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INFLUENCE OF SOIL MINERALOGICAL COMPOSITION ON ORGANIC CARBON STABILIZATION

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The paper considers the influence of the mineralogical composition of sod-podzolic sandy loam soils on the stabilization of organic carbon in the soils. The profiles of the following soils were studied: profiles 1 (SSP), 2 (SSP1) – sod-strongly podzolic soil; profiles 3 (GSP), 4 (GSP1) – gley sod-podzolic soil; profile 5 (SSPSG) – sod-strongly podzolic surface-gley soil.

The content of total organic carbon and carbon associated with clay was determined by the Tyurin method. The clay fraction of the soil after exposing the samples to ultrasound was isolated by sedimentation followed by centrifugation. X-ray analysis was used to determine the qualitative composition of soil minerals of the clay fraction. The survey was carried out on a DRON-3M X-ray diffractometer (Cu Ka tube, 30 mA, 30 kV mode, from 3.5 to 75 degrees, goniometer rotation speed –1 degree per minute). As a result of the study, it was found that the upper horizon of SSP1 is characterized by the highest level of C_{org} ($p < 0.0001$) (37.23 g C kg^{-1}). A sharp drop in the C_{org} content (from 6 to 24 times) was noted in the A2B horizon of all profiles with its further decrease down the profile. The maximum amount of C_{clay} was found in the arable horizon of the GSP1 profile ($p < 0.002$) (92.27 g C kg^{-1}).

Due to the presence of large amount of reduced iron, which can easily react with the soil organic matter, the gley soil horizons were characterized by a greater ability to accumulate carbon in the clay fraction compared to the similar genetic horizons without signs of gleying. The maximum values of E_{soc} were recorded for horizons AB and B of the gley soils, where they were in the range of 6.7–53.3.

Quartz is the predominant mineral in the studied soils. It was more involved in the stabilization of organic compounds in the clay fraction. Owing to its structure, quartz retains particles of organic matter only on its surface, without forming close bonds with organic fragments, which leads to rapid mineralization of soil organic matter. It was also found that plagioclase had a positive effect on carbon sequestration in the clay fraction. Plagioclase refers to feldspars, which in a crushed state can acquire the same absorption capacity as clay minerals, and as a result they can form a close bond with organic colloids. Other minerals did not significantly affect the accumulation of carbon in the clay fraction of the studied soils.

Key words: carbon stabilization, mineralogical composition, sod-podzolic soils, clay fraction.