CONTENTS

5. SUMMARY AND CONCLUSIONS

Cotton is considered as the first fiber crop all over the world. About 3% of the world production are produced in Egypt. It supplies the textile industry with about 16% of the extra long staple cotton.

Vegetative, earliness, yield and yield component traits as well as fiber quality traits are important objective in cotton breeding in Egypt. It is known that all cultivated varieties were originated of Ashmouni of 1860. A fact that indicated the narrow genetic base within all past breeding efforts operated. Some foreign varieties belonging to *Gossypium barbadense,* L. pass a number of characteristics, which if transferred to Egyptian cotton, would be a great gain. Among of these traits; earliness, boll weight, lint percentage and seed index with maintaining of fiber quality in Egyptian cotton. Therefor, the first aim of the present study was to determine the relative magnitudes of both general and specific combining abilities and to evaluate some of the cotton varieties according to their general and specific combining ability effects.

The genetic materials in this investigation were six cotton varieties belong to *Gossypium barbadense,* L. These varieties more representing a rang of earliness, vegetative, yield and yield component traits and fiber traits that were devoted to establish the experimental materials for this investigation, three new germplasm materials 6022 (P_1) Russian cotton variety, Suvin (P_2) Indian cotton variety and Pima S_7 (P_3), American cotton variety. In addition two of them were extra long staple varieties, i.e.: G.88 (P_5) and G.70 (P_6), one of them was long staple variety i.e.: G.85 (P_4) were used in this investigation.

In the growing season of 2001, the six varieties were cultivated and mated in a half diallel fashion to obtain 15 F_1 single crosses. In addition, the parental varieties were selfed to obtain more seed of them. In the growing season of 2002 the six varieties and their 15 F_1 single crosses were planted and mated in three-way crosse fashion to obtain 60 three-way crosses. In 2003 growing season, the genetic material obtained from hybridization and their parental varieties were evaluated in two field trial experiments at Sakha Agricultural Research Station, Kafar EL-Sheikh Governorate, and Cotton Research Experimental at Abo – Kebir, EL-Sharkia Governorate. Vegetative, earliness, yield and yield component traits and fiber traits were studied. These traits were: number of vegetative branches, number of fruiting branches, plant height by cm., first fruiting node, number of days to first flower, number of days to first opening boll, seed cotton yield per plant, lint cotton yield per plant, lint percentage, boll weight, number of bolls per plant, seed index, lint index, fiber strength, fiber fineness, span length at 50 %, span length at 2.5% and uniformity ratio.

The obtained results of this investigation could be summarized as follows:

A. Single crosses:-

- Analyses of variance and the mean squares of vegetative, earliness, yield and yield component traits and fiber properties traits showed that the mean squares of the genotypes showed highly significance for all studied traits in L_1, L_2 and their combined data over both locations.

- The mean performances of genotypes indicated that the highest yielding variety were G.88 (P_5) and Suvin (P_2), while the lowest parent for yield and yield component traits was the variety G.70 (P_6). Similarly, for earliness traits P_2 was the lowest for N.D.F.F., and N.D.F.B., while, G.85 (P_4) for F.F.N. trait, with the value 70.88, 120.65, and 2.75, respectively. The variety G.70 (P_6) showed the highest mean for most of studied fiber traits.

- Most of F_1 single crosses which had Pima S_7 (P_3) or G.88 (P_5) exhibited the highest yielding, as well as most of single crosses which had Suvin (P_2) G.77 (P_6) and G88 (P_5)were the best crosses for fiber traits.

- Significance heterosis values versus mid – parents and the better parent were detected and showed highly significance for most studied traits and ranged from –13.17% for N.F.N. in L_2 to 184.50% for N.V.B./P in L_1 of vegetative and earliness traits. For yield and yield component traits heterosis values ranged from 4.28 % for L.% in L_2 to 78.00% for L.C.Y./P. Also for fiber traits, the heterosis values ranged from –14.84 for F.F. in L_2 to 9.89% for S.L.2.5% in L_1.

- Concerning the combining ability of diallel crosses the results revealed that P_5 (G.88) was the best combiner for yield and yield component traits, P_1 was the best combiner for earliness traits and the P_1(6022) was the best combiner for the fiber traits.

