# Effect of Salinity Stress on Seed Germination in *Hordeum vulgare*

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**Introduction** Soil salinity is a major factor limiting plant productivity , affecting about 95 million hectares world wide (Szabolcs , 1994) . Salinity imposes serious environmental problems that affect grassland cover and the availability of animal feed in arid and semi-arid regions (El-Kharbotly *et al* . , 2003) . Shokohifard *et al* . , (1989) reported that salt stress negatively affected seed germination ; either osmotically through reduced water absorption or ionically through the accumulation of Na and Cl causing in imbalance in nutrient uptake and toxicity . Saline soils contain multiple types of soluble salt components , each of which has a different effect on the initial growth of plant (Redmann , 1974) .

**Materials and methods** To evaluate salt tolerance during germination , 25 seeds were placed on filter paper in 9 cm petri dishes and submerged in 5 ml of each solution . Solutions of the NaCl and $CaCl_2$ were used at concentrations of 0 (control) , 60 , 120 , 180 , 240 , 300 , 360 , and 420 mM . Experiments were performed in a completely randomized design with 4 replicates in the seed laboratory of Natural Resources Faculty of Tehran University . At the end of the germination period , the germination percentage , length of the stem and radicle were measured or calculated . A multrivariate ANOVA was used to evaluate the effects of salinity on seed germination .

**Results** Generally , germination percentage was reduced by increased salt concentration (Table 1) .

**Table 1** *Germination percentage , length of stem , length of radicle of* Hordeum vulgare *seeds in saline solutions of NaCl and* $CaCl_2$ .

| Salinity (mM) | 0 | 60 | 120 | 180 | 240 | 300 | 360 | 420 |
|---|---|---|---|---|---|---|---|---|
| NaCl | 52±11 .8aA | 51±13 .2aA | 40±5 .7abA | 51±15 .4aA | 34±10 .6abcA | 23±15 .8bcdA | 13±8 .9cdA | 0±0dA |
| $CaCl_2$ | 52±11 .8aA | 44±17aA | 38±10 .6aA | 12±5 .7bB | 3±2bB | 0±0bB | 0±0bB | 0±0bA |

Values are mean±S .D . Means within a row and that have a different small letter are significantly different from each other and means within a columns that have different capital letter are significantly different from each other .

**Conclusions** Although maximum germination was obtained with non-saline conditions (control treatment) , its seeds germinated at higher levels of salinity in NaCl . As reported in results , seed germination was reduced by increasing salinity levels . Reduction in germination by an increase of salinity levels has been described by numerous authors (Othman *et al* . , 2006 ; Breen *et al* . , 1977) . BaSalah (1991) found that high levels of salinity can significantly inhibit seed germination . Further , Waisel (1972) found that increasing salinity concentration often cause osmotic and/or specific toxicity which may reduce or retard germination percentage . In general , based on our results it seems that *H . vulgare* is tolerant to different salts . Therefore , using *H . vulgare* seeds in range reclamation and restoration projects could lead to suitable results in arid and semi arid areas , where salinity strongly affects vegetation .

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