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RELATIVE WATER CONTENT AND GROWTH OF MAIZE VARIETIES IN SALINE SOIL

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Response of three varieties of maize *(Zea mays* L.) viz. Akbar, Sadaf and Sultan was compared in NaCl salinated soil. Germination, though delayed was not yet reduced in any of these varieties. There was a comparatively greater decrease in relative water content in the variety called Akbar than other two varieties (Sultan and Sadaf) in 15 and 30 days crop. Varieties with higher water content exhibited better growth regarding number of leaves, leaf area, fresh and dry matter production in 30 days old crop.

INTRODUCTION

Crops growing in saline soils are frequently characterized by uneven and poor stands due to damages during germination and seedling emergence, which have been reported to be more sensitive stages to salinity than later stages of development. Like many other crops, growth of maize seedlings has also been found to be depressed by salinity (Soliman, 1988; Ashraf and McNeilly, 1989). Various cultivars of a crop show differences regarding their growth response to salinity (Aslam *et al.,* 1989). A variety can be expected to prove useful than others if it withstands the saline conditions better in early stages of growth and forms good stand. Such data are not available in ssufficientt amount regarding maize cultivars grown in Pakistan.

Osmotic adjustment of the plants growing in saline soils is usually disturbed (Greenway and Thomas, 1965). A knowledge of plant water balance of different varieties can be valuable in the selection of suitable cultivars. In the present study three varieties of maize were compared for their water balance and growth response to NaCl salinity in early stage of growth.

MATERIALS AND METHODS

Three varieties of maize *(Zea mays* L.) viz. Akbar, Sadaf and Sultan were grown in plastic pots (16 x 20 cm) containing NaCl salinated soil at EC_e 5, 10 and 15 dS m^{-1} along with field soil of EC_e 2.5 dS m^{-1} acting as control. These were irrigated with canal water. The data for water balance studies were collected at two stages of growth i.e. 15 and 30 days after germination of crop, according to the technique of Barrs and Weatherley (1962) and relative water content was calculated by the following formula:

$$\text{Relative water content} = \frac{\text{Fresh wt. - Dry wt.}}{\text{Saturated wt. - Dry wt.}} \times 100$$

Data for growth were collected from 30 days old crop. These were subjected to statistical analysis following completely randomized design to compare means.

Table 1. Effect of sodium chloride salinity on maize varieties

Variety	ECe level dS m^{-1}	RWC (%)		Leaves		Shoot weight (g)		Root weight (g)	
		15 days	30 days	Number	Area (cm)^2	Fresh	Dry	Fresh	Dry
Sultan	2.50	90.61 a	91.02 a	7.33 a	734.00 a	21.03 a	3.28 a	10.27 a	2.38 a
	5.00	89.08 a	90.33 a	6.67 a	584.33 b	19.77 a	2.75 ab	9.20 a	1.97 ab
	10.00	87.18 a	87.98 b	6.33 a	541.33 b	16.70 ab	3.22 b	7.17 b	1.49 bc
	15.00	86.58 a	86.73 b	6.33 a	520.67 b	14.13 b	1.97 b	4.87 c	1.16 c
Sadaf	2.50	91.62 a	90.64 a	7.00 a	664.67 a	22.45 a	3.11 a	9.83 a	1.98 a
	5.00	89.79 a	90.31 a	7.00	572.00 ab	20.53 a	2.89 ab	9.23 a	1.64 ab
	10.00	88.54 a	87.57 b	7.00 a	500.33 b	15.63 b	2.26 b	6.70 b	1.36 b
	15.00	87.13 a	86.89 b	6.67 a	495.67 b	15.17 b	1.99 b	6.33 b	1.29 b
Akbar	2.50	90.18 a	91.14 a	6.67 a	705.00 a	22.03 a	3.03 a	9.07 a	1.84 a
	5.00	87.14 a	89.49 a	6.33 a	594.67 b	19.20 a	2.55 a	8.10 a	1.53 a
	10.00	86.60 a	86.58 b	4.33 b	203.67 c	7.37 b	0.85 b	2.53 b	0.54 b
	15.00	85.02 a	84.18 b	4.00 b	149.67 c	5.20 b	0.69 b	1.13 b	0.29 b
Standard error		2.53	0.89	0.43	35.80	1.51	0.26	0.69	0.20

RESULTS AND DISCUSSION

The maize varieties namely Akbar, Sadaf and Sultan were quite tolerant of NaCl salinity during germination. It was delayed by one day in EC_e 10 dS m^{-1} and by two days in EC_e 15 dS m^{-1}, but salinity did not affect final emergence of seedlings which was almost complete.

Relative water content (RWC) decreased progressively with increase in NaCl salinization in all varieties at both stages of growth i.e. 15 and 30 days after germination (Table 1). The magnitude of difference between control and salinized plants increased in 30 days crop as compared with that of 15 days. There was no significant difference in RWC of these varieties but at higher levels of salinization, the variety Sadaf contained the highest percentage of water content while variety Akbar exhibited the lowest values.

All the growth parameters studied were adversely affected by salinity in all the varieties. Leaf area was reduced by 78.86, 29.15 and 25.45% in varieties Akbar, Sadaf and Sultan respectively, although the leaves were otherwise normal in appearance. This reduction was due to smaller size and lesser number of leaves in the variety Akbar but in other two varieties only smaller size of leaves was considered responsible for it. There was progressive decrease in fresh and dry matter production with increasing salinity levels in all varieties. Reduction was noted even at low levels of salinity (EC_e 5 dS m^{-1}) which may have a stimulatory effect in numerous other crops (Heikal *et al.,* 1980). Plants at higher salinity levels differed significantly from control in all varieties but the variety Akbar was affected the most. It showed a greater reduction (77.23%) in shoot dry weight as compared with Sultan and Sadaf which exhibited a reduction of 39.94 and 32.81% respectively. Similar reduction in growth of plant parts in maize was observed by Ashraf and McNeilly (1989).

From these data it seems that varieties Sultan and Sadaf maintaining slightly better RWC developed better in saline conditions than variety Akbar, probably due to better osmotic adjustment capacity.

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