J. Agric. Chem. and Biotechn., Mansoura Univ. Vol. ٣(٣): ٩١ - ١٠٢, ٢٠١٢

GENETICAL STUDIES ON SOME CROSSES OF COTTON *Gossypium barbadense*

Nassar, M. A.*; H. Y. Awad and S.S. Hassan****
*** Faculty of Agriculture Al-Azhar University**
****Cotton Breeding Dept., Cotton Res. Inst., ARC, Egypt**

ABSTRACT

The studying of gene action would be of great importance to plant breeders as it provides information about possible improvement of different yield, yield components and fiber properties traits. Hence, this investigation has been done to partition the genetic variance to its components through studies on different generations of two cotton crosses i.e. Giza ٨٨ x Pima S٦ (Egyptian x American variety) and Giza ٤٥ x Suvin (Egyptian x Indian variety) at Sakha Agricultural Station, during three successive growing seasons (٢٠٠٨-٢٠١٠).

The results showed presence of significant differences among generations in the two crosses for all studied traits. These findings reflected the presence of heterotic effects and the higher frequency of dominant genes controlling these traits. Also, $F_{٣}$'s generation showed superiority for most studied traits compared with the $F_{٢}$'s generation values in two crosses. These results indicated that the parents Suvin, Pima $S_{٦}$, Giza ٨٨ and Giza ٤٥ could had transmitted their performances to their offspring, hence could be utilized these parents in cotton breeding program for improving these traits. Highly significant positive heterosis was observed relative to mid-parents for most studied traits. In addition, heterosis relative to the better parent was significantly positive for all studied traits in the two crosses except for seed index, ٢,٥٪ span length, fiber fineness and fiber strength in cross I. As well as, seed index only in cross II. Moreover, positive highly significant heterosis relative to better-parent were obtained for number of opening bolls / plant and lint percentage in cross I and for all studied traits except, boll weight, seed index , ٢..٥٪ span length and fiber strength in cross II. Highly significant positive inbreeding depression values were observed in $F_{٢}$ and $F_{٣}$ generations for most of yield and fiber quality traits with respect to the studied two crosses. Over dominance appeared to be controlling most studied traits in $F_{١}$ hybrids and $F_{٢}$ generations in the two crosses and the other remaining traits were controlled by partial dominance.

The mean effect of $F_{٢}$ performance (m) was highly significant for all studied traits in the two crosses. Also, the additive gene effects (d) were significant or highly significant positive for all studied traits except uniformity ratio in cross II. While, Dominance effects (h) were positive and highly significant for number of opening bolls/ plant, lint cotton yield /plant and lint percentage in two crosses and for ٢,٥٪ span length and uniformity ratio in cross II. Therefore, the presence of both additive and non-additive gene action for most studied traits with some exceptions for certain crosses, indicated that selection procedures based of the accumulation of additive effects should be successful in improving these traits.

Finally, all types of gene action effects (d, h and epistasis) were highly significant or significant, but additive x additive component (i) epistatic effect was significant and higher in magnitude compared to other components. Therefore it could be concluded that the gene action played a major role in the inheritance of these traits.

INTRODUCTION

Determine the amount of variations and further partition the genetic variance to its components in order to understand the nature of gene action of some quantitative traits to increase the yield capacity and improve fiber traits through breeding programs which depends on the knowledge concerning multiple factors such as heterosis, inbreeding depression and the nature of the interactions of genes controlling the quantitative traits. Many authors studied these factors. El-Akhedar (٢٠٠١) and El-Disouqi and Zeina (٢٠٠١), reported that the roles of non-allelic interaction were governing most of studied traits in two crosses. The additive gene effects were significantly positive or negative for all studied traits except seed cotton yield/plant in cross I and dominance gene effects were important in the inheritance of most studied traits in both crosses and were relatively high in magnitude compared with additive effects in all variables. They also added that, heritability values in narrow sense were ٢٣,٢٢٪ for seed cotton yield/plant in cross I. While, Soliman (٢٠٠٣) stated that highly significant positive heterosis relative to mid and better -parents for seed cotton yield /plant, lint yield /plant, fiber strength and ٢,٥٪ span length in all crosses were observed. Also, highly positive significant inbreeding depression values in F٢ and F٣ generation for all most studied traits. All types of gene action effects were significant for yield and cotton properties. While, dominance and epistatic effects were higher in magnitude than additive in some traits. On the other hand, Soomro *et al*. (٢٠٠٦), stated that heterosis for seed cotton yield ranged from -٢١,٧٢ to +١٩٦,٦٧ and -٣٦,٧٠ to +١٥٩,٣ over MP and BP, respectively. In addition, they obtained that very low and negative level of heterosis and heterobeltiosis were expressed for yield and yield components traits.

Abou El-Yazied *et al* (٢٠٠٨) studied genetic variances in different generations of two cotton crosses for some yield, yield components and fiber properties traits and recorded that highly significant positive inbreeding depression in values F٢ and F٣ for boll weight, seed cotton yield /plant, lint cotton yield /plant and ٢,٥٪ span length in the two crosses as well as, lint percentage, number of bolls /plant and fiber fineness in cross I and seed index in cross II. Over dominance appeared to be controlling most studied traits in F١ hybrids and F٢ generations in the two crosses and the other remaining traits were controlled by partial dominance. Results of scaling test (C and D) suggested the presence of non-allelic interaction for boll weight, seed index, lint index, fiber strength and fiber fineness in the two crosses.

