



Evaluation of Grain Yield and Physiological Traits of Seven Hybrids (*Zea mays* L.) Maize under Different Levels of Saline Water

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Introduction: In order to evaluate the effects of salt stress on membrane stability, chlorophyll a and b, carotenoids, yield components and grain yield of seven maize hybrids (Ksc700, Ksc500, KSc704, Ksc301, Ksc647) (Iranian hybrids) and Ksc404 and maxima (foreign hybrids), a test was conducted in research field of faculty of agriculture in Shahid Bahonar University of Kerman, Iran in 2011 using plot splits in the form of complete random block with three replications. The main plots included four salinity water of irrigation water with electrical conductivity of four, six, eight and 10 dS/m, respectively, and subplots, including the mentioned hybrids. According to the results, increase of salinity level led to decrease of all evaluated traits, with exception of carotenoids, in a way that the highest level of measured traits were obtained from the lowest salinity level. Calculation of correlation coefficients between the traits demonstrated a positive and significant correlation between grain yield and membrane stability in 120 minutes ($r=0.61^{**}$) and grain yield and the 1000-grain weight ($r=0.93^{**}$). In this research, the minimum and maximum amount of grain yield were estimated as 10610 and 5750 kg/ha, respectively, in salinity level of 4 and 10 Ds/m. Moreover, among the hybrids, the Ksc704 hybrid had the highest level of membrane stability and grain yield in the evaluation condition, and was introduced as the salt tolerant hybrid for culture in such conditions.

Materials and Methods: This experiment was done in experimental field of the Faculty of Agronomy of the University of Shahid Bahonar Kerman, Iran, located in latitude 30°N, longitude 57°E and altitude 1754 m above sea level in 2012. The experiment was carried in split plot in the Complete Block design with three replications. The main plots were four salinity levels (4, 6, 8 and dS10) where in the subplots seven maize hybrids included Ksc700, Ksc500, Ksc404, Ksc704, Ksc647, Ksc301 and Maxima that were prepared from Kerman Research Center. Excel software was used for mean comparisons using a multiple range test (LSD) test that was performed at the 5% level.

Measuring the stability of the membrane: From each experimental unit a plant is randomly selected, a leaf in the same position is separated and washed thoroughly with distilled water and dried by drying paper, so the circular pieces of paper is cut by punch and immediately were recorded and kept on lidded tube containing 5 ml of distilled water. Conductivity meter machine was adjusted for two hours to record and store every 3 minutes the electrical conductivity of the solution. The gained measurements were analyzed and regressed in the relevant time period. Given that in most cases a second degree between the data is fitted, the slope of the acquired line in the first 15 minutes is estimated while a linear function on the data and in each case were considered as an indicator of the stability of the membrane and hence the predicted values of electrical conductivity by graphs were counted according to equation 1 for the three times of 60, 15 and 120 minutes; consequently the obtained numbers for these three times were used according to the factorial model in a completely randomized design on the analysis of variance. It is assumed that an increase in the electrical conductivity of the solution was in contact with the leaf samples from leaking continuously ions in the solution and the rate of leakage reflects the stability of the membrane at the exit of ions.

Measurements of Leaf pigments (Chlorophyll and carotenoid concentrations): Chlorophyll (Chl a, b) and carotenoid content of the youngest fully expanded leaves was estimated at midday. Samples of 0.5g were taken from the collected leaves. Subsequently, 0.25g of each sample was extracted by 80% acetone and put in

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the freezer at -5°C for 24h. For each replicate (plant), chlorophyll content was the result of the average of 5 measurements on the same leaf.

Results and Discussion: Mean comparison showed salt stress has significant effects on ion leakage at three times and includes 15, 60 and 120 minutes after samples were in water. Results showed that ion leakage content increased in salt stress and with the passage of time, therefore, membrane stability decreased. The highest and lowest membrane stability were minimum of 15 minutes and maximum of 120 minutes. At the highest time, membrane stability decreased in salt stress compared to the control. At 120th minute, the highest and the lowest membrane stability monitored from Ksc704 and Maxima hybrids respectively. The highest Chl a, b obtained from of Ksc647 hybrid. Carotenoid content increased under salt stress. The highest and lowest carotenoid content obtained under salt stress and normal condition respectively. Among hybrids, Ksc700 hybrid showed the highest and Maxima showed lowest (unless were no significant differences with Ksc404, Ksc500, Ksc704, Ksc301) carotenoid content respectively. Analysis of variance showed a significant difference between hybrids about total dry weight. The highest and lowest dry weight obtained under normal condition and salt stress respectively. Among hybrids, Ksc647 hybrid and Ksc700 hybrid showed the highest and the lowest total dry weight respectively. So hybrids have higher levels of this trait can be introduced as hybrids with higher yield in saline conditions. The highest and lowest grain weight obtained from normal condition and salt stress respectively. Among hybrids, Ksc301 hybrid and Ksc700 hybrid showed the highest and the lowest grain weight respectively. The highest and lowest grain yield obtained from normal condition and salt stress respectively. Among hybrids, Ksc704 hybrid and Maxima hybrid showed the highest and the lowest grain yield respectively.

Conclusions: The main goal of this study was selection of resistant hybrid that contain higher grain yield. Where in this study the Ksc704 hybrid demonstrate the highest membrane stability, photosynthetic pigment and the highest yield among the displayed hybrids to be introduced as resistant hybrid with respect to other tested hybrids.

Keywords: 1000-grain weight, Ksc704, Membrane Stability, Photosynthetic pigments, Salinity