Geophysical Research Abstracts
Vol. 15, EGU2013-6179, 2013
EGU General Assembly 2013

The importance of plant-soil interactions for N mineralisation in different soil types

Conor Murphy (1,2,3), Eric Paterson (2), Elizabeth Baggs (1), Nicholas Morley (1), David Wall (3), and Rogier Schulte (3)

(1) University of Aberdeen, Soil Science, Aberdeen, United Kingdom (n.morley@abdn.ac.uk), (2) James Hutton Institute, Ecology, Aberdeen, United Kingdom (eric.paterson@hutton.ac.uk), (3) Teagasc, Environment, Soils and Land Use Research, Wexfod, Rep. Ireland (rogier.schulte@teagasc.ie)

The last hundred years has seen major advancements in our knowledge of nitrogen mineralisation in soil, but key drivers and controls remain poorly understood. Due to an increase in the global population there is a higher demand on food production. To accommodate this demand agriculture has increased its use of N based fertilizers, but these pose risks for water quality and GHG emissions as N can be lost through nitrate leaching, ammonia volatilization, and denitrification processes (Velthof, *et al*., 2009). Therefore, understanding the underlying processes that determine the soils ability to supply N to the plant is vital for effective optimisation of N-fertilisation with crop demand. Carbon rich compounds exuded from plant roots to the rhizosphere, which are utilized by the microbial biomass and support activities including nutrient transformations, may be a key unaccounted for driver of N mineralisation. The main aim of this study was to study the impact of root exudates on turnover of C and N in soil, as mediated by the microbial community. Two soil types, known to contrast in N-mineralisation capacity, were used to determine relationships between C inputs, organic matter mineralisation (priming effects) and N fluxes. ^{15}N and ^{13}C stable isotope approaches were used to quantify the importance of rhizosphere processes on C and N mineralisation. Gross nitrogen mineralisation was measured using ^{15}N pool dilution. Total soil CO_2 efflux was measured and ^{13}C isotope partitioning was applied to quantify SOM turnover and microbial biomass respiration. Also, ^{13}C was traced through the microbial biomass (chloroform fumigation) to separate pool-substitution effects (apparent priming) from altered microbial utilisation of soil organic matter (real priming effects). Addition of labile carbon resulted in an increase in N-mineralisation from soil organic matter in both soils. Concurrent with this there was an increase in microbial biomass size, indicating that labile C elicited real priming effects that mobilised N from organic matter. The results from this experiment indicate that rhizosphere processes play an important role in mediating rates of C and N mineralisation and should be accounted for in estimating soil N-supply capacities.

Velthof, G.L., Oudendag, D., Witzke, H.P., Asman, W.A.H., Klimont, Z., Oenema, O., 2009. Integrated assessment of nitrogen losses from agriculture in EU-27 using MITERRA-EUROPE. Journal of Environmental Quality 38, 402-417.