Geophysical Research Abstracts,
Vol. 11, EGU2009-2287, 2009
EGU General Assembly 2009

Phenol oxidase activity in secondary transformed peat-moorsh soils

K. Styła and L. Szajdak

Research Center for Agricultural and Forest Environment, Polish Academy of Science, ul. Bukowska 19, 60-809 Poznań, Poland (styla.katarzyna@gmail.com / fax: +48 61 8473668 / phone: +48 61 8475601)

The chemical composition of peat depends on the geobotanical conditions of its formation and on the depth of sampling. The evolution of hydrogenic peat soils is closely related to the genesis of peat and to the changes in water conditions. Due to a number of factors including oscillation of ground water level, different redox potential, changes of aerobic conditions, different plant communities, and root exudes, and products of the degradation of plant remains, peat-moorsh soils may undergo a process of secondary transformation conditions (Sokolowska et al. 2005; Szajdak et al. 2007).

Phenol oxidase is one of the few enzymes able to degrade recalcitrant phenolic materials as lignin (Freeman et al. 2004). Phenol oxidase enzymes catalyze polyphenol oxidation in the presence of oxygen (O_2) by removing phenolic hydrogen or hydrogenes to from radicals or quinines. These products undergo nucleophilic addition reactions in the presence or absence of free - NH_2 group with the eventual production of humic acid-like polymers. The presence of phenol oxidase in soil environments is important in the formation of humic substances a desirable process because the carbon is stored in a stable form (Matocha et al. 2004).

The investigations were carried out on the transect of peatland 4.5 km long, located in the Agroecological Landscape Park host D. Chlapowski in Turew (40 km South-West of Poznań, West Polish Lowland). The sites of investigation were located along Wyskoć ditch. The following material was taken from four chosen sites marked as Zbechy, Bridge, Shelterbelt and Hirudo in two layers: cartel (0-50cm) and cattle (50-100cm).

The object of this study was to characterize the biochemical properties by the determination of the phenol oxidize activity in two layers of the four different peat-moors soils used as meadow.

The phenol oxidase activity was determined spectrophotometrically by measuring quinone formation at λ_{max}=525 nm with catechol as substrate by method of Perucci et al. (2000).

In peat the highest activities of phenol oxidase was observed in the combinations marked as Shelterbelt and whereas the lowest - in Zbechy, Bridge and Hirudo. Activities of this enzyme in peat ranged from 15.35 to 38.33 μmol h^{-1}g d.m soil. Increased activities of phenol oxidase have been recorded on the depth 50-100cm - catotelm (21.74-38.33 μmol h^{-1}g d.m soil) in comparison with the depth 0-50cm - acrotelm (15.35-28.32 μmol h^{-1}g d.m soil).

References

Freeman, C., Ostle N.J., Fener, N., Kang H. 2004. A regulatory role for phenol oxidase during decomposition in peatlands. Soil Biology and Biochemistry, 36, 1663-1667.

Matocha Ch.J., Haszler G.R., Grove J.H. 2004. Nitrogen fertilization suppresses soil phenol oxidase enzyme activity in no-tillage systems. Soil Science, 169/10, 708-714.

Perucci P., Casucci C., Dumontet S. 2000. An improved method to evaluate the o-diphenol oxidase activity of soil. Soil Biology and Biochemistry, 32, 1927-1933.

Sokolowska Z., Szajdak L., Matyka-Sarzyńska D. 2005. Impact of the degree of secondary transformation on amid-base properties of organic compounds in mucks. Geoderma, 127, 80-90.

Szajdak L., Szczepański M., Bogacz A. 2007. Impact of secondary transformation of peat-moorsh soils on the decrease of nitrogen and carbon compounds in ground water. Agronomy Research, 5/2, 189-200.