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- بالرسالة صفحات قد يكون بها خطأ ترقيم

PRODUCTIVITY RESPONSE OF SOME SOYBEAN GENOTYPES TO CERTAIN ABIOTIC STRESSES

BY

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B.Sc., Agric. Sci , (Crop Breeding), Ain Shams Univ., 1996

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ABSTRACT

Sherif Ibrahim El Sayed Abdel Wahab, Productivity response of some soybean genotypes to certain abiotic stresses. Unpublished Master of Science Thesis, Dept. of Agronomy, Faculty of Agriculture, Ain Shams University, 2002.

Four field experiments were carried out during 1998, 1999 and 2000 summer seasons. The first and second experiments were conducted at the Experimental Station of the Faculty of Agriculture, Cairo University, Domo, El-Fayoum Governorate in 1998 season. The third and fourth experiments were conducted at the High Institute of Agriculture Cooperation Farm, Wadi El-Faregh, Cairo-Alexandria desert road, 62 Kilometers away from Cairo in 1999 and 2000 seasons. The study aimed to investigate the effect of some abiotic stresses on vegetative growth characteristics of soybean (*Glycine max (L.) Merr.*) throughout growing ten soybean genotypes under sandy and saline soils conditions and water stress by skipping one day of drip irrigation under sandy soil conditions from flowering stage up to harvest. As a result of salinity, plant height, number of green leaves/plant, number of branches/plant and leaf fresh weight decreased considerably compared to sandy soil condition over all studied genotypes with a reduction of 54.6, 67.7, 54.1 and 75.4 %, respectively. Highly significant differences between soybean genotypes were obtained under both sandy and saline soil for all vegetative growth characteristics except for plant height under sandy soil condition in 1998 season.

Combined data of the two seasons, 1999 and 2000, show significant differences among the studied genotypes for total dry weight at 45 days from sowing and for all vegetative growth characteristics at 90 days from sowing and for most studied yield and yield attributes except for biological yield/fed, pod yield/fed, seed yield/fed, seed yield/ m^2 and seed yield/plant.

Data show that plant height, number of green leaves/plant, number of pods/plant, total fresh weight/plant, branch fresh weight/plant, leaf fresh weight/plant, pod fresh weight/plant, total dry weight/plant, branch dry weight/plant, leaf dry weight/plant, pod dry weight/plant, biological yield/fed, straw yield/fed, pod yield/fed, seed yield/fed, seed yield/m^2, seed yield/plant, 100-seed weight, oil percentage, protein yield/fed and oil yield/fed were significantly decreased as soil moisture stress increased by skipping one day of drip irrigation under sandy soil condition (stressed treatment) from flowering up to harvest.

The interaction between water stress treatments and genotype was significant for number of branches/plant, branch fresh weight/plant, leaf fresh weight/plant, total dry weight/plant, branch dry weight/plant, leaf dry weight/plant, protein percentage, protein yield/fed and oil yield/fed.

Pod fresh weight/plant was positively and significantly correlated with branch fresh weight/plant, pod dry weight/plant, branch dry weight/plant and leaf dry weight/plant under non-stressed and stressed treatments. Biological yield/fed was positively and significantly correlated with each of straw yield/fed and pod yield/fed under non-stressed and stressed treatments. Harvest index was positively and significantly correlated with 100-seed weight, seed yield/plant, protein yield/fed and oil yield/fed under non-stressed treatment.

Key words: Abiotic stresses- Soybean- Genotypes- Saline soil- Sandy soil- Simple correlation- Drought susceptibility index.

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INTRODUCTION

Egypt is facing acute shortage of edible oil. Vegetable oil is imported in large quantities to satisfy the domestic needs of the country. The gap between production and consumption reaches more than 85 %. In the Nile Valley and the Delta, oil seed crops present 1.7 % of cultivated land, it is not feasible to expand the area for oil seed crops because of high competition from other summer crops. It is, however, feasible to increase the acreage of these crops such as soybean in newly reclaimed lands which suffer from abiotic stresses. In Egypt, experimental work on soybean has been started in late 1940 's at a very small scale. In 1970, the area cropped to soybean was about 3261 fed, with an average seed yield of 311 kg/fed. The acreage has increased rapidly, reaching 147155 fed in 1983 with an average yield of 1.099 ton/fed, then it began to decline continuously till it reached 43316 fed in 1997, though productivity was almost the same. This decline in acreage might be attributed to one or more of the following:

1. Static soybean productivity, increased production cost and lower net return compared with other summer crops.
2. Soybean has to complete with other strategic crops such as cotton, rice, sorghum and maize for arable land.
3. Infestation with cotton leaf worm.
4. Lack of proper varieties that can fit better in the crop rotation.

Recently, attention has been directed towards introducing soybean to the newly reclaimed land, *i.e.* sandy and saline soils where an area of 2534 fed was planted with a yield average of 790 kg/fed in 1994. The acreage decreased then after reaching only 677 fed in 1997 because of some abiotic stresses, especially drought stress. Drought susceptibility index (S) is one of the important measures for the performance of a genotype subjected to drought stress and is an indicator of drought resistance in a genotype. The use of this index has also the advantage of making comparisons and determining differences among genotypes on a

relative basis and eliminating the effect of large differences in yield potential among genotypes.

The running study is dealing with productivity response of some soybean genotypes to certain abiotic stresses to identify the promising ones that perform well under such conditions.

REVIEW OF LITERATURE

A- Effect of salinity on vegetative growth

Many workers studied the effect of salinity on vegetative growth characteristics, **Zaidi and Singh (1993)** found that leaf and stem dry weight decreased with increasing soil salinity (EC of 10 and 20 dS/m) using the soyabean cv. Bragg. Meantime, **Chang *et al.* (1994)** studied seven soybean cultivars grown in saline soils at Cangzhou in Hebei Province and Changyi in Shangdong Province. The results revealed that plant height and number of branches were decreased by salinity with a greater effect on susceptible cultivars. Also, **Delgado *et al.* (1994)** exposed pea cv. Lincoln, faba bean cv. Alborea, phaseolus vulgaris cv. Contender and soyabean cv. Williams to 0, 50 and 100 mM NaCl. The results demonstrated that salinity decreased shoot dry weight.

Mohamed and Zapata (1994) found that shoot dry weight significantly decreased by 10 and 9 % during early and mid pod filling, respectively as a result of subjecting soybean genotypes to salinity stress. They added that A-100 and Lee genotypes were less sensitive to salinity than the others. On the other hand, Goldsoy, Evans and Ada were more sensitive at both early and mid pod filling stages of growth. The reduction in shoot dry weight indicated the relative tolerance or sensitivity of a genotype to salinity, being a relative measure of salt tolerance.

Using soybean cv. Buchanan, **Qifu and Murray (1994)** subjected plants to 1 of 3 levels of salinity pretreatment (with electrical conductivities of 0.7, 4.4 and 6.5 dS/m) for 3 weeks and then exposed to 1 of 3 concentrations of SO_2 (1, 145 and 300 nl/litre for 5 h/d) for 3 weeks, or vice versa. The results revealed that salinity decreased shoot dry weight. In another study, **Attumi *et al.* (1999)** exposed soyabean plants (*Glycine max (L.) Merr.*) growing in greenhouse (average height: 25 cm) cultured in Hoagland solution to radiophosphorus (32 P) and