

**Extraction and characterization of soil water-soluble humic substances**

Kulikova NA<sup>1</sup>, Perminova IV<sup>2\*</sup>

<sup>1</sup>Department of Soil Science, Lomonosov Moscow State University, Russia

<sup>2</sup>Department of Chemistry, Lomonosov Moscow State University, Russia

\*[iperm@org.chem.msu.ru](mailto:iperm@org.chem.msu.ru)

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Humic substances (HS) of soil solution seem to be poorly understood because of their low concentration in soil and labor-consuming extraction procedure. Water soluble HS (WSHS), however, supposed to be the most readily soluble part of soil humus what results in their high availability to biota and mobility in soil profile. The present study was aimed to extract WSHS from three samples of sod-podzolic soils and compare their properties with humic (HA) and fulvic acids (FA) extracted from the soils. Samples of WSHS were isolated from water extract of soils (soil:water 1:2 w/w) filtered through 0.45 µm membrane filter. To extract WSHS XAD-2 procedure was applied similarly to isolation of aquatic HS. Soil HA and FA were isolated by standard procedure using alkali extraction with 0.1 M NaOH followed by acidification pH 1-2 with 0.1 M HCl to separate HA and FA fractions. Obtained samples of WSHS, HA, and FA were desalted using dialysis, freeze-dried and characterized using elemental analysis, size-exclusion chromatography, and inductively coupled plasma mass spectrometry (ICP MS). It was shown that weight averaged molecular weight of studied HS varied in the range 6.3-7.9, 8.0-11.7, and 14.2-16.6 kD for WSHS, FA, and HA, respectively. According to molecular weight studied samples of HS could be put in the following ascending order: WSHS < FA < HA. Data of elemental composition demonstrated that WSHS were characterized with higher H/C and O/C ratios comparing with FA and HA. That finding indicated that WSHS were enriched in oxygen-containing functional groups and possessed high unsaturation level comparing soil HA and FA. ICP MS analysis revealed that WSHS contained significant amounts of silica. The latter indicated that WSHS in soil presented to a great extent as organo-mineral compounds. This research was supported by the Russian Foundation for Basic Research (#06-04-49017a) and Program of Interdisciplinary Science Projects of Lomonosov Moscow State University in 2007.