

ABSTRACT

Wafaa Wahba Mohamed Shafie: Analysis of Gene Action for Yield and Quality Characteristics in Diallel Crosses of Sesame. Unpublished Ph.D. Thesis, Department of Agronomy, Faculty of Agriculture, Ain Shams University, 2010.

Eight sesame genotypes were crossed in a diallel mating design, excluding reciprocals, to produce 28 F_1 hybrid seeds in 2004 season and the 36 entries (8 parents + 28 F_1 's) were evaluated for eleven traits in 2005 season. The eight genotypes were re-crossed in the same diallel pattern in 2005 season and the 36 entries were evaluated for the same traits in 2006 season aiming to study heterosis, combining abilities, types of gene action and heritability, as well as correlation and path coefficient analysis for earliness, yield attributes and oil and protein contents in both seasons.

The results indicated that the mean squares due to all 36 genotypes as well as mean squares due to parents and crosses were highly significant for all studied characters, i.e., days to flowering, height of first capsule, plant height, fruiting zone length, number of fruiting branches/pant, number of capsules/plant, capsule length, 1000-seed weight, seed yield/plant, oil and protein percentages in both seasons, revealing the presence of sufficient genetic variability in the studied genotypes.

Parents vs. crosses mean squares as an indication to average heterosis for all hybrids were significant in all traits. Significant desirable negative or positive heteosis relative to mid and better parents were observed in many crosses for all traits in both seasons.

Both general and specific combining ability mean squares were found to be highly significant for all studied traits in both seasons, indicating the importance of both additive and non-additive gene effects in the expression of the studied traits. The ratios of GCA/SCA variances were greater than unity for days to flowering in the first season and near unity

in the 2nd, height of first capsule, plant height, fruiting zone length, no. of fruiting branches, no. of capsules/plant, capsule length, 1000-seed weight, seed yield/plant, oil % and protein % in both seasons, indicating that the inheritance of these traits were mainly controlled by additive gene effects. However, ratios were less than unity for no. of capsules/plant in both seasons illustrating that this traits was mainly controlled by the non-additive gene effects. Good general combiner parents were identified for each of the studied traits. Some crosses exhibited significant desirable SCA effects in all studied traits and some of them involved at least one good general combiner parent, therefore, considered as promising F₁ cross combinations for improving sesame traits.

High estimates of heritability values in the narrow sense exceeding 50% were detected for plant height, number of branches/plant, fruiting zone length, oil% and protein% in the two seasons. These values ranged from 50.04% for number of branches/plant in 2005 season to 66.04% for oil % in 2006 season, indicating the importance of additive and additive x additive gene effects in the inheritance of these traits and consequently the effectiveness of selection for improving such traits in early segregating generations. However, moderate values of heritability in the narrow sense were obtained in both seasons for number of capsules/plant, capsule length, 1000-seed weight and seed yield/plant, ranging from 32.67% for 1000-seed weight in the 1st season to 45.63% for seed yield/plant in the 2nd. With regard to the two earliness traits, i.e. days to flowering and height of first capsule, low estimates of narrow sense heritability were obtained in both seasons ranging from 21.24% for days to flowering in the 2nd season to 27.49% for height of first capsule in the 2nd season, indicating that, in the case of moderate and low heritabilities in the narrow sense, response to selection for these traits in later segregating generations would be expected.

Except for oil%, the other 10 earliness, yield attributes and protein content exhibited consistent high estimates of broad sense heritabilities as compared to their respective narrow sense values ranging from 84.6% for

1000-seed weight in 2005 season to 99.4% for height of first capsule in both seasons, indicating that dominance effects had prominent role in the inheritance of these traits.

Path analysis indicated that, plant height, fruiting zone length, height of first capsule and no. of capsules/plant and their interactions across as the main sources of seed yield variation

Key Words: Sesame, Diallel crosses, Combining abilities, Heritability, Earliness, Yield, Oil, Protein, Correlation and path analysis.

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