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"Development on the margin"

Effects of Soluble Salts on Water Holding Capacity of Hydrophilic Polymers: A Case Study on Geohumus

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Abstract

Gel-forming polymers that can absorb water up to 1000 times their weight are considered as ameliorants of soil water supply in arid and semi arid areas. A new product belonging to these polymers, called Geohumus, can absorb pure water up to 40 times of its weight. However, when Geohumus is applied under field conditions, soil physical condition and the ion concentration of soil water may interfere with this water absorption capacity. In order to quantify these effects Geohumus was imbedded in variable concentrations and types of salts, a standard nutrient solution as well as soil extracts for 2 hours and the water absorption quantified. Significant differences in water holding capacity (WHC, g of water per g of Geohumus) between treatments were noticed with all treatments lowering the WHC compared to that measured in distilled water (13.5 g H_2O g^{-1}), sandy soil extract (8.2 g H_2O g^{-1}) and sandy soil extract with nutrient solution (4.4 g H_2O g^{-1}). Testing the WHC over a wider range of salt concentrations *i.e.*, 0.01 to 0.05M, WHC of Geohumus decreased in the order: KNO_3, NH_4NO_3, NaCl, K_2SO_4, $MgSO_4$, $Al_2O_{12}S_3{\cdot}13.4–14.5H_2O$, and $FeSO_4{\cdot}7H_2O$. WHC and concentration of salts were negatively correlated. Valance II elements impeded Geohumus water absorption capacity more than valances I elements. In conclusion, similar to other hydrophilic polymers, WHC of Geohumus is sensitive external salt concentrations which are realistic for *in-situ* soil solutions. These results imply that when Geohumus is applied under field conditions interactions between soil type and soil solution composition should be considered.

Keywords: Drought stress, field water balance, soil solution concentration

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