The present investigation target to study the heterosis, inbreeding depression and type of gene action in some quantitative traits in two intra-specific crosses to identify about the appropriate selection system in the breeding program.

MATERIALS AND METHODS

This investigation was carried out at Sakha experimental Farm, Sakha Agricultural Research Station, ARC, Egypt, during the ٢٠٠٨, ٢٠٠٩ and ٢٠١٠ growing seasons. Crossing is used between four cotton genotypes belonging to *Gossypium barbadense L.* Where, (Giza ٨٨ x Pima S٦) cross I and (Giza ٤٥ x Suvin) cross II. In the same time, the parental lines selfed to obtain pure seed for the next growing season.

The filial generations $F_{١}$, $F_{٢}$ and $F_{٣}$ were obtained, the five populations, $P_{١}$, $P_{٢}$, $F_{١}$, $F_{٢}$ and $F_{٣}$ of each cross were evaluated through ٢٠٠٩ season in a randomized complete block design with three replications. Each replicate consisted of ١٥ rows. The non-segregating generations ($P_{١}$, $P_{٢}$ and $F_{١}$) were representative in one row. Meanwhile, $F_{٢}$ and $F_{٣}$ generations in ٦ rows. Each row ٧ meter along and ٠,٦٥ m in a wide and comprised ٢٠ hills. Each hill was spaced ٣٥ cm apart and comprised one plant. Data and measurements were recorded for ten characters on individual plants. ٤٠ individual guarded plants for non segregating generation ($P_{١}$, $P_{٢}$and $F_{١}$),١٢٠ individual guarded plants and ٣٠٠ individual guarded plants for the segregating generations ($F_{٢}$ and $F_{٣}$) were selected at random then guarded plants from each plot selected at random , to study performance of the ten following traits:

I -Yield and yield components including number of opening bolls per plant, seed cotton yield /plant, lint cotton yield /plant, lint percentage, boll weight and seed index.

II-Fiber properties including fiber length (٢,٥٪ span length in mm),fiber strength as Pressely index, fiber fineness as Micronaire reading and uniformity ratio

Statistical procedure:

Means and variances were computed, then the following estimations were calculated:

$$\text{Heterosis over the better-parent (H.B.P \%)} = \frac{\overline{F1}-\overline{BP}}{\overline{BP}} x100$$

$$\text{Inbreeding depression from } F_1 \text{ to mid-parents (I.D.M.P \%)} = \frac{\overline{F1}-\overline{MP}}{\overline{MP}} x100$$

$$\text{Inbreeding depression from } F_1 \text{ to } F_2 \text{ (I.D. } F_2\text{\%)} = \frac{\overline{F1}-\overline{F2}}{\overline{F1}} x100$$

$$\text{Inbreeding depression from } F_1 \text{ to } F_3 \text{ (I.D. } F_3\text{\%)} = \frac{\overline{F1}-\overline{F3}}{\overline{F1}} x100$$

Nature and degree of dominance were determined by means of potence ratio method outlined by Smith (١٩٥٢), which can be defined as follows:

Potence ratio in F١ (P.R.F١) = $\dfrac{\overline{F}_1 - \overline{M}.\overline{P}}{\frac{1}{2}(\overline{p1} - \overline{P}_2)}$

Potence ratio in F٢ (P.R.F٢) = $\dfrac{2(\overline{F}_2 - \overline{M}.\overline{P})}{\frac{1}{2}(\overline{P}_1 - \overline{P}_2)}$

The test which determines the presence or absence of non-allelic interaction and their type is known as scaling test. Mather (١٩٤٩) gave the following scaling tests which were used in five populations.

C = ٤ F٢ – F١ – P١ – P٢   D = ٤ F٣ – ٢ F٢ – P١ – P٢

The variance means for these estimates are obtained as follows:

VC = ٤ VF٢ + ٢ VF١ + VP١ + VP٢   **VD =** ٤ VF٣ + ٢ VF٢ + VP١ + VP٢

Where:

VC and VD are the variances of the two different effects and VP١, VP٢, VF١, VF٢ and VF٣ are the variances of mean for the non-segregating and segregating generation populations.

Estimates of gene effects**,** means and variances of populations for P١, P٢, F١, F٢ and F٣ generations were used to estimate the type of gene action for the two studied crosses.

Hayman (١٩٥٨) gave five parameters of gene effects to estimate the components of genetic variance by using the means and variances of the five populations in each single cross as follows:

m = F٢   d = $\frac{1}{2}$ P١ - $\frac{1}{2}$ P٢

h = $\frac{1}{6}$ (٤ F١ + ١٢ F٢ – ١٦ F٣)

i = P١ –F٢ + $\frac{1}{2}$ (P١ – P٢ + h) - $\frac{1}{4}$ l

l = $\frac{1}{3}$ (١٦ F٣ – ٢٤ F٢ + ٨ F١)

Where, the parameters m, d, h, i, and l refer to mean effects, additive, dominance, additive x additive and dominance x dominance gene effects, respectively.

