GENETIC VARIABILITY STUDIES OF YIELD, YIELD COMPONENTS AND FIBER PROPERTIES IN SOME EGYPTIAN COTTON GENOTYPES
(*Gossypium barbadense* L.)

By

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CONTENTS

LIST OF TABLES

SUMMARY

The main objective of this research was to study and evaluate the possibility of improving the Egyptian cotton through the hybridization between different cotton genotypes.

The experiments were conducted during 2014, 2015 and 2016 seasons at Sids Agricultural Research Experiment Station, Beni-Suef Governorate, Agricultural Research Center, Egypt. The experiment was set as randomized complete blocks design with three replications.
In this study two statistical genetical methods of analysis were used as follows.

Part -1 General and specific combining.
Part -2 six parameters method.

The results obtained could be summarized as follows:

Part -1 General and specific combining ability

1. The values of average heterosis (heterosis over mid-parents) were 4.82, 0.58, 5.49, 7.59, 2.45, -0.18 and 3.87 for (NB/P), (BW), (SCY/P), (LY/P), (L %), (SI) and (LI), respectively. Heterobeltiosis, calculated as the percent difference between the F_1 and its higher parent average i.e. -9.34, -5.79, -8.58, -7.28, -3.79, -14.28 and -2.30 for (NB/P), (BW), (SCY/P), (LY/P), (L %), (SI) and (LI),respectively. Inbreeding depression (ID) results recorded negatively values for (NB/P), (BW), (SCY/P), (LY/P) and (LI), while (L %) and (SI) revealed positive values of inbreeding depression (ID).
2. The values of heterosis versus to mid-parents recorded negative value for (Mic) and (PL), it were -1.94 and -0.67, respectively. On the other hand (FL) and (UR) revealed positive values of heterosis and it was 4.30 and 0.36, respectively. Heterobeltiosis values for fiber properties traits shoewd negative values for all fiber traits except (FL)

which recorded positive value of heterobeltiosis, these were -10.5, -5.3 and -0.24 and 1.39 for (Mic), (PL) and (UR), respectively. Inbreeding depression results were positive and negative values for (Mic) and (PL), (FL) and (UR).

3. The analysis of variance for yield components and fiber property traits showed, significant and highly significant differences for (SCY/P) and (L %) as regard to general combining ability (GCA). For specific combining ability (SCA) highly significant and significant differences were estimated for (NB/P), (SI), (SCY/P), (LY/P), (L %) and (LI) and (FL). σ2 gca / σ2 sca, the mean squares of SCA were greater than GCA for all traits under study except for (Mic) which recorded that GCA was garter than SCA.
4. The estimation of GCA effects showed that the parental CB58 had the higher and significant value for GCA for (NB/P), (SCY/P) and (SI). Moreover the parental (G95) recorded higher value and significant effects for (BW) and (L %). Meanwhile the parental (G80) recorded negatively significant GCA for (LY/P).The SCA effects for yield components traits, indicating that the hybrid CB58 X G90 recorded SCA effects positive significant for (LI) and highly significant positive value for (L %) negative for (NB/P), (SCY/P). The F1 generation of the hybrid CB58 X G80 conducted negative significant SCA effects for (BW), while it was positive significant SCA effects for (NB/P), (SCY/P), (LY/P) and (L %). Estimates of SCA effects was positive and significant for (NB/P) and (SCY/P) traits in cross CB58 X G95. For the combination namely (G90 X G80), had positive and significant SCA effects for (SI) and (LI). The hybrid [G90 X (G90 X Aus.)] exhibited positive and significant SCA effects for (BW), (SCY/P), (SI) and (LI) and negative significant for (L %). Meanwhile the cross (G80 X G95) and [G95 X (G90 X Aus.)] showed significant positive for (SCY/P) and (LY/P) and negative for (NB/P). Estimates of SCA and GCA effects for fiber properties traits showed that the parent CB58 had

negatively significant GCA effects for (Mic). With respect to SCA effects, indicating significant positive SCA was recorded for (UR) of the cross [CB58 X (G90 X Aus.)], (Mic) and (FL) of the cross [G90 X (G90 X Aus.)], (FL) of the cross (G80 X G95) and cross [G80 X (G90 X Aus.)]. On the other hand, the cross (CB58 X G90) and (CB58 X G95) revealed significant negative SCA effects for (PI) and (UR) traits.

