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5. SUMMARY

Grain sorghum (*Sorghum bicolor* L. Moench) is one of the qualified field crop for growing in the new reclaimed land of Egypt, where the soil is of low water-holding capacity and high salinity, since it is drought and saline tolerant field crop.

The present investigation was aimed to make :

- (A) Estimation the effect of soil salinity levels on germination percentage of grain sorghum in laboratory and in the field experiment, growth, grain yield and its components.
- (B) Study the biochemical genetic variations for peroxidase isozymes in seven grain sorghum genotypes under well salined (control) and saline stress in three age stages (30, 45 and 60 days) of plants.
- (C) Study the effect of saline stress on crude protein quantity and accumulation of free amino acids osmoprotectants against saline stress.

To achieve the above aims, Randomized Complete Blocks Design with four replications. Seven grain sorghum were used, i.e., one parental (Dorado), three maternal genotypes (ICSB.1, ICSB.37, BTX.631) and 3 F_1 's crosses (H.Sh₁, H.Sh₂ and H.Sh₆). Two separated experiments were performed in the experimental farm. The first experiment carried out at normal salinity levels as control [EC = 1.2 mmhos/cm²] and the second was performed at high salinity level [EC = 6.5 mmhos/cm²] in two growing seasons 2000 and 2001 in Nubaria Agricultural Research Station, combined analysis was done between two experiments in each season and over two season.

The results obtained could be summarized as follows :

- 1- There were a non-significant reduction in the average of seeds grown at 1000 ppm for parents and hybrids as compared to the control. Whereas, there were a significant reduction in the seeds grown under other salinity levels by 27.9 % and 5.29 % at 3000 ppm and by 46.25% and 18.76% at 5000 ppm for parents and hybrids, respectively.
- 2- All characters mean germination percentage, plant height, leaf area/plant, panicle length, panicle width and grain yield showed significant reduction under saline stress as compared with those plants grown under well-salined (control) also saline stress significantly increased late 50% flowering date by (17.31%) for parents while, it is prior to anthesis significant early flowering data by 11.46% for hybrids, respectively. The interaction between saline levels and grain sorghum genotypes were significantly in both seasons. There were significant differences between genotypes in their number of green leaves/plant in the second season only while, no significant differences in number of leaves/plant in both growing seasons. Statistically analysis indicated that the most salinity tolerant parents was the parental "Dorado" genotype and the hybrids H.Sh₂ and H.Sh₆ were always the most salinity tolerance hybrids. On the contrary, the maternal ICSB.1 and ICSB.37 genotypes always gave the lowest values in these characters which are under study.
- 3- The results of peroxidase isozymes in leaves of plants in three stages of plant under well saline (control) and saline stress indicated that the activity of peroxidase isozyme were increased in all genotypes which, are under saline stress compared with (control) specially at 30 and 45 days from planting. These variability were clear in the activity of

cathodal bands more than the anodal ones. The genotypes ICSB.1 and ICSB.37 always gave the highest number of bands under saline stress followed by BIX.631. The hybrids H.Sh₁ always gave number of bands under saline stress more than control.

- 4- From the results, it can be seen that the peroxidase profiles exhibited the lack of the band C-5 in all genotypes in control conditions. On the contrary, it was present in all stressed genotypes at 60 days from planting. A-7 band was present only in stressed ICSB.1 genotype at 45 days but it was absent in stressed BIX.631 genotype at 30 days. C-1 band was absent in all genotype in two stages 30 and 45 days under well-saline and saline stress. It is present only in H.Sh₁ (control) and in some stressed genotypes in 60 days stage. Finally, it was found that some genotypes revealed stability for gene expression of cathodal and anodal peroxidase isoenzymes.
- 5- Stressed genotypes revealed a markedly decrease in crude protein percentage under saline stress compared with control. The maternal genotypes BIX.631 and ICSB.37 were always showing higher protein content under control and salinity level also, the same results were in their hybrids H.Sh₆ and H.Sh₂. Generally, protein content was always higher in the hybrids than parents under control and salinity level of soil.
- 6- There was a marked increase in the concentration of some amino acids in relation to other acids. In all genotypes, leucine and glutamic were the most predominant amino acids representing 14.34% and 10.83% of total free amino acid, respectively. While, under saline stress, the predominant amino acids were proline and leucine representing 20.26% and 15.01%, respectively. The tolerant parent

“Dorado”, the hybrids H.Sh₂ and H.Sh₆ showed a remarkably decrease in glutamic acid under saline stress in relation to control. phenylalanine was observed increase in tolerant genotypes than sensitive ones with saline stress while, tyrosine was decreased. It worthy to note that free proline in sorghum grains under saline stress was higher than its concentration under control. Finally, it was found that, saline stress caused remarkable increase¹ in total grain free amino acids of 6% for parental genotypes and 13% for their hybrids.