The variance of these estimates is obtained as follows:

$$Vm = VF_2 \quad \text{Where } VF_2 = \frac{VF2}{\text{NO. of plants in F2}}$$

and by similar way for all the different genotypes; parents, F١'s and F٢.as follows:

$$Vm = VF_{٢,٣} \qquad Vd = \frac{1}{4} (VP_{١} + VP_{٢})$$

$$Vh = \frac{1}{36} (١٦\ VF_{١} + ١٤٤\ VF_{٢} + ٢٥٦\ VF_{٣})$$

$$Vi = VP_{١} + VF_{٢} + \frac{1}{4} (VP_{١} + VP_{٢} + Vh) + \frac{1}{16} VL$$

$$Vl = \frac{1}{9} (٢٥٩\ VF_{٣} + ٥٧٦\ VF_{٢} + ٦٤\ VF_{١})$$

Where, Vm, Vd, Vh, Vl and VL are the variances of the different effects and $VP_{١}$, $VP_{٢}$, $VF_{١}$, $VF_{٢}$ are the variances of the mean for different populations.

RESULTS AND DISCUSSION

The mean performances and standard errors of five generations in this investigation which include four parents and their ٢$F_{١}$ hybrids, ٢$F_{٢}$ and ٢$F_{٣}$ generations are presented in Table ١.The results showed that the genotype Pima $S_{٦}$ gave the highest values for all studied yield and yield components traits except for lint percentage and bolls weight followed by Suvin for all studied yield traits. Whereas, varieties Giza ٤٥ and Giza ٨٨ exhibited to be the best for all fiber quality traits.

Moreover, $F_{١}$ of the hybrid Giza ٨٨ x Pima $S_{٦}$ was the best for most studied yield and yield components and fiber quality traits. Also, $F_{١}$ and $F_{٣}$ generations of the hybrid Giza ٤٥ x Suvin showed best values for all studied yield and fiber quality traits except for seed index and fiber fineness which it were high in $F_{٢}$ generation. These findings reflected the presence of heterotic effects and the higher frequency of dominant genes controlling these traits. Also, $F_{٣}$'s generation showed superiority for most studied traits compared with the $F_{٢}$'s generation values in two crosses. These results indicated that the parents Giza ٨٨, Giza ٤٥, Pima $S_{٦}$ and Suvin could had transmitted their performances to their offspring, hence could be utilized for the improving these traits. These results were in agreement with those obtained by El-Disouqi and Zeina (٢٠٠١), Soliman (٢٠٠٣) and Abou El Yazied *et. al*. (٢٠٠٨).

The values of heterosis for mid and better-parents, inbreeding depression and potence ratio in cross ١ were calculated and presented in Table ٢. The results showed highly significant positive heterosis relative to mid-parents for all studied traits in the two crosses except for seed index, fiber fineness and fiber strength in cross I. As well as, all studied traits in cross II. Moreover, positive highly significant heterosis relative to better-parent were obtained for most studied traits in cross I and for all studied traits except, ٢,٥٪ span length and fiber strength in cross II.

١

Table (٢): Heterosis from mid and better parents, in breeding depression and potence ratio in five populations for yield and yield components and fiber traits in the two cotton crosses.

Parameters	Characters									
	N.O.B/P	S.C.Y/P	L.C.Y/P	L.P	B.W	S.I	٢,٥٪ S.L	F.F	F.S	U.R%
Cross I (Giza ٨٨ x Pima S٦)										
H.M.P	٣,٨٩**	٢,٥١**	٧,٩٥**	٥,١٧**	١,٩١**	٠,٢٠	-٤,٥٩**	-١,٩٣	٢,١١	٠,٧٨**
H.B.P	٣,٤٥**	-٣,٣٣**	-١١,٧٢**	١,٠٥**	-٣,٠٣*	-١,٠٩	-١,٧٧**	-٠,٣٦	٠,٠٩	٠,١١
ID from M.P	٣,٧٥**	٢,٤٥**	٧,٣٤**	٤,٩١**	١,٨٧	.٢٠	-٤,٨١**	-١,٩٦	٢,٠٦*	٠,٧٧٩**
ID from F٢٪	٢,٢٢**	٧,٢٦**	١١,٥٣**	٤,٦٨**	-٣,١٢*	٠,٥١	-٢,١١**	-٦,٧٩*	٦,٧٩**	-١,٠٠**
ID from F٣٪	٥,٥٢٨**	٠,٥٤**	٧,٤٤**	٤,٩١**	-٣,١٢*	٢,٠٢	-١,٥١**	-٧,١٤*	٥,٢٣**	٠,٧٥**
Potence ratio in F١	٩,٠	-٠,٤١٥	-٤,٠٧	١,٢٦	-٠,٣٧	-٠,١٥	-١,٦٠	١,٢٢	١,٠٥	١,١٦
Potence ratio in F٢	٧,٣٣	١,٦٣	-٤,٥٩	٠,١٢	-٢,٠٠	٠,٤٦	-١,٨٠	-٦,٠٠	-٤,٧٩	-.٠,٦٦
Cross II (Giza ٤٥ x Suvin)										
H.M.P	٣,٦٣**	١٨,٠٤**	٢٩,٢١**	٩,٨**	١٦,٢٣**	-٦,١٧**	٦,٨٣**	٥,٢٦**	٢,٨٥*	١,٧٥**
H.B.P	٣,١٥٨**	٣,٤٨**	١١,٣٦**	٧,٧٥**	١,٤٩	-٨,٧٠**	٠,٢٧	٠,٠٠٢**	٠,٠٩	١,٦٩**
ID from M.P	٣,٤٩**	١٥,٢٨**	٢٢,٦١**	٨,٩٣**	١٣,٩٧**	-٦,٥٧**	٦,٣٩**	٥,٠*	٢,٧٧**	٠,٩٥**
ID from F٢٪	٤,٩٥**	٦,٢٠**	١٣,٥٩**	٨,٤٩**	٢,٣٥	-٠,٧٦	٢,١٨**	-٣,٣٣	٠,٩١	٠,٢٢
ID from F٣٪	٤,٦٦٥**	٣,٥٠**	١٠,٦٩**	٧,٥٠**	٢,٠٦	٠,١١	٢,٤٥**	-٦,٦٦**	١,٠	٠,٥٥**
Potence ratio in F١	٨,٠	-١,٢٨	-١,٨٢	-٤,٩١	-١,١٢	٢,٢٢	١,٠٥	-٣,٠	١,٠٣	٣١,٠٠
Potence ratio in F٢	-٦,٦٧	-١,٥٢	-١,٤٥	-٠,٤٩	-١,٨٦	٣,٩٣	١,٣٨	-١٠,٠	١,٣٩	٥٤,٠٠

