The Effect of Salinity Stress on Seed Germination of *Agropyron elongatum*

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Introduction

Successful seedling establishment depends on the frequency and the amount of precipitation as well as on the ability of the seed species to germinate and grow while soil moisture and osmotic potentials decrease. Germination and seedling characteristics are the most valuable criteria for selecting salt tolerance in plants. Salinity stress can reduce seed germination through osmotic effects (Jamil *et al.* 2006). *Agropyron* is a perennial grass genus with 19 different species reported. This genus has wide adaptation and can be grown in different climates.

The objective of this study was to evaluate the impact of salinity stress on the germination of *Agropyron elongatum* seed under laboratory conditions.

Materials and methods

In this study we have used complete randomized design with four salinity rates of 0, 2, 4 and 10 g/l NaCl. The 50 seeds with three replications were placed on two layers of filter paper moistened with 5 ml of distilled water in covered 9 cm Petri dishes.

Germination tests were conducted in a germinator maintained within 20–25°C during 16-hour light period and an 8-hour dark one with a light intensity of 38 u mol/m^2/s provided by cool-white fluorescent lamps with 80% relative humidity. The germinated seeds were counted each day for 12 days. Germination was considered to have occurred when the root length was 2mm.

Data were analysed by ANOVA with means compared by the Duncan's multiple range test using procedures in SPSS Statistics 17.0 and Microsoft Excel.

Using count data from the last day germination was calculated by the following equation:

$$\text{percentage of germination} = \frac{\text{number of germination seed}}{\text{total number of seeds}} \times 100 \quad \text{.....(1)}$$

Germination rate using the relationship (2) was calculated as:

$$GR = \sum_{i=1}^{n} \left[\frac{n}{t}\right] \quad \text{..... (2)}$$

where n is the number of seeds germinated in the time t and t is number of days from the start of the experiment (Panwer and Bhardwaj, 2005).

Results

Comparison of means showed that germination percentage in the 0 g/l NaCl treatment was different from the other three treatments. At the 10 g/l NaCl treatment no germination occurred at all (Fig. 1).

Comparison of means showed that at 0 g/l NaCl the germination rate was greater than the other three treatments while the minimum germination rate occurred in treatments of 4 and 10 g/l NaCl (Fig. 2).

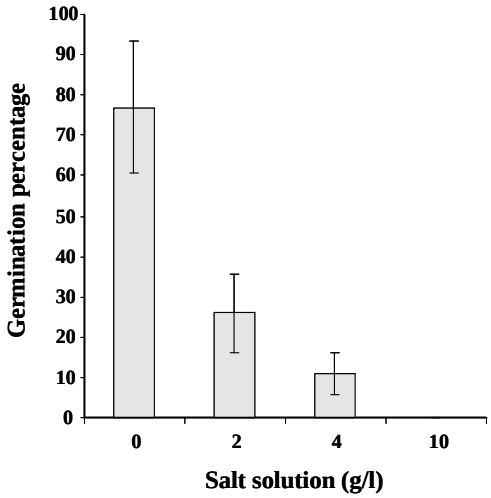

Figure 1. The effect of increasing salinity on germination percentage of *Agropyron elongate.*

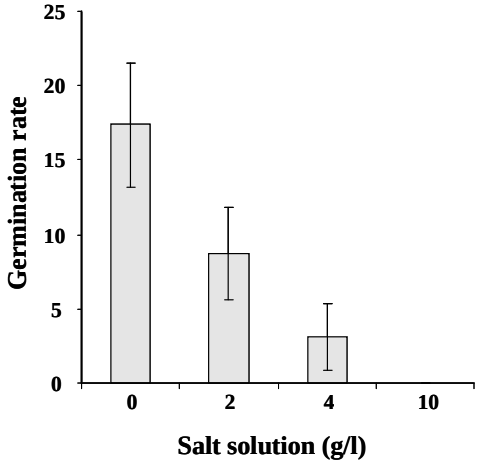

Figure 2. The effect of increasing salinity on germination rate of *Agropyron elongatum*

Discussion

The results of this study showed that the maximum germination occurred in the control treatments. At the highest salinity tested (10 g/l), no germination occurred. Grieve *et al.* (1992) also observed that high levels of salinity significantly reduce seed germination and growth and that this was due to an increase in osmotic potential and the toxicity of soluble ions. With increase in the amount of solute, plant growth rate also decreased. Salinity causes changes in the amount and type of metabolic substances and plant growth regulators. It appears that a decrease in germination is related to salinity induced disturbance of metabolic process leading to a possible increase in phenolic compounds. It is assumed that germination rate and the final seed germination level decrease with the decrease of the water movement into the seeds during imbibition (Jamil *et al.* 2006). In general it can be concluded that the species *Agropyron elongatum* considering the results of this study is quite resistant to salt, so it is best not to use this valuable species in areas that do not have high salinity.

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