



Soil responses to nitrogen addition: Evidence from a natural grassland

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Abstract

Over the last century, anthropogenic reactive nitrogen flows surpassed natural turnover rates, significantly altering its biogeochemical cycle. Our study focuses on soil responses to nitrogen additions in a natural grassland from Neajlov catchment (Romanian LTSER site). We used plots of 2 m² for fertilization with NH₄NO₃ to simulate increased bioavailable nitrogen inputs of 0, 5 and 10 kg/ha/year which were fertilized during summer period. Topsoil samples were monthly collected and analyses were performed in triplicates. For each replicate, we measured pH, soil water and organic matter contents, along with enzymatic rates of nitrate reductase and urease. Inorganic nitrogen species were determined using spectrophotometric methods after extraction with KCl. We assessed the mineralization potential of soil microbial community via ammonium formation under hypoxic conditions. Study showed a slight acidification, more discernable for the highest nitrogen addition. We noted a temporal accumulation of both nitrate and ammonium, especially during fertilization period. As expected, enzymatic rates showed seasonal variation, but we documented lower rates as bioavailable nitrogen increased. We observed strong correlations between soil extracellular enzymes and substrates, which were clearer when warm and cold season were analyzed separately. Urease activity positively correlates with organic matter, R² values of 0.31 (warm season) and 0.41 (cold season), whereas R² for nitrate reductase and N-NO₃⁻ were 0.49 and 0.47 respectively. Our findings suggest that more subtle responses of nitrogen surplus are found at soil microbial community level and that a natural ecosystem is more able to absorb this type of pressure.

Biography:

Carmen Postolache is currently Dean of Faculty of Biology, Member of the University of Bucharest, Head of Research Platform in Biology and Systems Ecology, Member of the Institute of Ecology and Environmental Management. She has obtained PhD degree (1999) in Chemistry at the University of Bucharest. Since 1991, her research was focused on biogeochemical cycles of nutrients and heavy metals, ecotoxicology and water quality issues. In the last 20 years, she was a Member of 19 national projects and Principle Investigator for Romanian team in 8 international projects. She published more than 50 papers in international journals.