in (Table 3).

Table 3. Contribution as percent of males, females and interaction for all studied traits.

Trait	Proportional contributions		
	Females	Males	Females x males
P.F.F.N.	11.44	37.97	50.59
D.F.F.	19.18	47.63	33.19
D.F.O.B.	49.90	36.86	13.24
B.W.	9.99	29.59	60.49
S.C.Y./P.	7.16	49.59	43.28
L.Y./P.	14.36	47.01	38.63
L.%	16.55	31.73	51.72
S.I.	20.09	39.39	40.52
No. o. B./P.	6.47	40.40	53.13
2.5% S.L.	9.61	47.74	42.64
F.S.	8.70	61.81	29.49
F.F.	3.79	59.19	37.02

The results showed that the male contribution was higher than those of females for all studied characters except days to first opening boll. Whereas, female contributions surpassed for days to first opening boll. On the other hand, males x females interaction were higher than males and females contributions for position of first fruiting node, boll weight, lint percentage, seed index and number of opening bolls/plant, indicating that presence of non additive controlling these traits.

Means

The mean performance of 12 studied traits for the biparental progenies with their corresponding parents are illustrated in (Table 4). The results clear that the mean performance was significant difference among the crosses of females, G. 83 and G. 86 with some males for most studied traits in all sets. The mean overall males were significant different for position of first fruiting node, days to first opening boll and lint percentage when compared with parent G. 86. Also, it was significant for boll weight and 2.5% span length when compared with the recurrent parent G. 83. The mean performance of the male no. 2 in set I exhibited significant values for lint percentage relative to recurrent parent G. 86 and for 2.5% SL and fiber strength when compared with the recurrent female G. 83. Male no. 2 in set II was significant when compared with G. 86 for days to first flower, fiber strength and for 2.5% SL when compared with the recurrent parent G. 83. Male no. 3 in set II exhibited highly significant value over G. 83 and G. 86 for seed index and fiber strength respectively. Male no. 4 in set III showed significant values (desirable) for days to first opening boll and lint percentage when compared with recurrent parent G. 83 and for boll weight when compared with G. 86. Male No. 3 in set IV exhibited significant values (earlier) for days to first flower, days to first opening boll, lint

Table 4. The average performance of all traits of 32 combinations (in four sets) between G. 86 x G. 83 F_2 hybrids with its parents.

Sets	Males	P.F.F.N		D.F.F.		D.F.O.B.		B.W.		S.C.Y/P.		L .Y./P.	
		G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86
Set I	1	8.00	7.34	87.7	89.5	127.5	130.5	2.83	2.79	104.5	115.4	40.8	44.9
	2	8.36	7.93	88.1	85.7	126.5	131.0	2.82	2.63	113.3	108.6	43.2	44.4
	3	7.73	7.89	84.2	86.0	129.1	133.5	2.78	3.21	128.0	132.6	49.2	52.8
	4	7.95	8.26	86.2	89.0	125.0	132.5	2.83	3.12	120.5	116.5	47.6	44.8
Set II	1	7.66	7.67	84.8	87.4	127.0	126.0	3.01	2.91	102.1	105.3	40.0	39.4
	2	7.19	8.19	85.5	86.4	130.0	132.5	2.72	2.82	121.2	96.5	46.7	37.0
	3	8.27	8.04	85.3	87.5	126.1	130.6	2.67	2.71	119.3	124.9	47.0	47.5
	4	7.96	7.89	85.4	89.2	129.5	131.1	2.76	2.78	114.7	104.0	43.9	40.1
Set III	1	8.13	7.82	88.1	85.5	130.1	132.2	2.66	2.82	104.9	143.2	44.2	54.9
	2	7.60	8.18	85.5	88.4	129.9	133.1	2.77	2.98	110.7	126.6	43.6	48.4
	3	7.61	7.57	85.8	87.4	129.5	130.2	2.76	2.85	115.7	99.6	45.4	37.9
	4	7.19	7.50	86.0	86.7	128.3	131.5	2.86	2.98	134.8	132.0	51.0	51.7
Set IV	1	7.62	8.07	87.2	86.4	128.1	131.0	2.81	2.95	139.0	117.6	56.1	45.8
	2	8.34	7.70	87.3	84.8	129.5	130.8	2.90	2.84	126.9	107.6	49.3	42.1
	3	7.33	7.95	84.5	84.6	126.0	127.3	2.67	2.99	129.5	125.7	51.7	49.4
	4	7.51	8.46	81.9	83.8	124.3	129.8	3.00	2.70	116.0	129.6	48.6	49.5
L.S.D	0.05	0.74		3.9		2.9		0.64		21.9		10.6	
	0.01	0.99		5.2		3.9		0.87		29.4		14.3	
Mean overall males		7.80	7.00	85.9	86.8	127.9	130.9	2.80	2.88	118.8	117.8	46.7	45.7
Parent mean		8.20	9.30	85.4	89.9	128.5	132.8	2.54	2.86	107.6	113.3	39.3	44.2

