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Impact of secondary transformation of peat moorsh soils on their physic-chemical properties

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A principal feature of organic matter of peat is its ability to absorb and retain large quantities of water. The relationship between soil structure and the ability of soil to stabilize soils organic matter is a key element in soil C dynamics. The long-term cultivation and agricultural use of peatlands has led to the number of factors including decrease of ground water level, changes of aerobic conditions, different plant communities, root exudates of cultivated plants as well as the products of the degradation of rest plant remains, which exhibit the sharp degradation and mineralization of peat. The drainage as a result of agricultural use of peatlands results in a sharp change of biotic and abiotic properties, which led to the degradation of peat organic matter. Considerable attention has been paid to the chemical composition and physical properties of peat, identifying the molecular characteristics of substances and aggregates most likely to hold water strongly.

Samples of peat moorsh soils were collected from Czarna Wieś, Otoczne and from place marked such as Kwatera 17. Samples represent two depths: 5-10 cm and 45-80 cm (the Biebrza National Park, North-East of Poland). Presently they are used as meadows.

Soils were sampled from 10 spots of each site. Samples were air dried and crushed to pass a 1 mm-mesh sieve. These 10 sub-samples were mixed for the reason of preparing a “mean sample”, which used for the potentiometric determination of pH (in H_2O and

in 1M KCl), and for the measurements of dissolved organic carbon (DOC) as well as total organic carbon (TOC). Isolation of humic acids was achieved using standard IHSS procedure.

The investigation has shown the impact of the kind of peat and the decomposition degree on the chemical properties of organic matter and the chemical structure of humic acids. The highest content of total organic carbon characterized reed-sedge moorsh with the decomposition degree H_5. Peats act in the direction of increase of total organic carbon and with decrease of dissolved organic carbon with increase of the depth. For all kinds of peats and increase of depth of sampling is connected with and increase of degree of condensation and aromatic polyconjugation and decrease of total organic carbon and an increase of dissolved organic carbon. For all kinds of peats, an increase in the depth is accompanied by the degree of humification or chemical maturity of humic acids.

Peat comprises relatively unstable substances, whose reactively contributes to its usefulness. The importance of humic substances and water management of peat is suggested by the fact that peat contains about 25-35% of humic acids. Organic matter of peat is characterized by colloidal behavior, and by irreversible loss of wettability, produced by drying. 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.

In order to determine soil water repellency the water drop penetration time test and wetting contact angle measurements were performed. The water drop penetration time test simply consists of placing a water drop on the soil surface and recording the time take for the water to penetrate the sample. The measurements were done on air dry soil samples. The wetting contact angle was measured using sessile drop method also on air dry soil samples. The obtained results show relatively good positive correlation between soil organic matter content and water drop penetration time.