Geophysical Research Abstracts
Vol. 20, EGU2018-8580, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Earthworms, soil management and dissolved organic nitrogen

Miranda T. Prendergast-Miller (1), Ryan Carter (2), and Mark E. Hodson (1)

(1) Environment Department, University of York, York, United Kingdom , (2) Department of Biology, University of York, York, United Kingdom

Experimental grass-clover transects were established in arable fields to quantify the benefits of a ley rotation to soil health, such as building up soil carbon, increasing soil biodiversity and improving soil resilience. In contrast, arable transects were established in long-term grassland fields to determine how easily benefits built up during a ley phase are eroded by comparing conventional or minimum tillage systems. These experimental transects have been monitored since 2015 as part of the SoilBioHedge project in northern England (UK). Within two years, ley transects had boosted earthworm abundance and species diversity compared to the surrounding arable fields. In contrast, returning grassland to an arable system lowered earthworm numbers. However, use of minimum tillage had a less negative effect on earthworm populations, especially on anecic species like *Lumbricus terrestris*.

Results are presented from a laboratory mesocosm experiment which was conducted to quantify nitrogen (N) pools and transformation rates in soils with contrasting soil management, i.e. arable-to-ley conversion or ley-to-arable conversion using conventional or minimum tillage. We also collected soil from the arable fields and field margins. Earthworms are known to alter nutrient availability through their burrowing and feeding activities, therefore, we also had an earthworm treatment, using *L. terrestris* as a model species.

Our data indicates that dissolved organic nitrogen (DON) was the dominant N pool, making up 55% of the total N pool in soil or earthworm cast samples, with nitrate (NO_3^-) and ammonium (NH_4^+) making up 45% and $\sim$1% respectively. N pools formed a gradient of decreasing N availability: arable-to-ley conversion soils $>$ field margin soil $>$ ley-to-arable conversion soil $>$ arable soil, which reflects N status and land use history. The combined addition of earthworms and litter increased DON and NO_3^- compared to control, earthworm or litter treatments. Organic nitrogen mineralisation, nitrification and microbial respiration rates were higher in earthworm cast samples compared to soil samples. This highlights the importance of surface casts as hotspots for earthworm-microbial interactions driving organic and inorganic N availability in agricultural soils.