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EFFECT OF SALT STRESS ON SEED GERMINATION AND SEEDLING GROWTH OF *Trigonella foenum-graecum*

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Key words : *Trigonella foenum-graecum,* sodium chloride, salinity

The effect of salinity on seed germination and seedling growth of *Trigonella foenum-graecum* has been studied. Treatment with sodium chloride improved percent seed germination and seedling growth as compared to control. Lower levels of salinity resulted in improved seed germination, rooting and shooting

INTRODUCTION

Stress is an external factor that exerts a disadvantageous influence on the plant. Salt stress is an important factor which restricts plant growth. Due to presence of salts in the soil, a plant is confronted with problems of obtaining water from the soil, negative osmotic potential and also in dealing with high concentration of potentially toxic sodium carbonate and chloride ions (Greenway and Munns, 1980).

Salinity influences seed germination and seedling growth. Sodium chloride is the most commonly considered source of salinity. Halophytes are able to accumulate a diverse range of ions to very high level. Salinity is known to affect almost all the aspects of plant metabolism, which induce changes in their anatomy and morphology.

A consequent decrease in seed germination of *Atriplex griffithii* Mog., *Suaeda fruiticosa* Forsk., *Haloxylon recurvum* Bunge ex Boiss and *Zygophyllum simplex* Linn. with increasing salinity have been reported (Khan and Ungar, 1997a, 1997b).

The physiology of some characteristic halophytic plant species which grow well in saline areas of Western Rajasthan has been studied (Harsh and Godara, 2000). All selected species *viz.*, *Salsola baryosma* (Roem. Et Schult) Dandy, *Suaeda fruticosa* and *Haloxylon recurvum* differ in morphological characters like seed size, weight, viability and germination behaviour. The phase of germination and seedling growth is a critical one, as the ability of a plant to germinate and establish the seedling frequently becomes a limiting factor in plant production. Salinity affects all stages of growth and development, resulting in stunted growth, restricted lateral shooting and reduction in the size of leaves, fruits and seeds and reduced yield.

Trigonella foenum-graecum L. is cultivated throughout the world. In Rajasthan, it occupies a prime position among the seed spices (Anonymous, 2002). It has been cultivated as a condiment and a pot herb in India (Annonymous, 1956). It is highly potential herb for Ayurvedic medicine (Gupta and Kumar, 2002). Fenugreek does well on saline soils where no other grain legume is profitable; this favours its cultivation on most soils of Rajasthan (Habib *et al*. 1971).

The present experiment was conducted to determine the influence of salinity on seed germination and seedling growth of *Trigonella foenum-graecum*.

MATERIAL AND METHODS

Healthy seeds of *Trigonella foenum-graecum* were selected and surface sterilized with 0.1% $HgCl_2$. Then the seeds were thoroughly washed with distilled water and soaked in 0.01, 0.1, 1, 2 and 3% aqueous solutions of sodium chloride prepared in distilled water. The seeds soaked in distilled water alone were taken as control. After 24 hours of soaking, the seeds were sown in 10 cm diameter neutral glass petridishes lined with single layer of cotton and double layer of filter paper. The petridishes were watered regularly with distilled water. Three replicates of 10 seeds each were used. The experiment was conducted under sterilized conditions.

The observations were made upto 7 days and root length and shoot length were recorded on 7th day. The results were analysed statistically and presented in Table 1. The figures interpreted in the result are mainly the mean of replications of treatment. The observations of each parameter of the experiments were analysed statistically for mean, analysis of variance, standard error and critical differences by applying 'F' test.

RESULTS AND DISCUSSION

The present investigations were carried out to observe the effect of different levels of salinity. Lower doses of sodium chloride upto 1% salinity level improved percent seed germination. Maximum seed germination (100%) was recorded at 1%. However, a decrease was recorded at 3% (90%). Sodium chloride also promoted rooting. Maximum root length, i.e., 2.18 cm was recorded at 0.01%, 0.1% and 1% salinity level significantly increased shooting. Maximum shoot length, i.e., 2.87 cm was recorded at 0.1%. The influence of sodium chloride on shoot length was significant while it was non-significant for germination and root length (Table 1).

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Table1-Effect of salinity on seed germination and seedling growth of *Trigonella foenum-graecum*

Concentration (percent)	Germination (percent)	Root length (cm)	Shoot length (cm)
Control	90 ± 4.711	1.82 ± 0.095	2.51 ± 0.181
0.01	93.3 ± 2.721	2.18 ± 0.110	2.72 ± 0.127
0.1	96.6 ± 2.721	1.88 ± 0.060	2.87* ± 0.124
1	100 ± 0.000	1.64 ± 0.122	2.85* ± 0.073
2	93.3 ± 2.721	1.34 ± 0.063	2.76 ± 0.164
3	90 ± 4.711	1.12 ± 0.087	2.0 ± 0.113
F ratio	0.91 N.S.	1.76 N.S.	8.44*
F value	3.11	3.11	3.11
C.D. at 5%	12.58	0.81	0.34

*Significant, N.S. Non-Significant

Lower levels of salinity resulted in improved seed germination, rooting and shooting. This might be due to accumulation of compatible solutes like proline and other amino acids and also other compounds as galactosyl glycerol and organic acids which help in osmotic adjustment (Hellebust, 1976).

The results obtained are in conformity with the results obtained by Ali *et al.* (1992) and Shadded and Zidan (1989). Salinity was also reported to increase seed germination and seedling growth in *Zygophyllum simplex* (Khan and Ungar, 1997a), *Arthroceneum indicum* (Khan and Gul, 1998), *Hordeum jubatum* (Badger and Ungar, 1989) and *Artiplex griffithii* (Khan and Rizvi, 1994).

It can be concluded that lower levels of salinity promote seed germination as well as root and shoot growth.

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