CONTENTS

SUMMARY AND CONCLUSION

The present investigation aimed to study the genetic behavior of groups of white inbred lines their single crosses under different environments, years, fertilization and population densities.

The diallel crosses among ten selected inbred lines made in 1992 season were evaluated under four different environments; two plant densities, 20 000 (D_1) and 30 000 (D_2) plants per faddan and each alternated with two nitrogen levels 80 kg N (N_1) and 160 kg N (N_2) per faddan over two years (1993 and 1994) in the farm of the Sakha Agriculture Research Station.

Four environmental conditions designated as D_1N_1, D_1N_2, D_2N_1 and D_2N_2 were proposed under which the genotypes would be tested each experiment consisted of the 45 crosses plus one commercial cross single cross 10 (S.C 10) as a control.

The 46 genotypes were tested in each of the four environmental condition in two years 1993 and 1994 which comprise 8 experiments ($4 \times 2 = 8$) in randomized complete block design, with two replicates. The variations among entries in each environment were calculated in both years. The four experiments over the two years were combined in one analysis of variance including; between the genotypes the environments or years and the possible interactions among them. Average heterosis were calculated relative to mid all crosses. The variations among crosses were further partitioned into the general and the specific combining ability, components. Also general and specific combining ability effects for the ten inbred lines were computed according to Griffing's method 4 model-I (1956).

The data was taken on grain yield kg./plot and adjusted to (ard./fad.), silking date, plant and ear height (cm), ear length (cm), ear diameter (cm), number of rows/ear, number of kernels/row and weight of 100 kernels (gm).

First : Grain yield :

The results obtained from this character could be summarized as follows:

1- Grain yield was affected by years, densities and nitrogen levels however, 1994 season produced the highest yields than 1993 season.

2- The four environments differed in their grain yield means through the two successive seasons and the highest yield mean was obtained from D_2N_2 environment and the lowest one was obtained from D_1N_1.

3- With regard to the separate environments, it was noticed that as an average the high density (D2) showed high yields than low density (D_1). Also the 160 kg. of N/faddan (N_2) produced higher yield than 80 kg. of N/faddan (N_1).

4- The optimum environment for the above estimations should be characterized by the following features:

   a- Optimum environment for production is positively correlated with the average performance of the four environments.

   b- Maximum genetic variance for grain yield and other traits relative to general combining ability and specific combining ability.

   c- Minimum value of error variance.

On the basis of the above informations, the optimum environments for the nine traits were different and are summarized in the following table.

Non stress environments for nine characters studied relative to high mean performance, maximum g.c.a. variance and minimum error variance.

Characters	Non-stress environments					
	High performance		Maximum g.c.a. var.		Minimum error var.	
	D and N		D and N		D and N	
	Combination	Separate	Combination	Separate	Combination	Separate
Grain yield (kg/plot)	D_2N_2	$D_2>N_2$	D_2N_2	$D_2>N_2$	D_1N_2	$N_2>D_1$
Silking date (days)	D_2N_1	$D_2>N_1$	D_2N_1	$N_1>D_2$	D_1N_1	$D_1>N_1$
Plant height (cm)	D_2N_2	$N_2>D_2$	D_2N_1	$N_1>D_2$	D_2N_2	$N_2>D_2$
Ear height (cm)	D_2N_1	$D_2>N_1$	D_2N_1	$D_2>N_1$	D_1N_2	$D_1>N_2$
Ear length (cm)	D_1N_2	$D_1>N_2$	D_1N_1	$N_1>D_1$	D_2N_2	$N_2>D_2$
Ear diameter (cm)	D_1N_2	$D_1>N_2$	D_2N_2	$N_2>D_2$	D_2N_1	$D_2=N_1$
No. of rows/ear	D_1N_2	$D_1>N_2$	D_2N_1	$D_2=N_1$	D_1N_2	$N_2>D_1$
No. of kernels/row	D_1N_2	$D_1>N_2$	D_1N_1	$N_1>D_1$	D_2N_2	$D_2>N_2$
Weight of 100 kernels (gm)	D_1N_2	$D_1>N_2$	D_2N_1	$N_1>D_2$	D_2N_2	$D_2>N_2$

On the basis of the above informations, it could be noticed that the (D_2N_2) condition could be considered the optimum condition or non-stress environment for grain yield because it is nearly the suitable one of the four environments which covered the mostly features mentioned above according to the following:

1- It produced the significantly higher grain yield.