***, ** significant at ٠,٠٥ and ٠,٠١ levels, respectively.**
N.O.B/P = Number of opening bolls per plant
S.C.Y/P = Seed cotton yield per plant in g.
L.C.Y/P = Lint cotton yield per plant in g. **L.P = Lint percentage**
B.W. = Boll weight in g. **S.I = Seed index**
٢,٥٪ S.L. = ٢,٥٪ span length **F.F = Fiber fineness**
F.S = Fiber strength **U.R% = Uniformity ratio**
H.M.P. = Heterosis from mid parent **H.M.B = Heterosis from better parent**
ID = Inbreeding depression

Concerning inbreeding depression, the results indicated highly significant positive inbreeding depression in mid-parents, $F_{٢}$ and $F_{٣}$ generations for all yield and fiber quality traits except, boll weight , seed index and fiber fineness in the two crosses as well as ٢,٥٪ span length in cross I and fiber strength in cross II The reduction in performance of the $F_{٢}$ and $F_{٣}$ generations with respect to their corresponding $F_{١}$ hybrids was negatively associated with the amounts of heterosis obtained in these hybrids. When the large amount of heterosis is obtained for any trait, large inbreeding depression can occur and may be due to fixation of unfavorable recessive genes in $F_{٢}$ and $F_{٣}$ generation, i.e. the depression of dominance effects of genes. El-Helw (٢٠٠٢) reported highly significant positive heterotic effects relative to mid-parents for seed cotton yield /plant, lint cotton yield /plant and boll weight and highly significant positive inbreeding depression values for seed cotton yield /plant, lint cotton yield /plant and lint percentage.

With respect to potence ratio, the results illustrated presence of over-dominance for most studied traits in $F_{١}$ hybrid and $F_{٢}$ generations in the two crosses. El-Akhedar (٢٠٠١) stated that the over-dominance controlled inheritance of seed and lint cotton yield/plant in the two crosses, seed index in the second cross and fiber fineness in the first cross. While, partial dominance controlled the rest of the traits. Also, he indicated that additive, dominance and most types of epistatic effects controlled the inheritance of fiber fineness. Concerning these results, could obtained from the failure of the parents of equal phenotypic values to carry the same dominant and duplication genes in different genomes may underestimate or overestimate the potence ratio which would exist if the genes were acting in a diploid state.

Concerning of scaling tests C and D for the studied traits are presented in Table ٣ The results revealed that, the C were highly significant for all studied traits in the two crosses except seed index, ٢,٥٪ span length and fiber fineness in cross I as well as fiber strength in cross II. The results assured that there were non- allelic interaction inheritance of these traits, more particularly, additive x additive type of gene action plays role in governing these traits.

Table (٣): Scaling test values for yield and yield components and fiber traits in two cotton crosses ten studied traits in the two cotton crosses

Traits		Cross I	Cross II
N.O.B./P	C	-٤,٤**±٠,٣١	٦,٧٤ **±٠,٣٢
	D	-٠,٦٠*±٠,٢٨	-٤,٠**±٠,٢٨
S.C.Y/P	C	-٢٦,٦١**±٠,٦١	٦,٥٨**±٠,٥٧
	D	١٨,٩٩**±٠,٥٢	٣٣,٠٦**±٠,٥٠
L.C.Y/P	C	-١٤,٣٤**±٠,٤٦	-٤,١٠**±٠,٤٢
	D	٣,٤٢**±٠,٣٦	١٣,٣**±٠,٣٤
L.P	C	-٣,٣٩**±٠,٤١	-٦,٣٣**±٠,٤١
	D	-٣,٤٣**±٠,٣٢	١,٩١**±٠,٣٣
B.W	C	٢١,١٩**±٠,٦١	٠,٦٣**±٠,١٩
	D	٢,٩٩±٠,٥٢	٠,٨٣**±٠,١٨
S.I.	C	-٠,١٦±٠,٣٩	-٠,٩٢*±٠,٣٨
	D	-٠,٦٦*±٠,٣٣	-١,٣٨**±٠,٣١
٢,٥٪ S.L	C	-٠,٤٠±٠,٣٨	١,٤٩**±٠,٣٧
	D	-٢,٦٠**±٠.٣٣	٢,٧٠**±٠,٣٠
F.F	C	٠,٦٥±٠,٢٦	٠,٧٠*±٠,٢٥
	D	٠,٣١*±٠,٢٤	٠,٩٠**±٠,٢٣
F.S	C	-٢,٥١**±٠,٣٩	٠,٢١±٠,٤١
	D	-٠,٣٥±٠,٣٢	٠,٣٧±٠,٣٣
U.R%.	C	-٢,٢**±٠,١٥	٢,٣**±٠,١٤
	D	٠,٤٨±٠,١٠	١,٥٠**±٠,٠٩

