SUMMARY

This study investigated the extent of heterosis, combining ability and their interactions with three nitrogen fertilizer levels (as three different environmental conditions) for some agronomic characters. Path coefficient analysis for grain yield, regression analysis, and the predictionof possible double crosses yield were also included. Two sets of diallel crosses were used in this study. The first diallel set involved eight inbred lines i.e. Moshtohor 28 (M.28), M.33, M.41, M.44, M.50, $M.70_C$, M.103 and Giza 307-A. The second diallel set involved seven inbred lines i.e. Moshtohor 50 (M.50), M.54, M.101, M.103, M.104, Giza 102 and Giza 307-A, representing wide range of variability in most of the studied traits. In 1989 growing season, these lines for each diallel set were sown and were crossed in all possible cross combination without reciprocals to obtain grains of 28 F_1 straight crosses (first diallel set) and 21 F_1 straight crosses (second diallel set) at the Agricultural Research and Experiment Center of Faculty of Agriculture, Moshtohor, Kalubia Governorate. In 1990 season, three adjacent experiments for each diallel set were conducted at the Experimental Station of the National Research Center, at Shalakan, Kalubia Governorate. The three experiments were fertilized by 40, 80 and 120 Kg N/fed. The first diallel set included 28 F_1 lhybrids and D.C. 204 (check variety). While, the second set of diallel included 21 F_1 hybrids and D.C. 204. The experimental design used a randomized complete blocks with three replications in each experiment. Data of the following traits were recorded on ten individual plants chosen at random from each plot, except silking and tasseling dates where the plot mean

basis was used.

Data recorded on :

A. Agronomic characters :

1. Tasseling date
2. Silking date
3. Ear height
4. Plant height
5. Leaf area
6. Ear husk

B. Yield and yield components :

1. Number of ears/plant.
2. Ear length
3. Ear diameter
4. Number of kernels/row
5. Number of rows/ear
6. 100-kernel of weight
7. Grain yield/plant.

An ordinary analysis of variance was first performed for each experiment and then a combined analysis was carried out whenever homogenity of error variances was realized. Heterosis was computed as the percentage deviation of F_1 mean performance from check variety D.C. 204 average value for individual crosses. General and specific combining ability estimates were obtained by employing Griffing's (1956) diallel cross analysis designated as method 4 model 1. The obtained results can be summarized as follows :-

1. Nitrogen levels mean squares were highly significant for all studied traits except number of ears/plant for both diallel set. Most traits were significantly increased as the level of nitrogen increased.

2. Genotype mean squares were highly significant for all the studied traits except number of ears/plant at 40, 80 and 120 Kg N/fed.

and combined analysis in the first and second diallel sets, ear length at 40 and 120 Kg N/fed. and ear diameter at 40, 80 and 120 Kg N/fed. and combined analysis in the second diallel set.

3. For grain yield/plant, the hybrid (3x4) gave the highest value followed by cross (4x5) and then by cross (5x6) in the first diallel set. While, the cross (1x3), (4x5) and (4x5) expressed the highest grain yield/plant at 40, 80 and 120 kg N/fed., respectively.

4. The interactions between nitrogen fertilizer levels and hybrids mean squares were significant for all the studied traits except number of ears/plant, ear length and number of kernels/row in the first diallel set, and for ear height, leaf area, ear husk, 100-kernel weight and grain yield/plant in the second diallel set.

5. Heterosis estimates percentages revealed that the first diallel cross, the five crosses; (3x4), (4x5), (5x6), (7x8) and (1x2) out-yielded the D.C. 204 by 34.11, 26.90, 18.87, 17.47 and 13.56 %, respectively over the three nitrogen levels. In the second diallel set, the four F_1 hybrids (4x6), (3x6), (2x6) and (2x4) significantly out-yielded the check variety by 12.16 to 20.79 % with a mean value 15.82 % over the three nitrogen fertilizer levels.

6. General combining ability mean squares reached the significant level of probability for all agronomic traits, yield and yield components except number of ears/plant in the first diallel set. While in the second diallel set, g.c.a. mean squares were significant for agronomic attributes, number of rows/ear, 100-kernel weight

and grain yield/plant in the three nitrogen levels as well as at the combined data, and ear diameter at 120 Kg N/fed. and the combined analysis.

