THE ROLE OF SOIL ENZYMES IN REDUCTION OF LOCAL CONTRIBUTION TO EUTROPHICATION OF SULEJOW WATER RESERVOIR IN AGRICULTURAL CATCHEMENT OF PILICA RIVER

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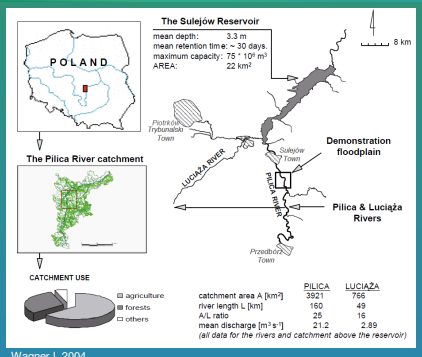
NON-POINT SOURCES

According to the data presented in HELCOM publication, over 60% of phosphorus and almost 70% of nitrogen load from area of Poland which catch the Baltic Sea is estimated to originate from diffuse (non-point) source pollution. Thus reduction of nutrient load from a catchment is one of the key challenges with regard to implementation of the Water Framework Directive.

ECOTONES



Wagner I. 2004

The formation of land-water ecotones has been proved to be an effective tool for reduction of the impact on freshwater ecosystem caused by nutrients from the landscapes (Schiemer et al. 1995). However, very often due to limited space in shoreline zone, buffer strips are insufficiently effective (Hufkens et al., 2008). It is crucial to create buffer strips on the border of land and water, which will pose biogeochemical barrier against incoming load of nutrients The goal of the project “Ecotones for reducing diffusion pollution” is an enhancement of ecotones zone in a agricultural catchement of Pilica river to reduce nitrogen and phosphorus fluxes to reservoirs towards achieving good ecological status, and reversing eutrophication of inland water and coastal zone.

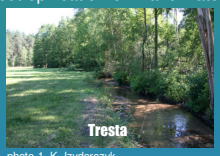
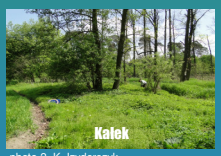


photo 1. K. Izydorczyk



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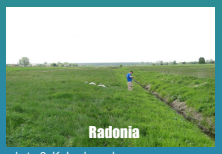
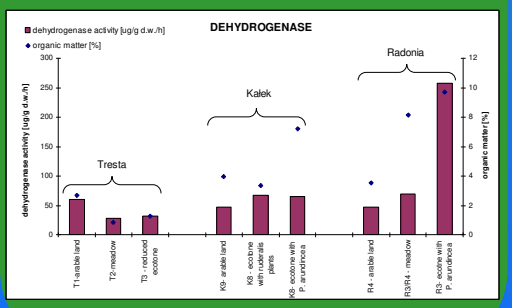


photo 3. K. Izydorczyk

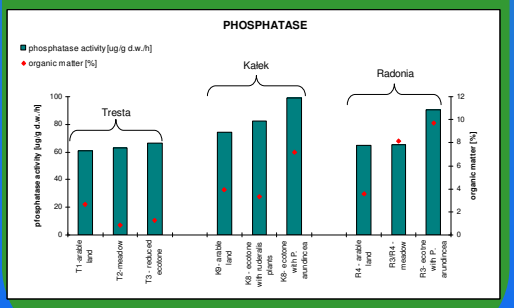
SOIL ENZYME ACTIVITY

Ecotones efficiency depends on many factors including activity of soil microorganisms which is linked to the soil enzyme activity (Klose & Tabatabai, 2000; Praveen-Kumar & Tarafdar, 2003). A part of undertaken activities involves measures of soil enzyme activity, therefore the aim of this part of study is to indicate the role of urease, phosphatase and dehydrogenase activity in soils under different vegetation communities that have their habitat in the Pilica River basin. The samples are collected from ecotones chosen all over the Pilica River basin.

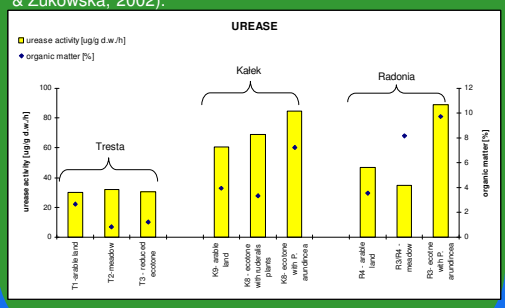
Dehydrogenase: activity of microorganisms commonly found in soil. The soil dehydrogenase activity is modified by the oxidation state of the soil (Pedrazzini & McKee, 1984].



Phosphatase: a good indicator of mineralization potential of phosphorus (Mocek- Płóciniak, 2010 in Dick & Tabatabai, 1993).



Urease: catalyzes hydrolisis of urea into CO_2 and ammonia (Mocek- Płóciniak, 2010). Used to control nitrogen fertilizing. Urease activity correlates with $N\text{-}NH_4$ content in soil (Bielińska & Żukowska, 2002).



- Plants play essential role in augmentation of soil enzyme activity (Kong et al. ,2009). Direct effect is based on excretion exogenous enzymes. Released exudates and oxygen can also enhance species and microbial diversity that results in increase of soil enzyme activity. Moreover, plants may reactivate free enzymes preserved by various chemicals (Neori 2000). The type of land use influnces soil enzyme activity. It was indicated that activity of analysed enzymes was lower in reduced ecotone (Tresta) than in fully formed one (Kałek and Radonia).
- Soil fertilization may increase soil microbial activity, plant productivity and simultaneously decrease the activity of some enzymes (Dąbek-Szreniawska et al. 2006). The case study determines lower enzymes activity of soil from arable land than from meadows and buffer zones .
- Many authors emphasise correlation between enzymes activity and organic matter content (Russel, 1974). The Present study confirms that relation (the Perason’s correlation coefficient): for dehydrogenase: 0,74; for urease: 0,64; for phosphatase: 0,62.

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