

EFFECT OF BIOCHAR ON BULK DENSITY AND WATER RETENTION CAPACITY OF LOAMY SAND SPODOSOL OF DIFFERENT FERTILITY LEVELS

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The effect of biochar applied at a rate of 20 t ha⁻¹ on bulk density and water retention capacity of loamy sand spodosol of medium and high fertility levels has been studied at the Menkovo branch of Agrophysical Research Institute. The biochar was produced from birch waste by fast pyrolysis at a temperature of 600°C. The application of biochar led to a significant ($p < 0.01$) decrease in the bulk density of the soil of medium fertility level from 1.36 ± 0.05 g cm⁻³– 1.43 ± 0.06 g cm⁻³ to 1.10 ± 0.05 g cm⁻³– 1.26 ± 0.02 g cm⁻³ and to an insignificant decrease in the bulk density of the soil of high fertility level from 1.13 ± 0.03 g cm⁻³– 1.32 ± 0.01 g cm⁻³ to 1.06 ± 0.06 g cm⁻³– 1.21 ± 0.11 g cm⁻³. Biochar application contributed to a significant ($p < 0.05$) increase in the water retention capacity (in the range of matrix moisture potentials from –5 kPa to –100 kPa) of the soil of medium fertility level only in May and September. The water retention capacity of the soil of high fertility level at the same matrix potentials insignificantly increased after the biochar application, since the higher content of hydrophilic soil organic matter in the soil also had a significant effect on the size distribution of water-retaining pores. Biochar had a greater effect on the content of macropores than meso- and micropores in both soils. The content of macropores in the studied soils was insignificantly higher in the treatments with biochar than in the control. Nevertheless, significant seasonal changes in moisture content in macropores of the soil of high fertility level were higher than in macropores of the soil of medium fertility level.

Keywords: biochar, soil fertility, soil bulk density, soil water retention capacity.