T able 4. Cont.

Sets	Males	L. %.		S.I.		No. O.B/P.		2.5% S.L.		F.S.		F.F.	
		G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86	G.83	G.86
Set I	1	39.2	38.6	9.42	9.56	36.9	41.5	30.8	31.6	9.8	10.7	4.2	3.9
	2	38.7	40.9	9.38	8.23	40.3	41.3	32.3	31.1	11.2	9.6	3.8	3.6
	3	38.5	39.9	9.16	9.40	46.1	41.6	30.9	32.6	10.4	10.2	4.0	4.0
	4	39.5	38.5	9.03	9.14	42.8	39.9	30.9	32.0	10.1	9.4	4.3	4.6
Set II	1	39.2	37.5	9.14	9.38	33.9	36.1	31.5	33.7	10.1	10.5	4.6	4.1
	2	38.7	38.4	9.32	9.74	44.6	34.1	32.5	33.0	10.5	10.9	3.9	4.1
	3	39.4	38.1	9.04	9.93	44.7	46.8	30.6	31.1	9.8	11.0	4.3	4.1
	4	38.3	38.6	9.07	9.72	41.6	37.5	31.6	32.5	10.2	9.9	4.5	4.4
Set III	1	42.1	38.3	8.23	9.04	39.3	50.9	32.3	31.9	9.5	9.2	3.6	3.4
	2	39.0	38.2	8.89	9.95	40.1	42.6	31.5	31.2	9.4	10.5	3.7	4.6
	3	39.3	38.0	9.85	9.75	42.3	35.5	30.8	30.9	10.4	11.4	4.4	4.2
	4	37.8	39.2	9.16	9.08	47.2	43.1	30.7	32.5	10.0	10.2	4.1	4.1
Set IV	1	40.3	39.0	8.13	9.09	49.5	39.9	28.8	31.9	8.7	10.1	3.8	3.9
	2	39.0	39.1	9.14	9.19	43.2	37.9	29.8	28.9	9.7	9.5	4.2	4.4
	3	39.6	39.4	8.75	8.96	48.8	42.6	28.5	32.4	9.8	10.0	4.3	4.0
	4	41.9	38.3	8.70	9.75	38.7	47.9	33.8	31.0	9.8	11.2	4.6	3.7
L.S.D	0.05	2.1		0.71		9.1		2.4		1.3		0.8	
	0.01	2.9		0.95		12.2		3.2		1.8		1.1	
Mean overall males		39.3	38.7	9.06	9.40	42.5	41.2	31.0	31.8	9.9	10.3	4.1	4.0
Parent mean		37.3	31.1	8.73	9.70	38.6	44.8	28.4	32.1	9.4	9.5	4.1	3.9

cotton yield/plant and lint percentage when compared with G. 86 the parent. Male no. 4 in set IV showed significant values over G. 83 for boll weight, lint percentage and 2.5% span length and fiber strength.

Generally, the results in Table 4 cleared that the biparental mating system was effective in breaking unfavorable linked groups, encouraging desirable recombination and also, allows for the exploitation of fixable epistasis. From these biparental progenies, we can obtain isolated strains with high performance for most quantitative studied previous traits surpassed overall the two their parents. Present findings were agree with obtained by El-Harony (1999), Zeina, (2002) and Soliman (2003).

