

EGU21-8456

<https://doi.org/10.5194/egusphere-egu21-8456>

EGU General Assembly 2021

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Selected properties of the humin fraction isolated from Chernozems and Phaeozems from various regions of Poland

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Humin fraction of soil organic matter is assigned to play an important role in carbon sequestration and sorption of xenobiotics. This study concerns the properties of humin (elemental composition, FTIR and SEM-EDS of humin ash) isolated from mollic horizons of eight Chernozems and Phaeozems, used as arable soils in various regions of Poland. Isolation procedure was described by Weber et al. (2021) in another abstract presented in this session. Investigated soils differed in the content of TOC, ranging from 13.3 to 41.7 g kg⁻¹, as well as texture from loam (Magnice, Pyrzyce) through silt loam (Trzebnik, Ciepłowody, Hrubieszów) and sandy clay loam (Psary) till clay (Ziemnice, Kętrzyn). They also differed in their pH values (from 5.64 to 7.71), and CEC (from 21.6 to 53.2 cmol(+)kg⁻¹). Ash content of humin varied between 22.89% - 54.50%, which is typical for humin originated from mineral soils (Stevenson 1994). This parameter was not correlated neither with the content of <0.002 mm fraction nor TOC content. SEM-EDS analyzes revealed that ash contained mainly Mg (3 - 14 weight%), Al (4 - 22 weight %) and Ti (10 - 25 weight%), depending on the area studied. The lowest pH as well as the highest TOC and CEC showed Trzebnik soil. Humin from this soil indicated the lowest content of carbon (30.84 %) and the highest values of H/C ratio, which point out to the higher aliphaticity of their molecules (Rice and MacCarthy 1991). High O/C ratio (0.91) calculated for humin from Trzebnik is common for more oxidized carbohydrate molecules and makes them similar to fulvic acids which are polysaccharidic in nature (Tan 2014). In contrast, the lowest TOC and CEC were determined in Ciepłowody soil. Humin molecules from this soil indicated the highest carbon content (43.12 %) and the lowest H/C ratio, what reflects the highest aromaticity among investigated samples. FTIR spectra confirmed results from elemental analysis and indicated that humin from Ciepłowody and Hrubieszów was the most aromatic among all analyzed soils.

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Acknowledgements

This work was supported by the National Science Center (NCN) Poland (project No 2018/31/B/ST10/00677 "Chemical and spectroscopic properties of soil humin fraction in relation to their mutual interaction with pesticides")