***, ** significant at ٠,٠٥ and ٠,٠١ levels, respectively.**
N.O.B/P = Number of opening bolls per plant
S.C.Y/P = Seed cotton yield per plant in g.
L.C.Y/P = Lint cotton yield per plant in g. **L.P = Lint percentage**
B.W. = Boll weight in g. **S.I = Seed index**
٢,٥٪ S.L. = ٢,٥٪ span length **F.F = Fiber fineness**
F.S = Fiber strength **U.R% = Uniformity ratio**

Also, D values, were highly significant for all yield and its components traits under study in the two crosses except boll weight and uniformity ratio in the cross I, and fiber strength in the two crosses. These conformed that, the non-allelic interaction played role in the inheritance of these traits, more particularly dominance x dominance type of gene action played role in governing these traits.

Generally, test of significance for one or two scales indicated that the additive-dominance model was inadequate. In other words, these results indicate the role of non-allelic interaction (interaction of non-allelic gene at different loci) governing these traits. Similar results and conclusion have been recorded by El-Helw (٢٠٠٢) and Abou El Yazied *et. al*. (٢٠٠٨).

The data in Table ٤ showed that the mean effect of $F_{٢}$ performance (m) were highly significant for all studied traits in the two crosses. Initially, it was noted that these characters were quantitatively inherited. Also, the additive gene effects (d) were significant or highly significant positive for all studied traits except uniformity ratio in cross II. Dominance effects (h) were positive and highly significant for number of opening bolls/ plant, lint cotton yield /plant and lint percentage in two crosses and for ٢,٥٪ span length and uniformity ratio in cross II. Therefore, the presence of both additive and non-additive gene action for most studied traits with some exceptions for certain crosses, indicated that selection procedures based of the accumulation of additive effects should be successful in improving these traits. To maximize selection advance, procedures that are effective in shifting gene frequency when both additive and non-additive genetic variances are involved would be preferred. (El- Akhedar and El- Mansy, ٢٠٠٦) stated that overall epistasis play important role in the inheritance of all yield and its component traits except for boll weight as well as fiber properties. Finally, all types of gene action effects (d, h and epistasis) were highly significant or significant, but additive x additive component (i) epistatic effect was higher in magnitude and played a major role in the inheritance of these traits. Also, the results revealed that, duplicate epistasis as revealed by difference in signs of h and L in crosses which exhibited significant epistasis for lint cotton yield per plant and seed index in two crosses and number of opening bolls /plant, lint percentage, fiber strength and uniformity ratio in cross II as well as ٢,٥٪ span length and fiber fineness in cross I. In duplicate type of epistasis (the ratio ١٥:١) identical substance of substances interchangeable in effect are presumably produced by the dominant alleles at both loci. Meanwhile, complimentary type of gene interaction was observed for seed cotton yield /plant and boll weight in two crosses and number of opening bolls /plant , lint percentage, fiber strength and uniformity ratio in cross I and for ٢,٥٪ span length and fiber fineness in cross II only where similar signs were obtained for both h and L. In complementary type of epistasis (the ratio ٩:٧) they probably produce different substances both of which were needed for the phenotypic manifestations of some property. Similar results were reported by EL-Akhedar (٢٠٠١), El-Helw (٢٠٠٢) and Soliman (٢٠٠٣).

REFERENCES

\Abou El-yazied,M.A. A.M.R. Abd El- Bary and M.A.M. Allam ٢٠٠٨. Genetic studies of some quantitative traits in two cotton crosses (*gossypium barbadense* l.) Egypt. J. Agric.,Res.,٨٦(٤):١٤٦٣-١٤٧٥

El-Akhedar, A.A.A. ٢٠٠١. Evaluation of some cotton crosses for earliness and economical traits. Ph. D. Thesis. Fac. of Agric., Kafr El-Sheikh, Tanta Univ., Egypt

El-Akhedar A.A.A and Y.M.EL_Mansy ٢٠٠٦. Detectinal of epistasis and genetic correlation in cotton using $F_{٢}$ triple test cross. Egy. J. Res.Cairo Univ.

El-Disouqi, A.E. and A.M. Zeina ٢٠٠١. Estimates of some genetic parameters and gene action for yield and yield component in cotton. J. Agric. Sci. Mansoura Univ., ٢٦(٦): ٣٤٠١-٣٤٠٩..

El-Helw, S.S.H. ٢٠٠٢. Genetic parameters of some economic characters in the extra-long cotton cross "Giza ٦٨ x Sea Island". J. Agric. Sci. Mansoura Univ., ٢٧(١٢): ٢٠١١-٢٠٢٠.

Gaurav, K.; B.S. Gill and R.S. Sohu (٢٠٠٧). Heterosis and combining ability analysis for plant and seed characters in upland cotton (*Gossypium hirsutum*, L.). J. Cotton Res. and Development. (India), ٢١(١): ١٢-١٥

Hayman, B.I. ١٩٥٨. The separation of epistatic from additive and dominance variation in generation means. Heredity, ١٢: ٣٧١-٩٠

Mather, K. ١٩٤٩. Biomettrical genetics. ١st ed. Methuem, London.

