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Selected soil physical and hydraulic properties for different crop successions under no tillage

M. C. SASAL (1), M. CASTIGLIONI (2), J. PAZ-FERREIRO (3), M. G. WILSON (1), and J. OSZUST (4)

(1) INTA, EEA Paraná, Entre Ríos, Argentina, (2) Facultad de Agronomía, Universidad de Buenos Aires, Argentina, (3) INGACAL, Centro de Investigaciones Agrarias de Mabegondo, Coruña, Spain, (4) Fcaultad de Ciencias Agropecuarias, Universidad Nacional de Entre Ríos, Argentina

No tillage is now widely widespread in Argentina in response to several circumstances, including limited runoff and a drop in soil erosion. Crop residues left on the soil surface help both natural rainfall and irrigation water infiltrate and also limits evaporation, conserving water for plant growth. This notwithstanding, wide differences in runoff rates between crop succession have been observed under no tillage. The aim of this work was to assess the effect of the main crop successions of Entre Ríos province, Argentina on selected soil physic and hydraulic properties. Results obtained on no-till plots were compared with those recorded on a 10-years old grassland plot and on a conventionally tilled plot left bare, both of them taken as references. The study soil was classified as an Aquic Argiudoll. Treatments were: maize and soybean, both cropped as monoculture, succession wheat/soybean or wheat/maize, grassland and conventionally tilled soil left bare. Soil runoff was recorded on experimental plots 100 m^2 in surface. Saturated hydraulic conductivity (Khc) and sorptivity were measured in field conditions using a disc permeameter. Bulk density (Bd), saturated hydraulic conductivity (Kh) total porosity (TP) and pore size distributions were determined on undisturbed cores sampled at the 0-4 and 4-8 cm depth with five replications. Maximum water losses were recorded in bare soils conventionally tilled. Under maize and soybean monocultures water losses were six time higher than under grassland. Water losses under successions wheat/soybean-maize were lower than under monoculture but not significantly different. Field saturated hydraulic conductivity (Khc) was highest under grassland and the remaining treatments don't showed significant differences. Differences in sorptivity between plots were not significantly different. A significant relationship was found between saturated hydraulic conductivity measured in field conditions (Khc) and determined in soil cores (Kh) and on average the later was 2.5 times higher than the former. Soil pore space with diameters >50 μm was higher under grassland at both sampling depths and showed no significant differences between other treatments. Saturated hydraulic conductivity (Khc), TP and Bd showed a significant relationship at the 0-4 cm depth. Runoff variance was explained by TP and partial porosity <10 μm. Although the effect of crop succession under no tillage was apparent for some of the studied soil properties, it should be emphasized that there is important to further assess soil management issues such as traffic, cop residue amounts and root activity that influence soil physical and hydraulic properties.