



## **Chemical structure and hydrophobic and hydrophilic properties of humic acids extracted from peat soil with different reagents**

V. Maryganova (1), L. Szajdak (2)

1. Institute for Problems of Natural Resources Use and Ecology, National Academy of Sciences of Belarus, F. Skorina Street 10, 220114 Minsk, Belarus  
(peatland@ns.ecology.ac.by)
2. Research Center for Agricultural and Forest Environment, Polish Academy of Science, ul. Bukowska 19, 60-809 Poznań, Poland (szajlech@man.poznan.pl / Fax: +48 61 8473668 / Phone: +48 61 8475601)

The aim of this study was to compare particularities of the chemical structure and hydrophobic and hydrophilic properties of humic acids (HAs) extracted from a peat soil on a reed peat with different reagents: 0.1 M NaOH, 0.1 M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> at pH 7, 0.1 M NaOH after extraction with 0.1 M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> at pH 7 and 0.1 M NaHCO<sub>3</sub>.

The chemical structure and molecular parameters of HAs were studied using wet-chemical, UV-VIS, <sup>13</sup>C NMR-spectroscopy and gel-chromatography. Hydrophobic and hydrophilic properties of HAs were investigated with the application of hydrophobic interaction chromatography (HIC) using hydrophobic gel Octyl-Sepharose 4 Fast Flow (Pharmacia, Sweden).

Reagents of different chemical nature extract from peat soil HAs with different chemical structure. The HA isolated with 0.1 M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> at pH 7 is characterized by the highest proportion of aromatic and carboxylic C, the lowest content of both alkyl and hetero-alkyl C, the most developed systems of polyconjugation, relatively low molecular weight, and presents the most chemically mature peat soil HA. The HA extracted with 0.1 M NaOH after extraction with 0.1 M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> at pH 7 is less chemically mature. It contains less amounts of aromatic and carboxylic C and more both alkyl and hetero-alkyl C, as well as less developed systems of polyconjugation. The HA isolated with 0.1 M NaHCO<sub>3</sub> can be regarded as the youngest fraction of peat soil HA (labile

HA). It is characterized by the lowest molecular weight, the lowest content of aromatic C and the highest proportion of carboxylic C, carbohydrates and amino acids, as well as the least dimensions of the polyconjugation systems in their molecules. The HA isolated with 0.1 M NaOH without pyrophosphate extraction is the most representative peat soil HA containing humic molecules of various molecular weight and chemical structure.

Using HIC, all the HAs were fractionated on 5 fractions with different hydrophobic and hydrophilic properties excepting the labile HA extracted with 0.1 M NaHCO<sub>3</sub>. It consists only of 3 fractions excluding two the most hydrophobic fractions. The content of the most hydrophilic components in it is nearly 60%. The most chemically mature peat soil HA extracted with 0.1 M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> at pH 7 contains 45-48% of hydrophilic components and 6-8% of the most hydrophobic compounds. For the less chemically mature peat soil HA extracted with 0.1 M NaOH after pyrophosphate extraction, the content of hydrophilic components are 2 times lower (23-25%) and the proportion of the most hydrophobic ones 3 times higher (18-24%). Fractions similar by their amphiphilic properties were found to have different chemical structure and physicochemical characteristics.