Part -2 Scaling test and six population genetic parameters experiment

1. The mean performance of the parent CB58 showed higher values for (NB/P), (SI), (LI) and (PI). While the parent Giza 80 recorded higher mean performance foe (BW), (SCY/P), (LY/P), (L %), (FL) and (UR) in cross I. Meanwhile in cross II the parent CB58 had high mean performance for (NB/P), (SCY/P). (LY/P), (PI), (FL) and (UR), while the parental Giza 90 showed higher mean performance for (BW), (L %), (SI) and (LI). Mean performance results in F_1 generation had high values for all yield components and fiber properties traits in the two crosses except for L% in cross I and (Mic) in cross II.
2. It is evident from the results that the (A, B and C) scaling test values deviated from zero of the two crosses for yield components and fiber properties. This indicated that the model of additive-dominance was inadequate for the role of additive, dominance that controlling these characters. The epistatic gene effects must be involved in the inheritance of the studied traits.
3. Regarding the type of gene effects, the additive gene effects were significant or highly significant positive for (BW), (SCY/P), (LY/P), (SI) and (LI) in cross I and (NB/P), (BW), (SCY/P), (LY/P) in cross II, while LI was significant negative. Significant negative or positive dominance gene effects were obtained for NB/P, BW, SCY/P, SI and LI in

cross I and L% in cross II. Additive X additive epistatic gene effects were highly significant for NB/P, BW, SCY/P, LY/P, SI, LI, PI and UR in cross I and NB/P, SCY/P, LY/P, Mic, FL and UR in cross II. Significant and highly significant negative or positive epistatic gene effect of dominance X additive were recorded for BW, SCY/P, LY/P, Mic, PI, FL and UR in cross I and BW, PI, FL and UR in cross II. Dominance X dominance gene effects were positive or negative and significant for all yield components and fiber properties traits except for L% in cross I and NB/P, SCY/P, LY/P, Mic, PI and UR in cross II.

4. Regarding heterosis values relative to better parent were insignificant for all yield components under study, while it were highly significant for all fiber property traits in two crosses. Heterosis over mid-parents, values were significant or highly significant for SCY/P, LY/P, PI, FL and UR in the two crosses.
5. All studied traits in the two crosses showed insignificant for inbreeding depression.
6. Average degree of dominance values showed over dominance for NB/P, BW, L%, SI, LI, PI and UR in cross I and NB/P, LY/P, L%, SI, Mic, PI, FL and UR in cross II. On the other hand SCY/P, LY/P, Mic and FL in cross I and BW, SCY/P and LI in cross II recorded partial dominance.
7. The relative high values of heritability (over 50%) in broad sense were noticed for BW, L%, PI, FL and UR traits in cross I, and for BW, LI, Mic and PI in cross II. Moderate heritability values (ranged from 30 to 50%) in broad sense were observed for LI and Mic in cross I and for SI in cross II. Low heritability values in broad (less than 30%) for NB/P, SCY/P, LY/P, SI and LI in cross I and for NB/P, SCY/P, LY/P, L% and FL in cross II. It is interesting to mention that high heritability values in narrow sense (over 50%) were recorded for UR in cross I and for Mic and UR in cross II. Moderate heritability values (ranged from 30% to 50%) in narrow sense were calculated for BW, L%, LI,

PI and FL in cross I, while moderate narrow sense heritability were not found for all studied traits in cross II. Low heritability values (less than 30%) in narrow sense were computed for NB/P, SCY/P, LY/P, SI and Mic in cross I and for all yield components and PI and FL traits in cross II.

8. The expected genetic advance values from selecting the desired 5% of F2 populations were high (over 10%) for all studied traits in cross I and for BW, L%, SI, LI, Mic, PI, FL and UR trait in cross II.