Genetic components

Ratios of additive genetic variance (σ^2A), dominance genetic variance (σ^2D), and environmental variance (σ^2E) as a proportion of phenotypic variance (σ^2ph) for all studied traits are summarized in (Table 5). Additive variance accounted for the major proportion of the phenotypic variance than dominance genetic variance for days to first flower, days to first opening boll, seed cotton yield/plant, lint cotton yield /plant, seed index, 2.5% span length, fiber strength and fiber fineness, These results showed that additive variance was the major component of the phenotypic variance, consequently, moderate to high heritabilities in narrow sense (ratios of σ^2A as a proportion of σ^2ph) for these traits and selection

Table 5. Additive (σ^2A), dominance (σ^2D) and environmental (σ^2E) variances as ratios of phenotypic variance (σ^2ph) and heritabilities in broad (h^2b) and narrow (h^2n) senses for all studied traits.

Traits	Genetic components				
	(σ^2A)/ (σ^2ph)	(σ^2D)/ (σ^2ph)	(σ^2E)/ (σ^2ph)	(h^2b)	(h^2n)
P.F.F.N.					
D.F.F.	0.2781	0.5110	0.2110	78.90	27.81
D.F.O.B.	0.5064	0.1400	0.3510	64.79	50.75
B.W.	0.7553	0.1499	0.0947	90.55	75.39
S.C.Y./P.	0.0788	0.6759	0.2453	75.47	7.88
L.Y./P.	0.4735	0.3739	0.1526	84.74	47.35
L.%	0.4269	0.2278	0.3453	65.46	42.69
S.I.	0.1930	0.5892	0.2198	78.22	19.30
No. O.	0.4501	0.4677	0.0821	91.79	44.59
B./p.	0.3056	0.5150	0.1793	82.07	30.56
2.5% S.L.	0.4675	0.3864	0.1461	85.39	46.75
F.S.	0.6826	0.1360	0.1814	81.86	68.26
F.F.	0.5731	0.1538	0.2730	72.69	57.31

broad (h^2b) and narrow (h^2n) senses for all studied traits.

procedures could be effective to improve these previous traits and might be gets on transgrassive segregation in offspring of biparental population hybrids for the previous traits will be higher than the respect better parent for all fiber properties and most yield, yield components and earliness measurements.

The dominance genetic variance (σ^2D) was the largest proportion of the phenotypic variance and higher in magnitude than those of additive genetic variance for position of first fruiting node, boll, weight, lint percentage, and no. of opening boll/plant. Confirming that the utilization of heterosis available in this biparental population could be fruitful and suggests that hybrids may be used to improve these traits. The same results were reported by Tang *et al.* (1996), El-Harony (1999), Sorour *et al.* (2006) and El-Akhedar and El-L awendy (2006).

On the other hand, both additive variance and dominance variance was proportionally near equal seed index, indicating that both additive and non-additive (dominance) played the same importance role in inheritance of this trait. Same results were obtained by Soliman (2003).

In these respect, the magnitude of (σ^2D) was greater than fixable genetic variance ($\sigma^2A + \sigma^2AA$), although for some traits, some (σ^2A) was detected. Considering the negative additive genetic correlation (Table 6) of no. of bolls/plant with fiber fineness, and between days to first opening boll with both fiber fineness and fiber strength would except to have difficulty in selecting for pure lines with early maturity combined with large bolls/plant with high fibers quality, (fineness and strength.) However, it is possible that fixable genetic variance has been reduced in populations derived from hereditary material that is the result of long-term selection program.

The estimates of environmental variances (σ^2E) were generally small for all studied traits except for boll weight and no. of boll/plant. This resulted in high or moderate heritabilities in broad sense for these traits,. Thus high progress to improve these biparental populations would be expected because narrow sense heritability was not low.

The results of additive (R_A), dominance (R_D), genotypic (R_G), phenotype (R_{ph}) and residual (R_E) correlations in biparental progenies are presented in (Table 6). Highly significant additive correlation and positive between lint cotton yield/plant and boll weight, and between position of first fruiting node with both lint percentage and seed index.