- The results revealed that the magnitudes of dominance genetic variance which were larger than that additive genetic variance and played the major role in the inheritance of yield and yield component traits. On the other hand, the magnitudes of additive genetic variances were important and larger than those of dominance genetic variance and played the major role in the inheritance of fiber, vegetative and earliness traits.

- The estimated values of heritability in broad sense were larger than their corresponding values of heritability in narrow sense and ranged from 7.30 to 95.57% for N.F.B. and N.D.F.F. traits, respectively. While, the narrow sense heritability ranged from 0.00% for F.F.N. and N.F.B. to 62.67% for N.D.F.F. in L_2 For yield traits the values of heritability in broad sense ranged from 64.88% for L.% in L_2 to 97.48% for the same trait in L_1. Also for fiber traits heritability in broad sense ranged from 30.02% to 99.91% for F.S. in L_2 and S.L.50% in L_2, respectively. But in narrow sense ranged from 12.86% for F.S. to 85.04 % for U.R.% in combined data.

B- Three- ways crosses analysis:

- The analysis of variances and mean squares for earliness, vegetative, yield and yields component traits indicated the presence of highly significant differences among three way crosses. The interactions between crosses and locations were insignificant for most of studied traits.

- The mean performances of genotypes indicated that most of three way crosses were more superior than the single crosses for most studied traits specially yield and yield component traits.

- Significant heterosis values were exhibited versus mid-parents and better parent from most studied three way crosses. The amounts of heterosis ranged from –19.08% for N.F.N. of M.P. to 172.52% for N.V.B. of M.P. trait .For yield and yield component traits most of studied three way crosses indicated highly positive heterosis. While, for fiber traits low heterosis values of the three-way crosses were determined.

- Concerning general combining ability the results revealed that the best combiner for earliness traits was the 6022 (P_1). While the Pima S_7 (P_3) and G.70 (P_6) were the best combiner for vegetative traits. In the same time, the Pima S7 (P_3) was the best combiner for fiber traits. It could be noticed that no parent was the best combiner for all the studied traits.

- Some of three way crosses were promising crosses and could be used in suitable breeding program and i.e.: for vegetative and earliness traits: (P_4xP_5) x P_1, (P_4x P_6) x P_1, (P_1 x P_3) x P_2, (P_1x P_6) x P_3, (P_1 x P_6) x P_2 and (P_3 x P_2) x P_1. For yield and yield component traits as (P_4x P_5) x P_6, (P_2 x P_6) x P_4, (P_4 x P_5) x P_2, (P_2 x P_6) x P_1, (P_1 x P_2) x P_3, (P_2 x P_3) x P_6 and (P_5 x P_6) x P_4. As well as for fiber traits i.e.: (P_3x P_4) x P_6, (P_2x P_3) x P_5, (P_1 x P_3) x P_6, (P_4 x P_5) x P_1, (P_1 x P_2) x P_3, (P_1 x P_4) x P_5, (P_5 x P_6) x P_3, (P_1x P_4) x P_5 and (P_5x P_6) x P_2.

- The results revealed that the magnitudes of additive genetic variances which, were positive and larger than those of dominance genetic variances, with respect to all studied traits .In addition, the results illustrated that the types of epistatic variances additive by additive and dominance by dominance were negative. While, additive by dominance was positive and played the major role in inheritance of most of studied traits.

- The magnitude of heritability in broad sense were larger than their corresponding values of heritability in narrow sense for all studied traits. Generally, the plant breeders should cary out breeding program, which make use of this promising combinations and should select in advanced segregation of these crosses.
- The results of this investigation indicated the possibility of producing of promising crosses obtained among selected varieties. Then these studied traits could improve through selection in segregated generations of promising hybrids.

CONCLUSIONS

The genetic studies such as heterosis and combining ability for cotton genotypes to selected optimum parents and crosses for breeding program .Two design of the statistical analysis i.e.: half diallel and three-way crosses analysis could be used in this study. The results indicated that, the analysis of variance was significant and highly significant for all the studied traits. The heterosis versus mid-parents and better parent cleared that desirable values in the three-way crosses larger than single crosses .In the same time genetic parameters indicated that dominance genetic variance was larger than additive genetic variance and played the major role in the inheritance of most of studied traits. However, in the three-way crosses additive and additive x dominance were larger than other genetic component variance and played the major role in the inheritance for all the studied traits and three-way crosses were larger than single crosses for most of studied traits.