Geophysical Research Abstracts
Vol. 19, EGU2017-4031, 2017
EGU General Assembly 2017

Effects of biochars on hydraulic properties of clayey soil

Jingbo Zhen (1), Mario Palladino (2), Naftali Lazarovitch (1), Giuliano Bonanomi (2), and Giovanni Battista Chirico (2)

(1) Wyler Department of Dryland Agriculture, French Associates Institute for Agriculture and Biotechnology of Dryland, Ben-Gurion University of the Negev, Sede Boqer Campus, 84990, Israel, (2) Department of Agriculture, University of Naples Federico II, Portici, 80055, Naples, Italy

Biochar has gained popularity as an amendment to improve soil hydraulic properties. Since biochar properties depend on feedstocks and pyrolysis temperatures used for its production, proper selection of biochar type as soil amendment is of great importance for soil hydraulic properties improvement. This study investigated the effects of eight types of biochar on physical and hydraulic properties of clayey soil. Biochars were derived from four different feedstocks (Alfalfa hay, municipal organic waste, corn residues and wood chip) pyrolyzed at two different temperatures (300 and 550 °C). Clayey soil samples were taken from Leone farm (40° 26' 15.31" N, 14° 59' 45.54" E), Italy, and were oven-dried at 105 °C to determine dry bulk density. Biochars were mixed with the clayey soil at 5% by mass. Bulk densities of the mixtures were also determined. Saturated hydraulic conductivities (Ks) of the original clayey soil and corresponding mixtures were measured by means of falling-head method. Soil water retention measurements were conducted for clayey soil and mixtures using suction table apparatus and Richards' plate with the pressure head (h) up to 12000 cm. van Genuchten retention function was selected to evaluate the retention characteristics of clayey soil and mixtures. Available water content (AWC) was calculated by field capacity (h = - 500 cm) minus wilting pointing (h = -12000 cm). The results showed that biochar addition decreased the bulk density of clayey soil. The Ks of clayey soil increased due to the incorporation of biochars except for waste and corn biochars pyrolyzed at 550 °C. AWC of soils mixed with corn biochar pyrolyzed at 300 °C and wood biochar pyrolyzed at 550 °C, increased by 31% and 7%, respectively. Further analysis will be conducted in combination of biochar properties such as specific surface area and total pore volume. Better understanding of biochar impact on clayey soil will be helpful in biochar selection for soil amendment and improving water use efficiency in agriculture.