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HETEROSIS AND COMBINING ABILITY IN DIALLEL CROSSES AMONG CULTIVARS OF UPLAND COTTON

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ABSTRACT

A seven parent (Halab 90 = P_1, SP 8886 = P_2, Dunn 1517 = P_3, Coker 5114 = P_4, Lachata = P_5, Dunn 1047 = P_6 and Coker 310 = P_7) diallel of upland cotton was planted in a randomized complete block design with three replications at Al-Haweja, Karkuk Governorate during the season of 2007. Data collected from the diallel were used to estimate combining ability and heterosis for plant height, number of bolls per plant, boll weight, lint index, ginning outturn and seed cotton yield. The results showed that the hybrids $P_1 \times P_4$, $P_3 \times P_5$, $P_4 \times P_5$, $P_5 \times P_6$ and $P_5 \times P_7$ had significantly positive mid parents and higher parent heterosis for a larger number of characters. Significant variances of genotype, parents vs crosses, general combining ability (gca) and specific combining ability (sca) were observed for all studied characters. Almost additive genetic variance was preponderant for plant height, boll weight, ginning outturn and seed cotton yield and non-additive gene action was involved in the number of bolls per plant and lint index. The two cultivars Coker 310 and Lachata, and the crosses $P_1 \times P_4$ and $P_5 \times P_7$ exhibited significant positive gca and sca effects respectively for a larger number of characters, and were found to be the best general and specific combiners, and could be used for future breeding programmes.

Key words: genotypes, heterosis, combining ability, upland cotton.

1. INTRODUCTION

Cotton as a commercial crop has played an important role in boosting national economy of several countries, and provides fiber, food, feed and fuel to high percentage of people as well as livestock (Ahmad *et al.*, 2005). The increase in yield per unit area of the crop is a prime concern of breeding programmes, and cotton breeders all over the world. They have been utilizing genetic resources to modify the cultivars to meet the ever changing requirements of their society. The first step in a successful breeding programme is to select appropriate parents. Diallel analysis provides a systematic approach for the detection of appropriate parents and crosses superior in terms of the investigated traits (Basal and Turgut, 2003). It also helps plant breeders to choose the most efficient selection method by allowing them to estimate several genetic parameters (Verhalen and Murray, 1967).

Heterosis is the superiority in performance of hybrid individuals compared with their parents. Regarding previous studies on heterosis in cotton, Salam (1991), Altaf *et al.* (1996) and Abro *et al.* (2009) conducted such studies for yield contributing characters and reported promising heterosis for yield parameters, and through heterosis, seed cotton contributing characters can be improved significantly (Naquibullah *et al.*, 2000).

Combining ability describes the breeding value of parental lines to produce hybrids. Sprague and Tatum (1942) used the term general combining ability (gca) to designate the average performance of a line in hybrid combinations, and used the term specific combining ability (sca) to define those cases in which certain combinations do relatively better or worse than the expected on the basis of the average performance of the lines involved.

In order to choose appropriate parents and crosses, and to determine the combining abilities of parents in the early generations, the diallel analysis method has been widely used by plant breeders. This method was applied to improve self and cross-pollinated plants (Jinks and Hayman, 1953; Hayman, 1954; Jinks, 1956; Griffing, 1956; and Hayman, 1960). The importance of combining ability studies lies in the assessment of of parental lines and their