Amphiphilic components of humic substances of Transbaikalia soils

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Humic substances (HS) are supramolecular systems of natural organic compounds with a high degree of structural heterogeneity, which determines their resistance to biodegradation. HS consist of aromatic rings and aliphatic chains and contain both polar groups and non-polar fragments, which gives them amphiphilicity, that is, the ability to exhibit both hydrophobic and hydrophilic properties [Milanovsky, 2000]. An integrated approach consisting in studying the composition and properties of HS using the method of liquid chromatography of hydrophobic interaction allows us to obtain valuable information on the structural and functional parameters of humic (HA) and fulvic acids (FA) of various genesis isolated from chernozem-permafrost soils and Transbaikalia Burozem.

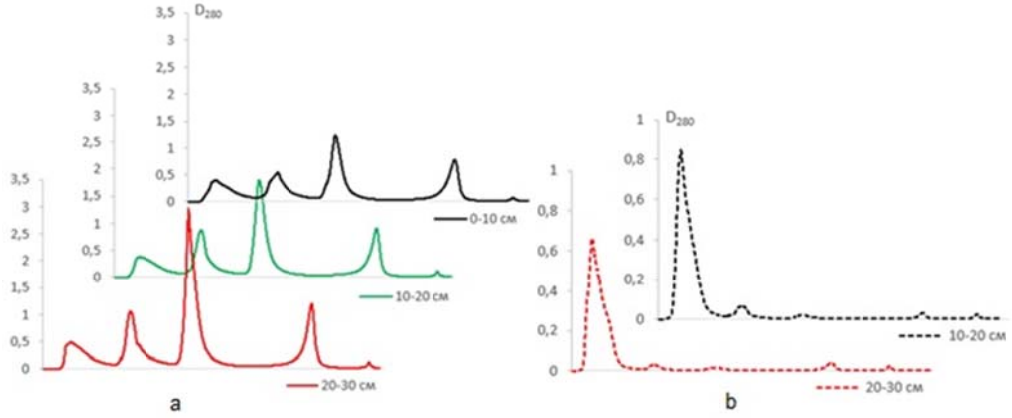

Figure 1. Chromatograms of humic (a) and fulvic acids (b) Meadow Chernozem permafrost soils.

Chromatographic analysis of the HS of soil genetic horizons (Fig. 1) showed the main patterns of differentiation of the amphiphilic components of HA and FA according to the profile. The composition of both HA and FA contains components with pronounced hydrophilic properties. In fulvic acids, the hydrophilic fraction is predominant and accounts for approximately 80–90% of the total area of the chromatogram. Hydrophilic components of HA make up 28–41% of the total area of chromatograms. HA of Burozem and meadow chernozem soil, respectively. The relative content of hydrophobic components in the composition of HS increases in the series: FC (Burozem) –FK (Meadow Chernozemic) –HC (Burozem) –HC (Meadow Chernozemic). The ability of humic acids to coagulate with calcium salts, their carbonization, degree of aromaticity, and other basic chemical and physico-chemical parameters changes in a similar way.

Due to the predominance of lateral radicals in their molecules, humic acids of Burozem have a higher hydrophilicity than HA from meadow chernozem soils, in whose molecules aromatic carbon networks predominate. Therefore, HA Burozem are prone to peptization, which is why their high resistance to electrolytes and mobility in the soil profile are related to that of meadow black-chernozem soil. Most likely, the more pronounced hydrophilic properties are in HV, the more these substances will be mobile in the soil profile, and to a greater extent, they will act as agents for acid hydrolysis of minerals and elute. Hydrophobic HSs, on the contrary, will be fixed at the place of formation, forming the accumulative characteristics of the profile. Apparently, this is the meaning and role of the amphiphilic property in the formation of the humus profile of soils.