Smith, H.H. ١٩٥٢. Fixing transgressive in nicotine. Heterosis . Iowa State College press, Ames, Iowa, U.S.A.

Soliman, Y. A.M. ٢٠٠٣. Studies on some quantitative characters in some intra-specific cotton crosses. Ph.D. Thesis, Fac. of Agric. Kafr El-Sheikh, Tanta Univ., Egypt.

Soomro, Z.A.; A.S. Larik; M.B. Kumbhar and N.U. Khan (٢٠٠٦). Expression of heterosis in the F١ generation of a diallel crosses of diverse cotton genotypes. Sarhad J.Agric., ٢٢(٣): ٤٢٧-٤٣١

دراسات وراثية علي بعض هجن القطن الباربادنس

محمد عبد السلام نصار*، حسين يحيى عوض و صلاح صابر حسن****
*** كلية الزراعه ، جامعة الازهر، مصر**
**** قسم بحوث تربية القطن، معهد بحوث القطن ، مركز البحوث الزراعية ، مصر**

تمثل دراسة تاثير فعل الجين اهمية قصوى لمربى النبات حيث تمده بالمعلومات اللازمة لتحسين صفات المحصول ومكوناته وكذا صفات الجودة. ومن ثم فقد اجرى هذا البحث لتقسيم التباين الوراثي الى مكوناتة من خلال دراسة الأجيال المتعاقبة لهجينين من القطن هما جيزة ٨٨ × بيما س٦ و جيزة ٤٥ × سيوفين بمحطة البحوث الزراعية بسخا خلال ثلاثة مواسم زراعية (٢٠٠٨- ٢٠١٠)

وكانت أهم النتائج المتحصل عليها كما يلي:-

- أظهرت النتائج وجود اختلافات معنوية بين الأجيال المتعاقبة داخل كل هجين بالنسبة لكل الصفات المدروسة.وهذا راجع لتاثير قوة الهجين وتاثير السيادة التى تحكم توريث هذة الصفات . وايضا ظهر تفوق الجيل الثالث لمعظم الصفات المدروسة بالمقارنة بقيم الجيل الثانى فى كلا الهجينين.
- وقد اوضحت النتائج قدرة الاباء سيوفين و بيما س٦ و جيزة ٨٨ و و جيزة ٤٥ على توريث ونقل صفاتها الى الأجيال المتعاقبة وبالتالي يمكن الاستفادة من هذه الآباء في برامج تربية القطن لتحسين هذة الصفات.
- لوحظ وجود قوة هجين موجبة وعالية المعنوية بالمقارنة بمتوسط الأبوين لمعظم الصفات المدروسة .وكذا بالمقارنة بالأب الأفضل فى كلا الهجينين ماعدا صفات دليل البذرة ومتوسط الطول عند ٢,٥% ونعومة ومتانة التيلة في الهجين الأول بالاضافة الى صفة دليل البذرة فقط فى الهجين الثانى.علاوة على ذلك فقد وجدت قوة هجين موجبة وعالية المعنوية بالمقرنة بالاب الافضل بالنسبة لصفات عدد اللوز المتفتح / نبات وتصافى الحليج فى الهجين الاول ولكل الصفات المدروسة فى الهجين الثانى ما عدا صفات متوسط وزن اللوزة ودليل البذرة ومتوسط الطول عند ٢,٥% ومتانة التيلة.
- كانت قيم الإنخفاض الناتج عن التربية الداخلية بالنسبة لمتوسط الآباء والجيل الثاني والثالث موجبة وعالية المعنوية لكل الصفات المدروسة ماعدا صفات متوسط وزن اللوزة ودليل البذرة ونعومة التيلة فى كلا الهجينين بالاضافة الى متوسط الطول عند ٢,٥% في الهجين الاول ومتانة التيلة في الهجين الثانى.
- تحكمت السيادة الفائقة في توريث معظم الصفات المدروسة في كلا من الجيل الأول الهجين والثاني أما باقي الصفات فقد تحكم في توريثها السيادة الجزئية.
- أوضحت نتائج اختبار الـ Scaling وجود تفاعل غير اليلى (تفوق) لمعظم الصفات المدروسة فى كلا الهجينين مما يدل على أهمية دور الفعل الوراثي التفوقى في وراثة هذه الصفات.
- كان متوسط اداء الجيل الثانى عالى المعنوية لكل الصفات المدروسة فى كلا الهجينين. وايضا كان التأثير الاضافى معنويا أو عالي المعنوية لكل الصفات المدروسة ماعدا صفة انتظام التيلة فى الهجين الثانى بينما كان التأثير السيادى موجب وعالي المعنوية لصفات عدد اللوز المتفتح / نبات و محصول القطن الشعر /نبات وتصافى الحليج فى كلا الهجينين وصفة متوسط الطول عند ٢,٥% وانتظام التيلة في الهجين الثانى .علاوة على وجود كلا من التاثير الاضافى وغير الاضافى للجين لمعظم الصفات تحت الدراسة مع بعض الاستثنئات فى كلا الهجينين مما يدل على امكانية اجراء الانتخاب المعتمد على التاثير الاضافى المكمل فى تحسين هذة الصفات.ولكن من بين مكونات التفوق كان التأثير الاضافى × الاضافى موجب ومعنوي واكثر أهمية ولعب دور كبير فى توريث هذة الصفات.