Genetic correlations

These results suggest that direct selection for low position of first fruiting node lead to increased both lint percentage and seed index may be caused by increasing maturity for fiber and seeds in early boll per plant.

These results is logic where increasing maturity for fiber and seeds in early boll on plants. The negative dominance correlation

Table 6. Estimates of correlation coefficients between phenotypic variance components among all agronomic studied traits in G. 83 x G. 86 F_2 hybrids with its parents.

Traits	Parameter	B.W.	L.Y./P.	L. %	No. B/P.	S.I.	F.F.	F.S.	2.5% S.L.	P.F.F.N	D.F.F.	D.F.O.B
S.C.Y./P.	R_A	0.60	0.91**	0.54	-0.05	0.75-	0.08	0.54	-0.51	0.79	-0.60	-0.75
	R_D	-0.38	0.98**	0.63	0.43	0.39	0.99**	-0.35	-0.38	-0.33	-0.30	-0.91**
	R_G	-0.69	0.89**	0.91**	0.01	0.48	0.67	0.28	-0.47	-0.01	-0.63	-0.64
	R_{ph}	-0.64	0.91**	0.88*	0.10	0.49	0.72	0.25	-0.45	-0.05	-0.61	-0.73
	R_E	0.74	0.64	0.86*	-0.02	-0.07	-0.48	0.64	0.14	0.05	-0.06	-0.15
B.W.	R_A		0.87*	-0.09	0.71	-0.02	-0.52	-0.26	-0.76	0.100	-0.66	0.07
	R_D		-0.20	-0.72	0.63	-0.17	-0.35	-0.69	1.00**	0.98**	0.11	0.43
	R_G		-0.94**	-0.60	-0.10	-0.32	0.04	-0.50	0.95**	0.72	0.65	0.33
	R_{ph}		-0.90**	-0.42	-0.09	-0.32	0.07	-0.39	0.96**	0.78	0.63	0.21
	R_E		0.87*	0.96**	0.11	-0.13	-0.04	0.87*	-0.03	-0.58	-0.23	0.47
L.Y./P.	R_A			0.30	0.30	0.41	-0.28	0.24	-0.76	0.49*	-0.64	-0.43
	R_D			0.47	0.60	0.52	0.96**	-0.53	-0.19	-0.14	-0.37	-0.75
	R_G			0.83*	-0.04	0.51	0.26	0.52	-0.83*	-0.47	-0.62	-0.42
	R_{ph}			0.76	0.02	0.52	0.74	0.57	-0.32	-0.46	-0.62	-57
	R_E				0.58	0.37	-0.40	1.00**	0.01	-0.79	0.27	0.64
L.%	R_A				0.01	0.81	0.81	-0.16	0.40	0.88*	-0.77	-0.46
	R_D				-0.34	0.43	0.69	0.42	-0.71	-0.80	0.37	-0.67
	R_G				-0.42	0.81	0.50	0.61	-0.47	-0.04	-0.25	-0.26
	R_{ph}				-0.37	0.82	0.74	0.57	-0.32	0.05	-0.15	-0.97**
	R_E				0.24	0.05	-0.31	0.92**	0.21	0.53	-0.02	0.36
No. B./P.	R_A					-0.46	-0.38	-0.86*	-0.26	-0.31	-0.59	0.69
	R_D					-0.71	0.41	-0.99**	0.63	0.71	-0.41	-0.38
	R_G					-0.87*	0.20	-0.80	0.07	0.02	-0.75	-0.73
	R_{ph}					-0.82*	0.08	-0.88*	0.10	0.15	-0.79	0.54
	R_E					0.95**	-0.65	-0.57	-0.08	0.72	0.90**	0.62
S.I.	R_A						0.69	0.70	0.15	0.98**	-0.44	-0.89**
	R_D						-0.28	0.71	-0.16	-0.36	0.93**	-0.11
	R_G						0.08	0.89**	-0.38	-0.12	0.33	0.35
	R_{ph}						0.32	0.92**	-0.38	-0.20	0.33	-0.88*
	R_E						-0.76	0.36	0.13	-0.47	0.99**	0.36
F.F.	R_A							0.25	0.82*	0.67	-0.28	-0.40
	R_D							-0.33	-0.35	-0.33	-0.17	-0.84
	R_G							-0.08	0.29	-0.55	0.32	0.54
	R_{ph}							-0.08	0.29	0.66	-0.25	-0.73
	R_E							-0.39	-0.72	0.08	-0.81	0.13
F.S.	R_A								-0.13	0.59	0.25	-0.94**
	R_D								-0.68	-0.76	0.41	0.32
	R_G								-0.066	-0.55	0.32	0.54
	R_{ph}								-0.54	-0.49	0.42	-0.63
	R_E								-0.01	0.80	0.26	0.65
2.5 % S.L	R_A									0.13	0.07	0.11
	R_D									0.98**	0.13	0.02
	R_G									0.88*	0.42	0.03
	R_{ph}									0.91**	0.42	0.15
	R_E									0.54	0.23	-0.73
P.F.F.N.	R_A										0.59	0.82*
	R_D										-0.09	0.12
	R_G										0.19	-0.27
	R_{ph}										0.19	-0.18
	R_E										-0.33	-0.97**
D.F.F.	R_A											0.09
	R_D											0.60
	R_G											0.90**
	R_{ph}											-0.10
	R_E											0.22

