Molecular composition of thermal fractions of organic matter of typical chernozems under different land uses

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Chernozems are the most fertile soils in the world, so they are actively used in agriculture. The land use has a noticeable effect on the transformation processes of soil organic matter (SOM) and directly affects its molecular composition. Analytical pyrolysis is one of the methods for evaluating the composition of SOM. The aim of the study was to evaluate the molecular composition of thermal fractions of typical chernozems of different land uses. The objects of the study were typical chernozems of long-term field experiments of various land uses, including undisturbed variants, variants at the stage of restoring stocks of organic matter, as well as arable soils. Double shot pyrolysis with gas chromatography and mass spectrometry was used to evaluate the molecular composition.

Double shot pyrolysis of typical chernozems of different types of land use allowed us to divide the variants of chernozems according to the degree of transformation of the SOM. It is shown that the molecular composition of the thermolabile SOM of undisturbed variants of typical chernozems is characterized by a high proportion of lignin derivatives and long-chain alkanes, and for arable soils, short-chain alkanes, nitrogen-containing compounds, and some pyrolyzates of polysaccharides (furfural and methylfurfural). The molecular composition of the thermally stable SOM of chernozems is characterized by a high content of components of a cyclic structure, the largest proportion of which was observed for arable soils, acyclic hydrocarbons were characteristic of undisturbed soils.

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