قام بتحكيم البحث
أ.د / ممدوح محمد عبد المقصود **كلية الزراعة – جامعة المنصورة**
أ.د / عبد المعطي محمد زينة **مركز البحوث الزراعية**

Table (١): Means and their standard errors of the five populations for yield and yield components and fiber traits in two cotton crosses

Crosses		N.O.B/P	S.C.Y/P	L.C.Y/P. g	L .P %	B.W	S.I	٢.٥٪ S.L.	F.F	F.S	U.R%
Cross I (G.٨٨ x P. S٦)	P١	٣٤,٨٣±٠,٠٦	١٠١,٠١±٠,١٦٠	٣٨,٦٠±٠,١٣٧	٣٨,٢١±٠,١١٩	٢,٩٨±٠,٠٢٠	٩,٧٥±٠,٠٧٦	٣٥,٨±٠,٠٦٥	٣,٠١±٠,٠٢٥	١٠,٨٩±٠,١١٩	٨٩,٧٠±٠,٠٩٦
	P٢	٣٤,٥٤±٠,٠٦	١١٤,٠٠±٠,١٦٦	٤٠,١٤±٠,١٣٤	٣٥,٢١±٠,١٠٤	٣,٣٠±٠,٠١٨	١٠,٠١±٠,٠٨٧	٣٣,٨٠±٠,٠٦٩	٣.٣٢±٠,٠٣	١٠,٤٦±٠,١١٧	٨٨,٥٠±٠,١٠٧
	F١	٣٦,٠±٠,٠٥	١١٠,٢٠±٠,١٥١	٤٢,٥±٠,١٢٠	٣٨,٦١±٠,١٠٥	٣,٢٠±٠,٠١٦	٩,٩٠±٠,٠٨٣	٣٣,٢٠±٠,٠٦٧	٣,٣٠±٠,٠٦	١٠,٩٠±٠,١١٣	٨٩,٨±٠,٠٨٩
	F٢	٣٥,٢ ±٠,٠٧	١٠٢,٢٠±٠,١٢٠	٣٧. ٦±٠,٠٨٤	٣٦,٨١±٠,٠٧٩	٣,٣٠±٠,٠٤٣	٩,٨٥±٠,٠٨٢	٣٣,٩±٠,٠٨٦	٢,٩٨±٠,٠٧	١٠,١٦±٠,٠٦٧	٨٨,٩±٠,٠٨١
	F٣	٣٤,٠١±٠,٠٦	١٠٩,٦٠±٠,١٠١	٣٩,٣٤±٠,٠٦٤	٣٥,٨٩±٠,٠٥٩	٣,٣٠±٠,٠٤٣	٩,٧٠±٠,٠٦٥	٣٣,٧٠±٠,٠٦٤	٢,٨٠±٠,٠٦٢	١٠,٣٣±٠,٠٥٧	٨٩,١٢±٠,٠٥٩
Cross II (G. ٤٥ x Suvin	P١	٣٣,٢٦±٠,٠٦	٨٣,١٤±٠,١٥٧	٢٩,١٨±٠,١١٨	٣٥,١٠±٠,١٠٤	٢,٥٠±٠,٠١٨	٩,٤٦±٠,٠٩٣	٣٦,٦٠±٠,٠٦	٢,٨±٠,٠٢٤	١٠,٩٩±٠,١٠٩	٨٨,٤٠±٠,١٠٨
	P٢	٣٢,٩٤±٠,٠٦	١١٠,٣٦±٠,٠٨٣	٤٠,٣٢±٠,١٠٤	٣٦,٥٣±٠,١٠٩	٣,٣٥±٠,٠١٩	١٠,٠٠±٠,٠٩٤	٣٢,١١±٠,٠٦٠	٢,٩٩±٠,٠٢	١٠,٤٠±٠,١٣٩	٨٨,٣٠±٠,١١٠
	F١	٣٤,٣±٠,٠٦٢	١١٤,٢٠±٠,١٢٩	٤٤,٩±٠,١١٢	٣٩,٣٣±٠,١٠٦	٣,٤±٠,٠٢١	٩,١٣±٠,٠٨٥	٣٦,٧±٠,٠٨٢	٣,٠±٠,٠٥١	١١,٠±٠,١٢٢	٨٩,٩٠±٠,١٠٦
	F٢	٣٢,٦±٠,٠٧	١٠٧,١٢±٠,١٢٠	٣٨,٨±٠,٠٨٢	٣٥,٩٩±٠,٠٧٩	٣,٣٢±٠,٠٤٧	٩,٢٠±٠,٠٧٩	٣٥,٨±٠,٠٧٨	٣,١٠±٠,٠٦	١٠,٩٠±٠,٠٧٠	٨٨,٧٠±٠,٠٦٩
	F٣	٣٢,٧±٠,٠٦	١١٠,٢٠±٠,١٠٢	٤٠,١٠±٠,٠٦٥	٣٦,٣٩±٠,٠٦١	٣,٣٣±٠,٠٣٨	٩,١٢±٠,٠٥٨	٣٥,٩٠±٠,٠٥٩	٣,٢١±٠,٠٥	١٠,٨٩±٠,٠٦١	٨٩,٤±٠,٠٥٤

