

Do Drought and Salinity Stresses Have Similar Effects on Thyme Germination and Seedling Growth?

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ABSTRACT

Iso-osmotic potentials using PEG-6000 and NaCl solutions (0, -2, -4, -6, -8, -10 and -12 bar) were used for germination of *Thymus fedtschenkoi*, *T. migricus* and *T. daenensis*. At iso-osmotic potentials, seeds in saline solutions germinated at a higher rate compared to those incubated in PEG-6000 solutions. Germination significantly decreased at -4 bar and dropped to zero at -10 bar under drought, while under salinity it decreased at -8 bar but did not fall to zero even at -12 bar. Under both salinity and drought, effects on germination and seedling development parameters were the same at low stress levels (-2 bar), but differed at higher stress levels. When exposed to salinity stress, germination of *T. migricus* was lower than that of *T. daenensis* and *T. fedtschenkoi*. Root branching decreased due to both drought and salinity, and the maximum number of secondary roots was observed in *T. daenensis* seedlings, while the lowest was observed in *T. fedtschenkoi* seedlings. Early seedling growth was more sensitive to drought and salinity than seed germination. Germination and early growth of thyme seedlings was more sensitive to drought than salinity. Differences in response of seeds and seedlings to drought and salinity at the same osmotic potential was probably due to differences in molecular size of PEG and NaCl, resulting in different rates of entrance of these molecules into cells, consequently affecting water uptake of cells.

INTRODUCTION

Interest in medicinal plants as a re-emerging health aid has been fueled by the rising costs of prescription drugs and the bioprospecting of new plant-derived drugs (Hoareau, 1999). Thyme (*Thymus* spp.) is an important medicinal and condiment plant. Nowadays, there is an increasing trend of growing medicinal plants in Iran. However, and in spite of abundant land availability, drought and salinity remain as major problems for crop production of medicinal plants due to low precipitation.

One of the most important abiotic factors limiting plant germination and early seedling development is water stress due to drought and salinity (Almansouri et al., 2001), which are widespread problems around the world (Soltani et al., 2006). Increasing frequency of dry periods in many regions of the world and the problems associated with salinity in irrigated areas frequently result in the consecutive occurrence of drought and salinity on cultivated land. Currently, 50% of all irrigation schemes are affected by salinity (Hu and Schmidhalter,

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