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Nitrogen utilization pathways of soil microorganisms

J. Pinggera (1), D. Geisseler (1), I. Merbach (2), and B. Ludwig (1)

(1) Department of Environmental Chemistry, University of Kassel, Nordbahnhofstr. 1a, 37213 Witzenhausen, Germany (pinggera@uni-kassel.de), (2) Centre for Environmental Research Leipzig-Halle, Theodor-Lieser-Straße 4, 06120 Halle

Nitrogen (N) is an essential nutrient for all organisms. In terrestrial ecosystems N occurs predominantly in the form of organic matter. Here, soil microorganisms can use two possible mechanisms for the uptake of organic N: the direct route and the mobilization-immobilization-turnover (MIT) route. In the direct route simple organic molecules are taken up directly into the cell. The deamination occurs inside the cell and only the surplus N is released into the soil solution. In the second route, the deamination occurs outside the cell and all N is mineralized before assimilation. To determine the importance of the different N uptake pathways of soil microorganisms an incubation experiment (21 days, 20°C) is currently being carried out. Corn leaves with different C to N ratios (20, 40) and (NH4)2SO4 have been added to three soils (Haplic Chernozem, FAO) with different fertilization histories (300dt/ha farmyard manure every second year, mineral NPK fertilizer, no fertilization) from the long-term experiment at Bad Lauchstädt. Contents of NH4+, NO_3- and microbial biomass C (Cmic) and N (Nmic), CO_2 production, potential protease activity, gross N mineralization and mineralization of added amino acids will be determined after 3, 7 and 21 days. Preliminary results show that the protease activity (without addition of corn residues) decreased in the order manure-fertilized soil (18.26 mg tyrosine kg-1 soil h-1) > Soil with mineral NPK fertilizer (17.45 mg tyrosine kg-1 soil h-1) > unfertilized soil (11.34 mg tyrosine kg-1 oven dry soil h-1). The turnover of amino acids after 24h was higher for the manure-fertilized soil (99.5% of the added amino acids were consumed) than for the NPK- fertilized and unfertilized soils (76%). The effects of the fertilization histories on the temporal dynamics of the different biological properties (Cmic, Nmic), CO_2 production, protease activity and N mineralization rates will be presented.