

## INFLUENCE OF SALTS ON THE GERMINATION AND SEEDLING GROWTH OF *HORDEUM VULGARE* L.

ARVIND KUMAR, BRIJESH BAHADUR AND B. K. SHARMA

Ecology Laboratory, Department of Botany, Bareilly College,  
Bareilly-243001, U. P.

Salinity adversely affects the germination and seedling growth, and the response of plants varies with the type of salinity (Levitt, 1980). Barley (*Hordeum vulgare* L.) is cultivated in the salt affected areas of Bareilly and other districts of Rohilkhand Division. Investigations were carried out to assess the effect of different cations and anions on germination and early growth of this crop.

Seeds of barley PL-103 strain were surface sterilized with 0.1% mercuric chloride solution, thoroughly washed and placed in culture petri-plates lined with filter paper. Twenty seeds were placed in each petri-plate. Salinity treatments were given by adding 10 ml of aqueous solutions of each of the four salts, viz., NaCl, KCl, Na<sub>2</sub>SO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub> at two conductivity levels, viz., 5 and 10 mmhos/cm as indicated below :

Electrical conductivity mmhos/cm	NaCl (g/l)	KCl (g/l)	Na <sub>2</sub> SO <sub>4</sub> (g/l)	K <sub>2</sub> SO <sub>4</sub> (g/l)
5	3.00	3.20	4.40	4.70
10	6.00	6.50	9.00	9.75

Distilled water was used as control. Three replicates of each treatment were maintained. The studies were made at room temperature ( $22 \pm 2^\circ\text{C}$ ). Data on root number, length and dry weights of shoot and root were recorded 6 days after imbibition.

Per cent seed germination decreased significantly with increasing levels of salinity in all the salt treatments as compared to control. However, no significant differences were obtained between Na<sub>2</sub>SO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub> in respect of seed germination at EC 10 mmhos/cm. Different salts inhibited germination in the order NaCl > KCl > K<sub>2</sub>SO<sub>4</sub> > Na<sub>2</sub>SO<sub>4</sub>. The results indicate that chloride ions, in association with sodium ions, exert more inhibitory effect on germination as compared to sulphate ions.

The length of shoot and root decreased significantly with increase in salinity levels from EC 0 to 10 mmhos/cm in all the salts. However, no significant difference was found for shoot length under KCl treatment between EC 5 and 10 mmhos/cm. The reduction was again more pronounced with the treatment of chloride salts than with sulphate salts. Kirkham et al. (1969) opined that the growth of salt stressed bean and barley plants was reduced due to their low osmotic potential.

Table 1. Effect of salinity on seed germination, root and shoot length, root number and root and shoot dry weight of barley seedlings

Treatment		Seed germination (%)	Length (cm)		No. of rootlets	Seedling dry wt (mg)	
Type of salts	mmhos/cm		Shoot	Root		Shoot	Root
Control	0	100	8.3	9.38	6.0	1.64	1.48
NaCl	5	78.00	6.93	7.63	4.5	1.20	1.00
	10	60.00	4.82	5.52	3.3	0.66	0.60
KCl	5	75.00	6.53	7.20	4.7	1.20	1.02
	10	66.00	4.98	5.03	3.7	0.75	0.77
Na <sub>2</sub> SO <sub>4</sub>	5	83.00	7.18	7.63	5.0	1.22	1.02
	10	73.00	5.21	5.52	4.3	0.80	0.77
K <sub>2</sub> SO <sub>4</sub>	5	88.00	7.38	8.52	5.1	1.26	1.08
	10	73.00	5.23	6.21	4.4	0.97	0.80
CD at 6%		5.03	1.83	1.38	0.82	0.35	0.34

\*Average of five samples

The root number, shoot and root dry weights exhibited significant decrease in all the treatments with the increase in salinity levels as compared to control. However, no significant differences were observed between EC 5 and 10 mmhos/cm in respect of root number and root dry weight in both the sulphate salts. The ionic imbalance, lack of osmotic adaptation as well as disturbances in metabolic pathways seem to be involved in retarding the growth and dry matter production of barley exposed to salinity.

The first author is grateful to Late Dr. Anil Kumar for inspiration.

#### REFERENCES

- Kirkham, H. B., Gardner, W. R. and Gerloff, G. C. 1969. Leaf water potential of differentially salinized plants. *Plant Physiology*. 44 : 1378-1382.
- Levitt, J. 1980. Responses of plants to environmental stresses. II. Water, radiation, salt and other stresses. Academic Press, New York.