Contents

SUMMARY

Twenty-one F_1 hybrids of a diallel cross involving 7 elite inbred lines, kindly provided by Sids Agricultural Research Station, ARC, were grown in two contrasting environments. The favourable condition was the clay loam soil of the Experimental Farm of Assiut University, while the other stressful environment was that of the sandy calcareous soil of El-Ghoraieb Exp. Farm. F_1's were sown through the seasons 2000 to 2003 under both favourable and water stressed environments. Hybrids were also grown in an additional environment, the moderately stressed condition of Mallawy Agricultural Res. Station (ARC), in the seasons 2001and 2002. Data were recorded on individual plant basis for the following characters:1- Days to 50% anthesis 2- Days to 50% silking 3- Plant height 4- Dry matter/plant 5- No. of kernels/row 6-Eighth leaf area (ELA) 7-Leaf area index (LAI) 8-Ear leaf area (ErLA) 9- 100-kernel weight 10-Grain yield/plant. The experimental results were as follows:

1. Results revealed a 10 days average retardation in 50% days to anthesis and 11 days average retardation in 50% days silking due to moisture stress. Averaged of the 21 F_1's, 50% days to anthesis ranged from 56.13 days under the favourable to 66.13 days under the moderately stressed environment. The average days to anthesis over all environments ranged from 58.87 days for hybrid (P_6xP_7) to 61.93 days for hybrid (P_2xP_3).

2. The average number of days to silking ranged from 57.76 days under the favourable conditions to 68.44 days under the strongly stressed environment. The average of the 21 F_1's over all environments ranged from 60.2 days for hybrid (P_6xP_7) to 64.1 days for hybrid (P_2xP_3).

3. The most drought affected traits were: grain yield/plant (70.81%) followed by dry matter/plant (65%), LAI (54.82%), plant height (46.2%), ErLA (43.7%), ELA (42.3%), number of kernels/row (34.8%) and the least affected character was 100 kernels weight (18.55%).

4. The analysis of variance revealed highly significant differences between environments, F_1's as well as a highly significant GxE interaction for No. of kernels/row and dry matter/plant. Most of the GxE interaction was ascribed to the non-linear rather than the linear component.

5. Both general combining ability (GCA) and specific combining ability (SCA) mean squares were highly significant for all studied traits in the four seasons. As for the vegetative traits (days to 50% anthesis and silking as well as plant height) the SCA mean square (MS) was greater in magnitude than the GCA MS in 2 to 3 out of the 4 seasons under favourable condition.

6. The additive component of variance (GCA) was greater in magnitude than the non-additive component (SCA) for the 4 seasons under both favourable and moisture stressed environments for LAI.

7. LAI appeared to be the most promising trait for indirect improvement of grain yield in the present material since it was not affected by genotype x environment interaction over the 10 environments used. It was mainly governed by the additive genetic component under both favourable and water stressed conditions and was also genetically correlated with grain yield/plant under water stressed conditions.

8. Yield (grain yield/plant) and yield related traits (dry matter/plant, No. of kernels/row and 100-kernel weight) were characterized by being generally affected by a greater GCA component than SCA component under favourable conditions and conversely under water stressed environments.

9. Positive phenotypic correlations were observed between LAI and all of plant height, dry matter/plant and grain yield/plant for the 21 F_1's grown under both favourable (F) and water stressed (S) environments averaged over the four seasons.

10. All leaf area traits were intercorrelated under both favourable and stressed environments.

11. Grain yield/plant was genotypically correlated with dry matter/plant, number of kernels/row, ELA and ErLA under both favourable and moisture stressed environments and was correlated with LAI only under stress. LAI was genotypically correlated with ErLA under both favourable and moisture stressed environments.

12. Dry matter/plant was also genotypically correlated with all of LAI, ErLA, ELA and grain yield/plant under both favourable and moisture stressed environments.

13. Selection was practiced for increasing and decreasing LAI in the progenies of the higher grain yielder F_1's in the (F) and in the (S) conditions. Positive responses to selection for increased LAI under favourable environments in the three populations were more pronounced than those obtained under strongly stressed conditions.

14. Under the strongly stressed environmental conditions, greater responses to selection were effective in reducing the mean LAI above the control mean than those obtained under favourable conditions.

15. The association between the different traits was altered as a consequence of selection. But the correlation between LAI and ELA was mostly present in the increasing direction under both favourable and water stress conditions.

16. Consistent and paralleled correlated responses were obtained in ELA and ErLA.

17. Under both favourable and strongly stressed environments, selection for increasing or decreasing leaf area index (LAI) resulted in significant correlated responses in the dry matter per plant in the three populations.

18. Results indicated that partitioning assimilates was not consistent in the different populations and should be considered while practicing selection for increasing LAI.