



Impact of the cropping systems on nitrogen compounds in the soil

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Nitrogen in soils occurs as various inorganic and organic forms. Essentially, all of the nitrogen in the plough layer occurs mostly in organic combinations, ranges between 93 to 97%. The intensification of the agricultural production leads to simplification of agroecosystem structure and loss of humus. Indications of fundamental changes in ecosystem function include enhanced chemical leaching, blow-off, volatilization, erosion, frequent, floods and droughts, pest outbreaks etc. The objective of this study was to compare the impact of the cropping systems on the content of nitrogen compounds in the soils.

Soils originated from the long-term arable plots at the Experimental Station of the Institute of Soil Science and Plant Cultivation in Osiny near Puławy (51°25' N, 21°58' E). Soil sub-samples were collected in 2000 and 2001. The experiments were conducted on grey-brown podzolic soil, on a good wheat and very good rye complex with loamy sand, valuation class IIIA-IVA according to 1994 FAO. The experimental units include four types of cropping systems: ecological, conventional, integrated and continuous cropping. Every one of them is characterized by the direction of crop rotation and fertilization.

The content of total nitrogen in the soils was estimated by Kjeldahl method, ammonium and nitrate by distillation method. Within investigated soils from 19 to 21 bound amino acids in humic acids (HA) were identified and quantified using an automatic amino acids analyzer T339 Microtechna-Prague.

The transformation of bound amino acids in HA as well as the total nitrogen, concentration of ammonium and nitrate in the soil were related to the choice of the farming

systems. The highest concentration of bound amino acids (483-510 g·kg⁻¹), lysine (39.84-49.65 g·kg⁻¹), β -alanine (12.24-21.42 g·kg⁻¹) and the total nitrogen (874-899 mg·kg⁻¹) in soils was found in ecological and conventional systems than continuous cropping. Higher concentration of β -alanine and lysine in the soils under the conventional and ecological systems than under integrated and continuous cropping systems may indicate a higher microbial biomass and the increases of the rate of transformation the organic matter in these soils. Our investigations have shown that the highest yearly mean concentration of ammonium (21.3 mg·kg⁻¹) occurred in the conventional system and nitrate (9.0 mg·kg⁻¹) in the integrated system.

It was confirmed that the continuous cropping system decreased yearly mean content of total nitrogen as well as total amount of bound amino acids in HA. It follows from our experiments, that the ecological and conventional farming systems increased the content of the total amount of bound amino acids, lysine and β -alanine, representing the microbial biomass in the soils and the total nitrogen.