

The diversity of the microbial properties along natural forest succession in the soils of Bieszczady National Park (Poland)

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Natural forest succession is a process of encroach shrubs and trees on non-forest areas caused by socio-economic changes, especially after the Second World War. This process is observed in Europe often in case infrequently used pasture land, or land with a steep slope, poor soils or other difficult to access areas. In recent decades, the areas of valuable and high biodiversity semi-natural meadows in Polish Carpathians were decrease significantly. Researches of abandoned land use in mountains areas are rare and mainly focused on herbaceous vegetation. However, there is still a lack of interdisciplinary approach to the land use changes. These changes could affect soil properties especially, a microbial activity which is used as an indicator of the soil environment condition. The purpose of this study was to investigate the diversity of microbial properties in the different land covered soils from meadow via succession to forest.

The study area was located in Bieszczady National Park in south-eastern Poland. The samples were taken from two layers (0-10 cm and 10-20 cm) in the four transects each consisted of a meadow, a succession (covered by 30-60 years trees) and forest (more than 150 years old trees). To determine the microbial properties biomass carbon content and selected enzyme activity were measured. Additionally, selected chemical and physical soil properties were tested (pH, total organic carbon and total nitrogen content, sorption properties).

The investigated soils were strongly acid, pH_{KCl} ranged from 3.0 to 4.0. Microbial activity of investigated soils was varied by examine layer deepness and land use type. In uppermost layer (0-10 cm) microbial biomass carbon content (MBC) was significantly higher than in 10-20 cm layer. The 0-10 cm soil layer of meadows characterised the highest dehydrogenase activity (DHA), and invertase activity (AI) compared to successions and forests, 53.2 $\mu\text{gTPF}\cdot\text{g}^{-1}\text{soil}\cdot\text{h}^{-1}$ and 44.3 $\text{mgC6H12O6}\cdot\text{kg}^{-1}\text{h}^{-1}$, respectively. MBC was positively correlated with DHA, total organic carbon, total nitrogen content and the sum of exchangeable basics. DHA was positively correlated with pH, the sum of exchangeable basics and negatively with exchangeable acidity. Moreover, AI was positively correlated with total nitrogen content.

The diversity of microbial activity in the soils of Bieszczady National Park, along forest succession process is noticeable. Microbial properties, such as enzymes activity and microbial biomass carbon content are responding indicators of this changes.

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