

Phosphorus efficiency of some barley genotypes in the presence of phosphate-solubilizing microorganisms

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Abstract

In order to investigate phosphorus efficiency (PE) of the barley genotypes in the presence of phosphate-solubilizing microorganisms (PSMs), a greenhouse factorial experiment was conducted as a completely randomized blocks design and 3 replications with 10 Iranian and foreign barley genotypes. The effects of different phosphorus (P) fertilizer treatments including control (P0), phosphate rock (RP), phosphate rock inoculated with phosphate solubilizing fungi (RP+F), phosphate rock inoculated with phosphate solubilizing bacteria (RP+B), phosphate rock inoculated with both fungi and bacteria inoculum (RP+B+F), and soluble phosphate (PS) was studied. After 9 weeks, plants were harvested and shoot dry weight (SDW) and P concentration (PC) was measured and then PE indices were calculated. The results indicated that barley genotypes had significant differences ($P<0.01$) in the SDW, PC, P content (TP), P acquisition efficiency (PACE) and P utilization efficiency (PUTE). Gara-arpa genotype and line AltICB-98 produced the highest and Rihane-03 genotype produced the lowest shoot dry mass at the P-free treatment (P0). The inoculation with PSMs significantly increased plant growth parameters and PACE as the fungi inoculation was more effective than bacteria and mixed inoculation of fungi and bacteria. With fungi inoculation, the average PC increased from 1.58 to 2.9 mg/g SDW, PACE from 0.12 to 0.27 and PE from 0.40 to 0.69. Among the varieties, Yea-168 was efficient in P acquisition, Sahand was efficient in P utilization, and Gara-arpa and line AltICB-98 were efficient in both acquisition and utilization of P. Thus, it is concluded that selecting P-efficient varieties along with inoculation by phosphate-solubilizing microorganisms could decrease application of chemical fertilizers due to increasing P absorption from phosphate rock and insoluble forms of P in the soil.

Keywords: Inoculation, P acquisition, P utilization.

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