

Effect of plant growth promoting micro organisms on increasing water use efficiency of alfalfa in water-stress conditions

M. Zafari¹, A. Ebadi², Gh. Parmoon^{1*} and S. Jahanbakhsh¹

(Received: June 26-2014 ; Accepted: Aug. 17-2014)

Abstract

In order to study the effect of bacterial growth on water use efficiency of alfalfa, a greenhouse experiment, as factorial based on completely randomized blocks design with three replications, was conducted at Faculty of Agriculture, University of Mohaghegh Ardabili, Ardabil, Iran, in 2012. Treatments consisted of 3 levels of water stress (75, 55 and 35% of field capacity) and seed inoculation at 4 levels (no inoculation (control), inoculation with mycorrhiza *G. mosseae*, inoculation with rhyzobium *S. meliloti*, and inoculation with combination of mycorrhiza and rhyzobium). Results showed that water stress and seed inoculation have significant effect ($P < 0.01$) on leaf nutrients content. Water stress reduced absorption of phosphorus (23%), potassium (8%), iron (4%) and increased sodium absorption (14%) in non-inoculated seeds. Inoculation of seeds reduced stress effects and combined inoculation had the highest effect. Stomatal conductance and water use efficiency were affected ($P < 0.01$) by inoculation and water stress. Stomatal conductance was decreased during the stress period and seed inoculation with mycorrhiza *G. mosseae* was most effective on increasing stomatal conductance (47% at the highest level of stress). Water use efficiency increased as a result of water stress and inoculation. The highest value of water use efficiency (0.166 mg/kg) was obtained in the combined inoculation with 35% field capacity treatment. Results of regression equations showed that during the inoculation, contribution of phosphorus and potassium in regulation of stomatal conductance was increased and contribution of sodium was decreased. However, during the stress period, the share of potassium and sodium was increased in stomatal conductance and the share of phosphorus was reduced. Also, stress increased the role of stomatal conductance in water use efficiency. However, inoculation reduced the role of stomatal conductance in water use efficiency.

Keywords: Water stress, Combined inoculation, Stomatal conductance.

1. Dept. of Agron., Faculty of Agric., Univ. of Mohaghegh Ardabili, Ardabil, Iran.

*: Corresponding Author, Email: ghasem.parmoon@gmail.com