N.O.B/P = Number of opening bolls per plant
S.C.Y/P = Seed cotton yield per plant in g.
L.C.Y/P = Lint cotton yield per plant in g.
L.P % = Lint percentage
B.W. = Boll weight in g.
S.I = Seed index
٢,٥٪ S.L. = ٢,٥٪ span length
F.F = Fiber fineness
F.S = Fiber strength
U.R% = Uniformity ratio

Table (٤): The estimate of gene effects and type of epistasis five populations for yield and yield components and fiber traits in two cotton crosses

Traits	Crosses	Gene effects					Type of epistasis
		m	d	h	i	L	
N.O.B./P	I	٣٥,٢ ٠**±٠,٠٨	٠,١٥ **±٠,٠٤	٣,٧١**±٠,٢٢	-٤,٢١**±٠,٧٢	٢,٦٦**±٠,٢٣	Compl.
	II	٣٢,٦ **±٠,٠٧	٠,١٥**±٠,٠٤	٠,٨٧**±٠,٢١	٥,٠٧**±٠,٤٤	-٠,٠٣±٠,٢٢	Dup
S.C.Y./P	I	١٠٢,٢٠**±٠,١٢	-٦,٥٠**±٠,١٢	-١٤,٤٠**±٠,٣٧	٦٠,٨**±٠,٤٣	-٣٠,٢٧**±.٥٦	Compl.
	II	١٠٧,١٢**±٠,١٢	-١٣,٦١**±٠,٠٩	-٣,٣٩**±٠,٣٧	٣٥,٣١**±١,١٦	-٤٨,١٦**±.١٦	Compl.
L.C.Y./P	I	٤٠,٥٦**±٠,٠٨	-٠,٧٧**±٠,٠١	٢,٥٤**±٠,٢٥	٠,٨٨**±٠,٣٧	-٩,٣٣**±٠,٨٢	Dupl.
	II	٣٨,٨**±٠,٠٠٧	-٥,٥٧**±٠,٠٨	٠,٦*±٠,٢٥	٢٣,٢**±٠,٨	-٢٠,٧٠**±.٨٦	Dupl.
L.P	I	٣٦,٨٠**±٠,٠٨	١,٥٠**±٠,٠٨	٣,٦٤**±٠,٢٣	-٠,٠٥±٠,٧٦	٤,٧٤**±٠,٠٨	Compl.
	II	٣٥,٩٩**±٠,٠٨	-٠,٧٢**±٠,٠٨	١,١٩**±٠,٢٤	١٠,٩٩**±٠,٥٨	-٣,٧٦**±٠,٧٩	Dupl.
B.W.	I	٣,٣٠**±٠,٠٤	-٠,١٦**±٠,٠١	-.٠٧±٠,٢٦	-٠,٤٥±٠,١٣	-٠,٢٧±٠,٤١	Compl.
	II	٣,٣٢**±٠,٠٥	-٠,٤٣**±٠.٠١	-٠,٠٢٧±٠,١٤	٠,٢٦٧±٠,١٨	-١,٣٠**±٠,١٣	Compl.
S.I	I	٩,٨٥**±٠,٠٨	-٠,١٣* ±٠,٠٦	٠,٤٣±٠,٢٤	٠,١٥±٠,٢٦	-٠,٦٦±٠,٧٧	Dupl.
	II	٩,٢٠**±٠,١٠	-٠,٢٧**±٠,٠٩	٠,١٦±٠,٢٢	٠,٢٢±٠,٢٦	-٠,٦١±٠,٧٣	Dupl.
٢,٥٪ S.L	I	٣٣,٩٠**±٠,٠٩	١,٠٠**±٠,٠٥	٠,٠٧±٠,٣٥	٣,٦٧**±٠,٢٦	-٢,٩٣**±٠,٧٨	Dupl.
	II	٣٥,٨٠**±٠,٠٨	٢,٢٤**±٠,٠٤	٠,٨٠**±٠,٢٣	١,٦١*±٠,٧٤	٢,٩٤**±٠,٠٦	Compl.
F.F	I	٢,٩١**±٠,٠٦	-٠,٠٦**±٠,١١	-٠,٢٨±٠,١٨	-٠,٣٥*±٠,٠,١٧	٠,١٦±٠,٥٥	Dupl.
	II	٣,١**±٠,٠٦	-٠,٠٥**±٠,٠٢	-٠,٣٣±٠,١٨	٠,٢٧±٠,٥٥	-٠,٥٨**±٠,١٧	Compl.
F.S	I	١٠,١٦**±٠,٠٤	٠,٢٢*±٠,٠٩	٠,٠٤±٠,٢٢	٠,٢٥±٠,٢٨	٢,٨٨**±٠,٦٩	Compl.
	II	١٠,٩٠**±٠,٠٤	٠,٢٩**±٠,٠٩	٠,٠١±٠,٢٣	٠,٤٢±٠,٢٩	-٠,١١±٠,٧٢	Dupl.
U.R.%	I	٨٨,٩**±٠,٠٨	٠,٦٠**±٠,٠٧	٠,٠١٣±٠,٢٣	٣,٥٧**±٠,٧٦	٠,٥١٣±٠,٢٧	Compl
	II	٨٩,٧٠**±٠,٠٧	٠,٠٥±٠,٠٧	٠,٩٣**±٠,٢١	-١,٠٦٥±٠,٦٨	-٠,٥١٦±٠,٢٦	Dupl.

***, ** significant and highly significant at ٥٪ and ١٪ statistically probability levels, respectively**