Geophysical Research Abstracts,
Vol. 11, EGU2009-3448, 2009
EGU General Assembly 2009

Impact of drainage on wettability of fen peat-moorsh soils

L. Szajdak (1), J. Szatyłowicz (2), and T. Brandyk (2)

(1) Research Centre for Agricultural and Forest Environment, Polish Academy of Sciences, Poznan, Poland, szajlech@man.poznan.pl, tel. +48 61 8475601, fax. +48 61 8473 668, (2) Department of Environmental Improvement, Warsaw University of Life Sciences - SGGW, ul. Nowoursynowska 159, 02-776 Warsaw, Poland, jan_szatylowicz@sggw.pl, tomasz_brandyk@sggw.pl

High water retention in peat is attributed to structural voids (macro-pores) due to the partial degradation of the structure of peat-forming plants, and molecular absorption sites (micro-pores) associated with the formation of humic substances. Water retention by the heterogeneously-structured system in peat organic matter depends on the chemical structure of solid surfaces. These naturally wet solids, if dried sufficiently, lose the ability to rewet quickly when immersed in water. The ability of peat surfaces to attract and hold water is attributed to hydrophilic functional groups which characterize the organic substances of peat. The investigations of chemical and physical properties were performed for three different peat-moorsh soils located in the Biebrza River Valley in Poland. All examined soils were used as meadow. Soil samples were taken from two depths: 5-10 cm (moorsh) and 50-80 cm (peat). Total organic carbon (TOC), dissolved organic carbon (DOC) and humic acids (HA) extracted from these samples were analysed. Also basic physical properties such as ash content and bulk density were measured. Wetting behavior of soils was quantified using water drop penetration time test (WDPT) and measured values of the soil-water contact angle using sessile drop method. The measurements were conducted on air-dry soil samples which volumetric moisture content was not exceeding 7%.

The significant differences in the concentrations of TOC, DOC and properties of HA between two investigated depth of among peat and moorsh samples were observed. The measured concentrations of total organic carbon in the considered soils ranged from 37.2 to 45.6%. Generally, the decrease of total organic carbon concentration with depth of profiles was observed. The contents of dissolved organic carbon in the soils ranged from 5.3 to 19.4%. The quantities of dissolved organic carbon decreased simultaneously with E_4/E_6 values and with the depth of the soil profiles. For the investigated peat's, an increase of the depth is accompanied by the decrease in the degree of humification or an increase in chemical maturity of HA. The measured values of the contact angle for investigated soils were in the range from 81.4˚ to 114.3˚ what indicates their high water repellency. The WDPT was positively correlated with total organic carbon, organic matter and humic acids content while ash content, soil bulk density, pH and absorbance were correlated negatively. The highest value of correlation coefficient (statistically significant) was obtained for relation between WDPT and ash content. The soil water contact angle was less correlated with peat-moorsh soil properties in comparison with WDPT with one exception pH. The pH against the contact angle indicates tendency of increasing the contact angle with decreasing pH.