7. Specific combining ability mean squares were significant for all agronomic attributes in two diallel set except plant height at 40 Kg N/fed. in the second diallel set. In the first diallel set, s.c.a. mean squares were significant for yield and yield components except number of ears/plant. While, in the second diallel set, s.c.a. variances were significant for 100-kernel weight, grain yield/ plant, in the three nitrogen levels and the combined analysis, ear length at 80 Kg N/fed. and the combined data, ear diameter at 120 Kg N/fed., number of rows/ear at 120 Kg N/fed. and the combined analysis and number of kernels/row at 40 Kg N/fed.

8. High g.c.a./s.c.a. ratios which largely exceed the unity were obtained for all cases except, (ear height at 80 Kg N/fed. in the second diallel set), 100-kernel weight at the three nitrogen levels and the combined analysis, grain yield/plant at 40 and 80 Kg N/fed. and the combined analysis, and ear length at 40 and 120 Kg N/fed. in the first diallel set, and ear length at 80 Kg N/fed. and number of kernels/row at 40 Kg N/fed. in the second diallel set. While, ear length at 80 Kg N/fed. and the combined analysis and grain yield/plant at 120 Kg N/fed. had g.c.a./s.c.a. ratio was equal to unity.

9. In both diallel sets, the mean squares of interaction between the three nitrogen fertilizer levels and both types of combining ability

were significant for all the studied traits, indicating that the magnitude of g.c.a. and s.c.a. varied from nitrogen fertilizer level to another.

10. The best combiners were: Parental inbred line Moshtohor 50 for earlines and leaf area, parental inbred line Moshtohor 44 for height of plant and ear in the first diallel set, parental inbred line Moshtohor 28 for earliness and height of plant and ear, parental inbred line Moshtohor 103 for leaf area in second diallel set, and parental inbred line Moshtohor 103 for yield and most of yield components in two diallel set.

11. The three combinations; (3x4), (4x5) and (5x6) in the first diallel set and (4x6), (3x6) and (2x6) in the second diallel set appeared to be the most promising crosses for breeding towards high yielding potentiality. Also, the four crosses (2x4), (3x6), (1x2) and (2x7) would be promising for; earliness, short plant and ear height, leaf area and ear husk in the first diallel set, and, cross (2x6) earliness, short plant and ear height and cross (1x2) for leaf area and ear husk in the second diallel set.

12. Significant positive phenotypic correlation values were obtained between grain yield/plant and number of kernels at 120 Kg N/fed. and 100-kernels weight at 40 and 120 Kg N/fed. in the first diallel set. Also, it were significant between grain yield/plant and each of its components at 120 Kg N/fed. and each of number of rows/ear and 100-kernel weight at 80 Kg N/fed. and 100-kernel weight at 40 Kg N/fed. in the second diallel set.

13. Based on multiple linear regression analysis, three characters could be arranged in their relative contributions in grain yield as 100-kernel weight, number of rows/ear and number of kernels/ row in two diallel set.

14. Based on path coefficient · analysis, the most important sources of variation in plant yield were: the direct effect of 100-kernel weight, number of rows/ear and number of kernels/row at the three nitrogen levels in the first and second diallel set.

15. Predictions of the yield for the possible 210, 105 double crosses in the first and second diallel set, respectively were estimated. The predictions of double crosses: (1x3) (2x4), (1x3) (4x6), (1x5) (2x4), (1x5) (4x6), (2x4) (3x5), (3x5) (4x6), (3x5) (4x7), (3x5) (4x8), (3x7) (4x8), (4x6) (5x7) and (4x8) (5x7) at 40, 80 and 120 Kg N/fed. as well as at the combined data in the first diallel set, and double crosses : (1x4) (2x6), (1x6) (3x4), (1x6) (2x3), (2x3) (4x6), (2x6) (3x4), (3x4) (6x7) and (3x7) (4x6) in the second diallel set over the three nitrogen levels would exhibited high performance and out-yielded the check variety D.C. 204. It could be concluded that these double crosses offer a possibility for increasing grain yield of maize especially at 80 Kg N/fed.