Geophysical Research Abstracts
Vol. 16, EGU2014-1466-5, 2014
EGU General Assembly 2014

Aggregates and structure stability as affected by polymer application and aggregate size

Amrakh I. Mamedov (1,2) and Guy J. Levy (3)

(1) KSU, USDA-ARS-EWERU, Manhattan, KS, USA, (2) Selcuk University, Konya, Turkey (amrakh03@yahoo.com), (3) Inst. of Soil, Water and Environmental Sciences, Agricultural Research Organization, Bet Dagan, Israel (vwguy@volcani.agri.gov.il)

Studying the effects of amendments application on soil structure is important for the development of effective soil and water conservation and management practices. The contribution of polymer addition to soil-structure stability depends, among others, on soil aggregate size which may vary with changes in soil properties and management. The effects of aggregate size (0.25-0.5; 0.5-1.0; 1.0-2.0 mm) of four semi-arid soils of varying texture (loam, sandy clay, and two clays), addition of 100 mg L^{-1} of high-molecular-weight polyacrylamide (PAM) and rate of aggregate wetting (2 and 100 mm h^{-1}) on aggregate and structure stability were studied using the high energy moisture characteristic (HEMC) method and deionized water. In this method, energy of hydration and entrapped air are the main forces responsible for breaking down of the aggregates. Differences in aggregate and structure stability among treatments were inferred from changes in water retention curves obtained at low suction ($\Psi \geq -5.0\,\mathrm{J\,kg^{-1}}$) which were, quantified using the modified van Genuchten (1980) model. Products of the water retention curves analysis by the model include (i) the parameter α which represent the location of the inflection point that can also be considered as the most frequent pore size termed modal suction (MS; MS=1/ α), (ii) the parameter n which indicates the steepness of the S-shaped water retention curve respectively, and (iii) the volume of drainable pores (VDP), which is an indicator for the quantity of water released by the tested sample over the range of suction studied. The change in the above indices is considered to be related to changes in pore-size distribution, and therefore to changes in aggregate and particle size distribution, thus characterizing the contribution of the management or treatments to aggregates stability. Our main findings indicated that (i) the tested treatments significantly affected the shape (e.g., α and n) of the water retention curves, (ii) soil type, aggregate size, PAM application and wetting rate and their interactions had significant effects on the stability indices, (iii) addition of PAM had no or small effect on the stability of small aggregates (0.25-0.5 mm), but significantly increased the stability of the larger aggregates (0.5-1.0 and 1.0-2.0 mm) and (iv) PAM-treated aggregates retained more water at low suction $\Psi \geq -1.2$ J kg^{-1}, and were less affected by rate of water addition than untreated aggregates. Our results suggest that effectiveness of PAM application in stabilizing aggregates and soil structure against water cannot be straightforwardly predicted as it strongly depends on soil properties and conditions prevailing in the field (e.g., texture, aggregate size and rate of water addition).