2- It is significantly higher for g.c.a. variance.

In addition this environment showed the higher positive and significant correlation coefficients among the other three environments or between the combined performance of the four conditions over the two years as indicated previously.

5- Heterosis of crosses was estimated relative to grand mean in percent and out of the 45 crosses the cross ($P_1 \times P_{10}$) indicated the highest heterosis percentage of 133%. Also the cross ($P_3 \times P_5$) indicated the lowest heterosis percentage of 85.71%.

6- As an average over the four environments the crosses means varied from 3.48 kg./plot or 24.85 Ard./fad for the cross ($P_3 \times P_5$) to 5.4 kg./plot or 38.57 Ard./fad. for the cross ($P_1 \times P_{10}$) with an average of 4.06 kg./plot or 29.00 Ard./fad.

7- The mean square of general and specific combining ability in case of absolute values are highly significant . However, the interaction were highly significant, indicating that g.c.a. (or additive effects) and s.c.a. (or non additive effects) are important in this trait. Moreover the g.c.a. and s.c.a. effects were affected by the various conditions except of that s.c.a. × D × N, g.c.a × Env. × Y and s.c.a. × Env. × Y. In addition the main effects of g.c.a. is more important than of s.c.a., while, the reverse were obtained from the interaction of them with either (D) or (N) or (D × N).

The results indicated that the inbred lines P_1 (K-1), P_6 (G-4) and P_{10} (G-338) are considered as a good combiners for grain

yield/plot. While the crosses [P_1 (k-1) × P_7 (G-6)] and [P_1 (k-1) × P_{10} (G-338)] gave highly positive and significant values of s.c.a. effects.

It could be concluded from the previous results that the inbreds with high yielding ability and superior genetic behaviour in crosses under the studied environmental factors and their could be considered the materials which may be used immediately for improving maize breeding programmes in Egypt.

8- The results indicate that the high yielding ability of the crosses may be due to the high g.c.a. and s.c.a. of the parents involved of those crosses.

The following relations were calculated as follows :

1- The correlation coefficient between line effects for ten lines and g.c.a. effects = 0.99 a value which is highly significant from zero.

2- The correlation coefficient between F_1 crosses per se and their respective s.c.a. = 0.51 a value which is highly significant different from zero.

Second :

The results of the other characters i.e. silking date, plant and ear height, ear length, ear diameter, number of rows per ear, number of kernels per row, and weight of 100 kernels showed that :

1- The mean performances of 1994 were generally higher than 1993 data.

2- Silking date, ear length, ear diameter, number of kernels per row and weight of 100 kernels were affected by the four environments under

study. While plant and ear height, number of rows per ear are not affected by different environmental conditions.

3- The separate conditions D (D_1 and D_2) and N (N_1 and N_2) declared that as an average over the four environmental conditions D_2 exceeded D_1 in, silking date and plant and ear height traits, while D_1 is superior than (D_2) in the remaining traits; ear length, ear diameter, number of rows/ear, number of kernels/row and weight of 100 kernels. On the other side and as an average the high (N_2) doses showed superiority to (N_1) doses in the performance of plant and ear height, ear length, ear diameter, number of rows per ear, number of kernels per row and weight of 100 kernels however, the reverse is obtained by silking date trait.

4- The four environments are suitable to declare the genetic variations among the all characters as shown in previous table.

5- The mean squares of g.c.a. and s.c.a. are highly significant for all traits. Also g.c.a. (or additive effects) is more important than s.c.a. (or non additive effects) for all traits except that of number of kernels per row which showed that the s.c.a (or non-additive effects) is more important than g.c.a. (or additive effects).

6- The interaction effects between g.c.a. or s.c.a. and the different environments conditions under study as well as their partitions; (D, N and D × N) are significant in most characters. Also s.c.a. when interacted with either (D) or (N) or (D × N) is more important than g.c.a. in all traits.