COMBINING ABILITY AND HETEROSIS ANALYSIS USING DIALLEL CROSS BETWEEN SOME COTTON GENOTYPES

BY

TAREK SHAKER GOMAA SALEM

A thesis submitted in partial fulfillment

of

The requirements for the degree of

MASTER OF SCIENCE

in

Agriculture Science

(Agronomy)

Department of Agronomy

Faculty of Agriculture

Zagazig University

2020

ABSTRACT

Cotton is important fiber crop plays a major role in economy and national income of several countries in the world. Estimating combining ability and gene action could support cotton breeders to select potential parents and promising F1 crosses as well as identifying applicable breeding strategies for realizing high-yielding varieties with high fiber quality. The aim of current study was to estimate general combining ability for diverse six cotton genotypes (*Gossypium barbadense* L.) and specific combining ability for their realized F1 crosses from half diallel mating. Besides, to determine the gene action for earliness, yield and related traits as well as fiber quality parameters. Randomized complete block design (RCBD) with three replications was applied to evaluate the six parents and their fifteen F1 crosses in Experimental Farm of Sids Research Station, Beni-Suef, Egypt. The obtained results displayed highly significant differences among parental genotypes and their F1 crosses for all evaluated traits. Moreover, General (GCA) and specific (SCA) combining ability effects were highly significant for all tested traits. Otherwise, the ratio of GCA/SCA was less than unity for all evaluated traits, which proposed the importance of non-additive gene action in inheritance of these traits. Furthermore, the results of components of genetic variance revealed to significant contribution for additive and non-additive gene actions in the inheritance of all studied traits. Otherwise, it was observed more contribution of dominance effects in inheritance of these traits compared to additive ones. The dominance effects for these traits proposing that selection in early generations may not be useful and it should be delayed to advanced generations.

The parents P2 and P3 exhibited lowest values of earliness traits; P2 and P5 surpassed the other parents in yield related traits; P1, P3 and P5 exhibited highest values of fiber quality parameters. Moreover, P2 presented good combining ability for reducing earliness traits, and P5 demonstrated good combining ability for increasing yield and contributing traits as well as P3 possessed good combining ability for increasing fiber quality parameters. Besides, the hybrids; P2×P5, P2×P6, P3×P5, P3×P6, P4×P5 P4×P6, and P5×P6 displayed lowest values of earliness traits; and P1×P2, P3×P6, P4×P5 and P4×P6 surpassed the parents and the other hybrids in yield traits; as well as P1×P3, P1×P5, P2×P5, P2×P6, P3×P4 and P5×P6 demonstrated highest values of fiber quality parameters. The crosses; P2×P5, P2×P6, P3×P5, P4×P5 and P4×P6 exhibited highest significant and negative SCA effects for reducing number of earliness traits. The crosses; P1×P2, P3×P6, P4×P6 and P5×P6 displayed the highest significant and positive SCA values for yield and related traits. The crosses; P2×P5, P2×P6 and P3×P4 exhibited the highest significant positive SCA values for fiber quality parameters. Additionally, Wr-Vr graphs revealed to high degree of genetic diversity for parents with different degrees of dominance and different distribution of dominant and recessive alleles in the parental genotypes for all evaluated traits. Boll weight/plant and number of opened bolls/plant exhibited highest positive direct effect on seed and lint cotton yield/plant. Which indicates the effectiveness of direct selection of these traits for achieving high seed and lint cotton yield/plant. On the other hand, the highest indirect positive effects were assigned for 100-seed weight through number of opened bolls/plant on both seed and lint cotton yield/plant.

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