

Wettability, soil organic matter and structure-properties of typical chernozems under the forest and under the arable land

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Intensive tillage affects the properties of soil: decrease in content of soil organic matter and in hydrophobicity of the soil's solid phase, the reduction of amount of water stable aggregates - all this leads to deterioration of the structure of the soil and affects the process of movement of moisture in the soil profile.

One of the hypotheses of soil's structure formation ascribes the formation of water stable aggregates with the presence of hydrophobic organic substances on the surface of the soil's solid phase.

The aim of this work is to study the effect of tillage on properties of typical chernozems (pachic Voronic Chernozems, Haplic Chernozems) (Russia, Kursk region), located under the forest and under the arable land. The determination of soil-water contact angle was performed by a Drop Shape Analyzer DSA100 (Krüss GmbH, Germany) by the static sessile drop method. For all samples the content of total and organic carbon by dry combustion in oxygen flow and the particle size distribution by the laser diffraction method on the device Analysette 22 comfort, FRITCH, Germany were determined. The estimation of aggregate composition was performed by dry sieving (AS 200, Retsch, Germany), the content of water stable aggregates was estimated by the Savvinov method. There was a positive correlation between the content of organic matter and soil's wettability in studied soils, a growth of contact angle with the increasing the content of organic matter. Under the forest the content of soil organic matter was changed from 6,41% on the surface up to 1,9% at the depth of 100 cm. In the Chernozem under the arable land the organic carbon content in arable horizon is almost two times less. The maximum of hydrophobicity (78.1o) was observed at the depth of 5 cm under the forest. In the profile under the arable land the contact angle value at the same depth was 50o. The results of the structure analysis has shown a decrease in the content of agronomically valuable and water stable aggregates in the profile under arable land.

These data indicate the correlation between the wettability of soils with the content of organic matter and their influence on the formation of water stable structure, as well as the negative impact of tillage on the analyzed characteristics.