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The study of salinity and drought stress effects on three range species *Agropyron intermedium* , *Avena barbata* and *Panicum antidotale* from Iran

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Key words : drought , dry matter , salinity , stress , water potential

Introduction Stress is considered to be a significant deviation from optimal conditions of life . The salinity is usually resulted in drought and most of the plants can tolerate a limited amount of salinity and drought , or else it will reduce the function of plant linearly (Jafari ,2000) . Salinity inhibition of plant growth is the result of osmotic and ionic effects and the different plant species have developed different mechanisms to cope with these effects (Munns ,2002) .

Materials and methods This experiment was carried out in order to study the effects of drought and salinity stress on three range species *Agropyron intermedium* , *Avena barbata* and *Panicum antidotale* using a completely randomized design in 3 repetitions of 36 treatments totaling 108 vessels in the greenhouse . Salinity stress was selected in the form of four salinity treatments , including zero (authentic) , 40 , 120 and 200 millimolars . Salt solutions of NaCl (60%) , Na₂SO₄ (30%) and CaCl₂ (10%) were used . Drought stress was selected based on irrigation at an interval of 6 , 12 and 20 days . Two months duration of stress was applied . During the test , some characters including : the stem and leaf dry matter , water potential in leaves and the percent of wilted leaves were measured .

Results and discussion 20 days drought and 120 millimolar salinity treatments have the most wilting . Quantity of the wilted leaves of *Avena barbata* and *Panicum antidotale* species are more than *Agropyron intermedium* , which indicates it's more adaptable in comparison with two other species . The water potential of the leaves is used for the plants tolerance against drought stress . The species under severe drought stress (20 days) in comparison with the species under less stress (6 days) have higher osmotic potential . Figure 1 shows that increasing drought stress could reduce the function and biomass of the stem and leaf . Increasing stress from 6 days to 12 days increases the loss intensity . Enhanced stress more than 12 days is not effective in reduction of function . The most dry matter among the plant species is related to *Avena barbata* in 6 days drought treatment and the least dry matter is related to *Agropyron intermedium* in 20 days drought treatment . In the three mentioned drought treatments , *Avena barbata* has the most biomass and *Agropyron intermedium* has the least biomass . Regarding Figure 2 , the salinity treatment doses not affect the oscillation of function significantly . Perhaps the plant can tolerate salinity until 200 millimolar concentration but more research is needed to demonstrate it . The information shows that *Avena barbata* has the most tolerance and function against salinity while *Agropyron intermedium* has the least tolerance and function against the salinity in compared with other treated species .

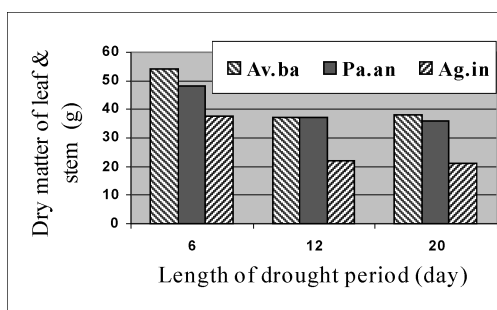


Figure 1 Effects of drought stress on the dry matter (leaf and stem) .

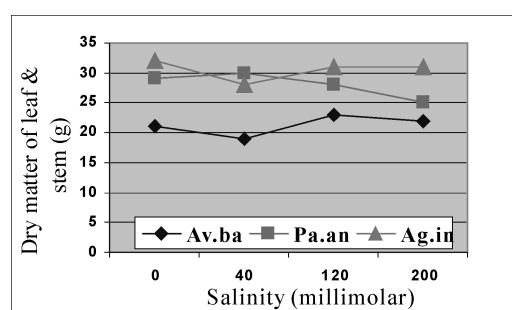


Figure 2 Effects of salinity stress on the dry matter (leaf & stem) .

Conclusions The drought and salinity could reduce the plant's biomass in short term . The plant would adopt itself with this condition and its growth is reduced . Type and intensity of adaptation are different in species . The stress effect could be observed on the leaves and their wilting increases . The cellular pressure reduction that resulted in water deficiency causes the replacement of water potential with pressure . Thus more resistant plants have the most negative water potential . In conclusion among 3 species , *Avena barbata* is the most resistant species , because it has the most dry matter , maximum of relative humidity and negative water potential of leaves . But *Agropyron intermedium* is less resistant and *Panicum antidotale* is the intermediate one . So *Avena barbata* is the most appropriate plant for cultivating in arid and semiarid areas .

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