SUMMARY

The aim of this investigation was to determine the extent of heterosis and combining ability estimates and their interaction with three spacings (densities) 35000 (D1) 23333 (D2) and 17500 (D3) plants/fed. in two locations, namely, Sakha (L1) and El-Serw (L2), for 50% flowering date, physiological maturity date, plant height, stem diameter, head diameter, 100-seed weight, seed husk percent, number of seeds/head, seed yield/plant, oil percentage, oil yield/plant and seed yield/fed.

Six cytoplasmic male sterile (CMS) lines (A-lines), two introduced from USDA (A_1 and A_4) and the others produced in El-Serw, Egypt (A3, A6, A9, and A10), and five fertility restorer lines (RF-lines), three of them introduced from USDA (R3, R4 and R8) and two from El-Serw Station Egypt (R12 and R14) of sunflower were planted at Sakha Agric. Research Station in 1996 summer season for developing 30 top crosses.

In 1997 summer season, the thirty hybrids, the five testers, the six fertile lines (B-lines) and the three hybrids (Eirflor, Malabar and Vidoic) were sown in two locations i.e., Sakha on 3rd July and El-Serw on 17th June. In each location, a split plot design with three replications was used. The main plots were assigned to plant spacings (densities) while sub-plots were allocated to forty four genotypes of sunflower. Each sub-plot consisted of five ridges, each ridge was 420 cm. long and 60 cm wide. Calcium superphosphate (15.5% P_2O_5) was added during seed bed preparation at the rate of 100-kg/fed. All agricultural practices were carried out as usual in the convential sunflower fields. Ordinary analysis of variance was performed for the data collected from top crosses in each location to test the significance of all genotypes. Homogeneity of error

variances was tested for each trait. When differences among top crosses were significance, line by tester analysis according to Kempthorne (1957) was done for each density and over the three densities in each location. Heterosis percentage for seed and oil yield/plant, oil percentage and seed yield/fed was computed for individuals crosses as the percentage increase of each top cross relative to Eirflor, Malabar and Vidoc commercial sunflower hybrids.

Data were recorded on twenty guarded plants chosen at random from each sub-plot. The characters studied were: · 50% flowering date, physiological maturity date, plant height, stem diameter, head diameter, weight of 100 seeds, seed husk percent, no. of seeds/head, seed yield/plant, oil percentage, and seed yield/fed.

The results obtained can be summarized as follows:

1- The highest mean values for flowering and maturity dates, stem diameter, head diameter, 100-seed weight, no. of seeds/head, seed husk percentage, seed yield/plant and oil yield/plant were obtained when hills were spaced 40 cm apart on the ridge. While, plant height, oil percentage and seed yield/fed were significantly increased by decreasing spacing between hills from 40 to 20 cm.

2- The mean squares of interaction between densities (spacing) and location were significant for most studied traits. The density (D1) (20 cm between hills) had the highest mean values for oil percentage and seed yield/fed. in El-Serw followed by D1 in Sakha location.

3- Genotypes mean squares were significant for all the studied traits at both locations as well as the combined analysis. Also, significant genotypes X location mean squares was detected for all traits.

4- The top crosses A1 x R3, A1 x R4, A1, R12, A1 x R14, A9 x R12, A9 x R14 and A10 x R14 showed significant increase in seed

yield/fed. compared to the best check hybrids in both locations as well as the combined analysis.

5- The crosses mean squares were significant for all the studied traits in separate density as well as the combined analysis in both locations.

6- The estimates of σ^2GCA played the major contribution in inheritance for plant height in separate density as well as the combined data in both locations, flowering date at D1 and D2 as well as the combined data in Sakha location, flowering date at D1 and the combined data in El-Serw location, stem diameter and head diameter at D1, D2, D3 and the combined data in Sakha location, and at D1 in El-Serw location, 100-seed weight at the three densities and the combined analysis in El-Serw location and at D1 in Sakha location, seed yield/plant at D2 and D3 in El-Serw location and seed yield/fed. at D3 in El-Serw location.

7- The parental inbred lines A1 and A6 and the parental testers R12 and R14 gave significantly positive $\hat{g}_i$ effect for seed yield.

8- The top cross A1 x R3 in both locations and top cross A6 x R8 in the second location (El-Serw) expressed significantly positive S_{ij} effects for seed yield/plant and yield kg/fed.

9- For seed yield/fed., thirteen, five and eitht top crosses in Sakha location, seven, six and fourteen crosses in El-Serw location showed significant positive heterotic effects relative to Eirflor, Malabar and Vidoic, respectively. The four top crosses (A1 x R3), (A1 x R4), (A1 x R12) and (A9 x R14) outyielded the check hybrids in both locations. The heterotic effect over two locations of the three check hybrids ranged from 11.6% for (A1 x R4) to 21.82% for (A1 x R3). It could be concluded that these crosses may be useful for improving seed yield of sunflower.