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Effect of zeolite and saline water application on saturated hydraulic conductivity and infiltration in different soil textures

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The effects of zeolite application (0, 4, 8 and16 g kg^{-1}) and saline water (0.5, 1.5, 3.0 and 5.0 dS m^{-1}) on saturated hydraulic conductivity (K_s) and sorptivity (S) in different soils were evaluated under laboratory conditions. Results showed that K_s was increased at salinity levels of 0.5-1.5 dS m^{-1} in clay loam and loam with 8 and 4 g zeolite kg^{-1} soil, respectively, and at salinity levels of 3.0–5.0 dS m^{-1} with 16 g zeolite kg^{-1} soil. K_s was decreased by using low and high salinity levels in sandy loam with application of 8 and 16 g zeolite kg^{-1}, respectively. In clay loam, salinity levels of 0.5–3.0 dS m^{-1} with application of 16 g kg^{-1} zeolite and 5.0 dS m^{-1} with application of 8 g zeolite kg^{-1} soil resulted in the lowest values of S. In loam, all salinity levels with application of 16 g zeolite kg^{-1} soil increased S compared with other zeolite application rates. In sandy loam, only a salinity level of 0.5 dS m^{-1} with application of 4 g zeolite kg^{-1} soil increased S. Other zeolite applications decreased S, whereas increasing the zeolite application to 16 g kg^{-1} soil resulted in the lowest value of S.

Keywords: saturated hydraulic conductivity; zeolite; water salinity; soil texture; saline sodic soils

Introduction

Irrigated areas in the arid and semi-arid regions of the world have soils of low quality due to high salinity and exchangeable sodium percentage or sodication. Hence, the threshold for irrigation water quality should be based on its effects on the physical and chemical properties of the soil and crop production.

The salinity of irrigation water and sodium adsorption ratio (SAR) affect soil physical properties (Suarez et al. 2006). Soil physical properties, including water infiltration and hydraulic conductivity, are important factors in agriculture production. Water infiltration is commonly defined as water entering the soil surface under a vertical hydraulic gradient. Infiltration is important for irrigation system design and it is one of the parameters used in the selection of a proper irrigation system. In sprinkler irrigation, the water application rate should be lower than the infiltration rate in order to prevent surface run-off and soil erosion. In surface irrigation, an infiltration equation is essential when designing the inflow duration and length of furrow or border irrigation. Furthermore, hydraulic conductivity is used to measure the ease with which water flows in the soil and is

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