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A COMPARATIVE STUDY OF BARLEY AND TRITICALE FOR SALT TOLERANCE

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Barley and triticale cultivars were tested against soil salinity in a pot study. The harmful effects of salinity were measured by computing correlation coefficients between salinity levels and different plant attributes of both the crops. The relative salt tolerance of the two crops was compared by calculating the salinity levels corresponding to 50% decline (over control) in the respective plant attributes. Triticale was more affected by harmful effect of salinity than barley. The two attributes of spike length and number of grains per spike in case of barley remained unaffected even at the highest salinity levels.

INTRODUCTION

The menace of soil salinity is one of the serious impediments to the delivery of the full potential of different crops. Apart from other remedial measures to correct this menace of our soils, an approach is the introduction of crops and crop varieties that can withstand higher concentration of salts in the rhizosphere and can bear economic yields [1]. It has been demonstrated that crop plants show a remarkable variation in their ability to grow and yield in problem soils [2,3]. This study therefore was initiated to find the relative salt tolerance of barley *(Hordeum vulgare L)* and triticale *(X-Triticosecale* Wittmack) so that farmers may be offered a choice of crops suited to their cropping pattern.

MATERIALS AND METHODS

A pot study was conducted utilizing hexploid triticale (C.V.NT-183) and barley (Netherlands-Pakistan Expendition 1976; Accession No.481) to find their salt tolerance potential. The soil was collected from 6-15 cm surface layer from the field area of Nuclear Institute for Agriculture and Biology, Faisalabad. The soil salinity levels viz 3,5,10,15,20,25 mmhos/cm at 25^{o}, saturation extract of soil (ECe) were developed artificially using sodium chloride, sodium sulphate, calcium chloride and magnesium sulphate. The salinity levels varied with constant value of Sodium Absorption Ratio of 10, chloride/sulphate ratio 1:1 and calcium/magnesium ratio 2:1.

The glazed pots (26 x 26 cm) were filled with 10 kg of air dried soil after mixing the required amount of salts to develop different salinity levels. The pots were irrigated to field capacity and the bottom holes of the glazed pots were closed with rubber corks to avoid free drainage. Three seeds per pot for each salinity level were sown using the complete randomized block design with four replications. At the beginning and the end of the experiment, the representative soil samples were taken from 0-30 cm soil depth and were analysed for ECe values by methods suggested by U.S.S.L. Staff [4]. The average of the two salinity values were used for presentation. The plants were grown in a glass house under semi-controlled conditions with temperatures ranging between 16 and 20^{o} and a relative humidity of about 60% during day time. The two crops were fertilized at the optimum dose rate of 20 kg. P_2O_5 and 84 kg. N/ha. Normal cultural practices and equal irrigations were given to both the crops.

Data on plant height and productive tillers per plant were recorded at the maturity of the crop. For dry matter yield, the whole plants were cut from the ground level and weighed after oven drying. The correlation between salinity levels and plant attributes and the salinity levels corresponding to 50% decline (LD50) in the respective plant attributes were calculated from respective regression slopes for the comparison of salt tolerance of two crops.

RESULTS

The effect of different levels of salinity on different plant attributes are presented in Table 1.

Plant Height. It is evident from the Table that plant height in both the crops decreased with the increase in salinity level. The drastic injurious effects were observed at the high salinity level of 20 and 25 mmhos/cm at 25° in both the crops. However, triticale could not survive beyond salinity level of 15 mmhos/cm. Highly significant negative correlation coefficients between salinity levels and plant height for both crops were obtained. The LD50 for triticale was lower than that of barley.

Dry Matter. Dry matter of both crops decreased with increase in salinity levels. Highly significant negative correlation coefficients between salinity levels and dry matter for both crops were obtained. However the LD50 for barley was higher than that of triticale.

Number of Effective Tillers per Plant. Number of effective tillers (ear-bearing) per plant decreased with the increase in salinity levels in both the crops. Highly signifi-

Table 1. Effect of salinity of different plant attributes of triticale and barley.

Plant attributes	Salinity	Levels		(ECe mmhos/cm at 25°)			Correlation/ coefficients	LD50 (ECe of soil associated with 50% decline of attributes
	3.0 (control)	5.0	10.0	15.0	20.0	25.0		
Plant height(cm)	115.2	106.7	88.3	68.1	0.0	0.0	** –0.964	14.0
	(89.8)	(89.0)	(77.7)	(63.5)	(48.6)	(41.0)	** (–0.994)	(22.8)
Dry wt. (g)	74.4	61.1	49.5	16.2	0.0	0.0	** –0.969	12.0
	(75.8)	(60.8)	(47.4)	(25.5)	(21.3)	(3.8)	** (–0.984)	(13.4)
No. of effective	18.0	17.8	13.4	11.2	0.0	0.0	** –0.962	14.2
tillers/plant	(21.7)	(16.7)	(16.6)	(18.0)	(14.3)	(1.8)	* (–0.825	(19.1)
Spike length(cm)	13.1	12.7	12.5	11.2	0.0	0.0	* –0.897	15.5
	(17.5)	(17.3)	(19.2)	(20.0)	(18.2)	(10.8)	NS (–0.524)	(55.1)
No. of spike-let/spike	27.9	26.8	26.2	23.3	0.0	0.0	* –0.902	15.4
	(21.4)	(23.7)	(23.3)	(20.0)	(18.2)	(13.0)	* (–0.879)	(35.8)
No. of grains/	66.9	73.3	73.2	60.8	0.0	0.0	* –0.881	16.4
Spike	(40.1)	(58.3)	(43.8)	(40.1)	(37.7)	(37.8)	NS (–0.597)	(55.2)
Yield/plant (g)	22.8	28.8	21.3	11.4	0	0	** –0.949	15.0
	(19.1)	(28.1)	(19.2)	(14.2)	(10.9)	(9.0)	* (–0.873)	(23.2)

N.B. = The upper figures indicate values for triticale and figures in prantheses the values for barley.
* = Significant at P=0.0.5
** = Significant at P=0.01
N.S = Non significant

cant negative correlation coefficients between different salinities and the number of productive tillers per plant for both crops were found. The LD50 for barley was comparatively higher than that of triticale.

Spike Length. Spike length also decreased with the increase of salt contents. The character showed significant negative correlation with different salinities only for triticale. However the LD50 for barley was not only higher than that of triticale but also the highest of all the attributes studied.

Number of Florets per Spike. Number of florets per spike also decreased with the increase in salinity levels and detrimental effects of salinity were quite obvious at highest salinities for both the crops. High significant negative correlation coefficients between salinity levels and number of florets per spike for both the crops were found. However the LD50 for barley was higher than that of triticale.

Number of Grains per Spike. Number of grains per spike decreased with the increase in salt stress only in triticale on which harmful effect of salinity was pronounced at highest salinities. The attribute showed significant negative correlation coefficients with different salinities in triticale. The LD50 for barley was also higher than that of triticale.

DISCUSSION

Highly significant negative correlation coefficients between salinity levels and different plant attributes were found for both crops except for spike length and number of grains per spike in case of barley. The LD50 values for barley for all the attributes were higher than those of triticale showing that barley is more tolerant to salinity than triticale. The results of present study are in conformity with the findings that barley has more salt tolerance than maize [5], rye and oat [6], wheat [6-7] and cotton [9]. The work of Epstein and Norlyn [10] is worth mentioning who have used barley crop for sea-water based crop production.

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