Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

THE USE OF SOIL HYDRAULIC PROPERTIES AS INDICATORS FOR ASSESSING THE IMPACT OF MANAGEMENT PRACTICES UNDER SEMI-ARID CLIMATES

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Abstract

Water retention capacity and hydraulic conductivity are major soil hydraulic properties that influence soil quality and the environment. The objective of this work was to assess major soil hydraulic characteristics in response to the effect of soil management and tillage practices. Eight soil treatments were considered: conventional tillage, reduced tillage, no-tillage, fallow no-tillage, abandoned soil, compacted soil, plough on compacted soil, and application of super absorbent polymers. The experiments were conducted at Koohin station, Iran. The equality of field saturated hydraulic conductivity (K_{fs}) and estimated K_{fs} was studied. Moreover, the contribution of the porosity to soil water flux was investigated and quantified. At the -1500 kPa potential, water content was influenced by the compacted treatment at soil depth of 0 to 25 cm. In this study, van Genuchten water retention curve parameters n, α, and θ_r values were not significantly different among treatments. The fit of the van Genuchten equation to the soil water retention data resulted in low sum of squared errors. No distinct trend was observed for estimated sorptivity in the studied area. The sorptivity values were not significantly different among soil management practices. Moreover, estimated K_{fs} values by DISC software were lower than measured K_{fs}. Soil treatments did not influence the soil water-conducting medium and macropores. Unsaturated hydraulic conductivity may partly be affected by soil texture and soil structure which were uniform under all treatments. Soil water retention and transmission may be manipulated with changes in pore size distribution under different tillage and management practices in long-term.

Key words: sorptivity, super absorbent polymers, transmissivity, water-conducting porosity

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