Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07692, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07692
EGU General Assembly 2008

Pore size distribution and water infiltration under different tillage systems

A. Nosalewicz, J. Lipiec, A. Wójciga

Institute of Agrophysics, Polish Academy of Sciences, Doswiadczalna 4, 20-280 Lublin, Poland, (a.nosalewicz@ipan.lublin.pl / Fax: +48 81 7445067 / Phone: +48 81 7445061)

The experiment was conducted on Eutric Fluvisol by the FAO legend at the experimental field of the Institute of Soil Science and Plant Cultivation in Pulawy, Poland. The soil has 25 % clay (< 2 μm), 62 % silt (2-50 μm) and 13% sand (50-2000 μm) at the depth 0-30 cm. The treatments were as follows: ploughing to the depth of 20 cm (CT); sowing to the uncultivated soil (NT).

Samples for analysis of areal porosity were taken under CT and NT treatments in the horizontal plane and from the layers of 0-8 and 10-18 cm in the vertical plane. After drying, the soil samples were saturated with a solution of Polimal 109 polyester resin. When hard, the surface of each block was polished with glass paper and powder to obtain opaque sections. Scanned images of the sections were analysed using the program Scion Image for Windows to determine areal porosity and perimeter and area of several pore size classes >50 μm. Then shape factor (SF) of pores was calculated according to the equation: perimeter$^2/4\pi \times$area. Based on the values of the shape factor the pores were divided into regular pores (SF from 1 to 2), irregular pores (SF from 2 to 5) and elongated pores (SF >5) (Pagliai et al., 2000).

Infiltration of water into the soil was determined by the double ring infiltrometer with a 21.5 cm diameter inner and 30 cm diameter outer cylinder inserted 14 cm into the soil. Water entering the soil was measured with a calibrated Mariotte bottle. A constant water head of 15 mm was maintained in both rings. The measurements were done at the initial soil water content corresponding to approximately field water capacity in all the treatments. This allowed to minimise the effect of different water content.It

was found that water infiltration into tilled soil was about 2 times higher at the beginning of the process and almost to 3 times at steady-state rate (after 3 hrs). Higher infiltration rate in CT than NT can be attributed to overall higher areal porosity and greater contribution of the elongated large pores, in particular in the vertical plane. As indicated by standard deviations variability of porosity for most pore size classes was greater in horizontal than vertical plane. Contribution of the regular pores decreased with increasing size of pores and the inverse was observed for the elongated pores.

This work was funded in part by the Polish Ministry of Science and Higher Education (Grant No. N310 036 32/1951).