between days to first opening boll with both lint cotton yield/plant and fiber fineness, and between no. of bolls/plant and fiber strength in these population (were not encouraging for the use F_2 hybrids to improve these previous traits together).These results support no evidence that the linkage associations among these traits were broken.

Highly significant positive dominance correlation (R_D) between lint cotton yield/plant with fiber strength and negative (desirable) with days to first opening boll and between boll weight with 2.5% SL, position of first fruiting node as well as between seed index and days to first flower.

This results are of interest in explaining the relative high degree of heterotic association among above pairs of traits added that higher dominance variance than additive variance and larger heritabilities in broad sense than those of narrow sense for these traits Table 5. Similar conclusion reported by El-Harony (1999).

High significant positive genotypic (R_G) and phenotypic (R_{ph}) correlations between lint cotton yield/plant and lint percentage. Boll weight showed highly significant positive R_G and R_{ph} with 2.5% SL. The same results observed between seed index and fiber strength and between 2.5% S.L with position of first fruiting node. These results were partial agrees with Tang *et al.* (1996).

Several of the residual correlation values (R_E) presented in Table 6, were significantly from zero. Lint percentage showed high significant positive R_E with both boll weight and lint cotton yield/plant. Also, fiber strength with boll weight as well as lint cotton yield/plant and lint percentage recorded the same results. Such R_E values suggested that residual factors such as random effects in field management might increase lint percentage by increase both boll weight and lint cotton yield/plant and increase both boll weight and lint cotton yield/plant lead to increase fiber strength. The R_A, R_D and R_E values reported herein provide new information that may be useful for cotton breeders attempting to maximize breeding efforts for earliness measurements, yield and its components and fiber properties in biparental progenies.

REFERENCES

Bhullar, B.C.; K. S. Gill and G.S. Makal (1978). Genetic analysis of protein in wheat. In: S. Ramanujam (Ed).Proceedings of Genetic symposium.2.613-625.Indian Agriculture Res. Ins., New delhi, India.

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

El-Akhedar, A.A.A. and M.A.M.EL-Lawendy (2006) Inheritance of quantitative characters through triple test cross in cotton (*Gossypium barbadense* L.) J. Agric. Res. Tanta Univ. 32(1): 63-75.

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

Singh ,R.K. and B.D. Chaudhary (1977). Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers , New Delhi.

Singh, R.B. and S.L. Dwevidi (1978). Biparental mating in wheat In. S. Ramanujam (Ed). Proceedings of the fifth international wheat. Genetic Symposium 2: 671-679. Indian Agriculture Research Institute, New Delhi, India.

Soliman, Y.A. M.(2003) Studied on some quantitative characters in some intraspecific cotton crosses. Ph. D Thesis, Faculty of Agric., Kafr El-Sheikh, Tanta University, 2003 Egypt.

