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ABSTRACT

A half diallel cross was made using six inbred lines *i.e.*, Gm 2, Gm 7, Gm 18, Gm 30, Sd 7 and Sd 63. All F_1's and their parents were evaluated for yield and its components in replicated field trials at four locations; Gemmeiza, Sakha, Sids and Mallawy in the two respective seasons, 2003 and 2004. Diallel analysis Griffing's Model I Method II were used to estimate general (GCA) and specific (SCA) combining ability. Mid-parent and high-parent heterosis were calculated. The results showed that the interaction between genotypes x locations, general and specific combining ability were highly significant for all studied traits. The SCA played the most important role in the inheritance of most studied trait. Each of the parental inbred lines Gm 30 and Sd 7 revealed the better combining ability with the other parents. The single crosses Gm 30 x Sd 63 and Sd 7 x Sd 63 were the best crosses with the highest yield productivity 36.17 and 35.62 ardab/feddan, respectively. F_1 crosses expressed highly significant values for grain yield heterosis ranged from 257.94 to 397.05 and 209.96 to 351.80 % for mid-parent and high-parent heterosis, respectively. The parental inbred lines were surveyed for DNA polymorphism using 28 RAPD primers, 21 SSR primer pairs and 10 AFLP primer combinations. The ratios of polymorphism were 82%, 98.48% and 79.20% for RAPDs, SSRs and AFLPs, respectively. All marker systems were able to uniquely fingerprint each of the inbred lines. Genetic similarity was determined using Dice's similarity coefficient, and a dendrogram was constructed for each marker type by UPGMA. The combined dendrogram based on the three types of markers, grouped the six maize inbred lines in complete accordance to their genetic background. The AFLP technique exhibited the highest effective number of alleles (408.36), the highest marker index (25.47) and the highest effective multiplex ratio (79.60) compared to RAPD and SSR. The genetic distances (GDs) based on molecular data were partitioned into general (GGD) and specific (SGD) components. Correlations of GD and SGD with F_1 grain yield, specific combining ability (SCA), mid-parent (MPH) and high-parent heterosis (HPH) were negative and non significant, however, the correlation of GD and SGDs based on AFLP and combined data revealed low positive association. These results pointed to AFLP analysis and/or the use of several types of molecular markers provide a powerful tool for assessing genetic variation and assigning maize inbred lines into different heterotic groups. Consequently, they are considered as valuable tools to field trials complementation for identifying groups with satisfactory heterotic response, thus assisting maize breeders to predict combinations of lines that result in high-yielding, single-cross hybrids.

Key words: Maize (*Zea mays*), molecular markers, diallel cross, correlation coefficients, combining ability, heterosis.

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