Sourour, F.A.,A M. Omer, M.E. Mosalem, A.A. Awad and A.A.A. EL-Akhedar(2006). Evaluation of some crosses for earliness and economical traits in cotton Agric. Res. Tanta Univ. 32(2): 53-65.

Tang, B., J.N. Jenkins ,C.E. Watson ,J. C. Mc carty Jr. and R.G. Greech (1996). Evaluation of genetic variance, heritabilities and correlations for yield and fiber traits among cotton F_2 hybrid population. Eyphytica.91:315-322.

Zeina, A.M.A. (2002). Using biparental mating system to produce new promising recombinations in cotton. Egypt. J. Agric., Res. 80(1): 325-340.

Zhu, J. (1992). Mixed model approaches for estimating genetic variances and co-variances. Chin J.Biomath7: 1-11.

Steel, R.G.D. and J.H. Torrie (1960). Principles and Procedures of Statistics. McGraw Hill Book Company Inc, New York.

استخدام طريقة الهجن الرجعية للأبوين فى الجيل الثاني فى القطن للتنبؤ بالتراكيب الو راثية الجديدة

ياسر عبد الرءوف محمد سليمان محمد عبد الفتاح أبو اليزيد

عبد الناصر محمد رضوان عبد الباري

معهد بحوث القطن- مركز البحوث الزراعية

استخدمت عشيرة واحدة من نباتات الجيل الثاني كأباء (Males) لتهجين الصنفى التابع للقطن المصري وهو جيزة 83 × جيزة 86 للتهجين مع آبائها وهى جيزة 83 . جيزة 86 كأمهات (Females) فى موسم 2005 باستخدام طريقة North Carolina الموديل الثالث. فى موسم 2006 تم تقييم الهجن الناتجة وهى 32 هجين مع آبائها فى قطاعات كاملة العشوائية ذات مكررتين بقسم بحوث تربية القطن -بمحطة البحوث الزراعية بسخا وذلك لدراسة التباينات الوراثية ودرجات التوريث والارتباط الوراثي لصفات المدروسة وكانت أهم النتائج المتحصل عليها ما يلي:

1- كان التباين الراجع للتفاعل بين Males x Females معنويا لصفات موقع أول فرع ثمري ومتوسط وزن اللوزة وتصافى الحليج و معامل البذرة وعدد اللوز المتفتح / نبات وطول التيلة عند نسبة توزيع 2.5%، على الجانب الأخر كان التباين الراجع لتأثير الأباء (Males) أعلى أو أقل من التباين الراجع لتأثير الأمهات (Females) لبعض الصفات المدروسة.

2- أظهر المتوسط العام للأباء فروق معنوية عند مقارنته بمتوسط الأب جيزة 86 لصفات موقع أول فرع ثمري وتاريخ تفتح أول لوزة وتصافى الحليج فى حين كان معنويا لصفات متوسط وزن اللوزة وطول التيلة عند نسبة توزيع 2.5%عند مقارنته بمتوسط جيزة 83 .

3- أظهر الارتباط الوراثي الإضافي قيم عالية المعنوية وموجبة بين محصول القطن الشعر / نبات ومتوسط وزن اللوزة ،بين موقع أول فرع ثمري مع كل من تصافي الحليج ومعامل البذرة. فى حين كان الارتباط السيادى على المعنوية وموجباً بين محصول القطن الشعر ومتانة التيلة و سالباً مع تاريخ تفتح أول لوزة ، وبين متوسط وزن اللوزة والطول عند نسبة توزيع 2.5% وموقع أول فرع ثمري ،بين معامل البذرة وتاريخ تفتح أول زهرة .

من النتائج يتضح أن التزاوج باستخدام طريقة North Carolina Design III فعالة فى كسر الارتباط بين التراكيب الوراثية الغير مرغوبة وتكوين تراكيب وراثية جديدة تتفوق على أفضل آبائها لمعظم الصفات المدروسة ومن ثم استخدامها فى برامج تربية القطن سوف يؤدى إلي الحصول على تراكيب وراثيه متفوقة فى صفات المحصول و التيلة و مبكرة .