Abstract Book

Ecology of Soil Microorganisms

Microbes as Important Drivers of Soil Processes

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Short-term responses of soil microbial communities to N enrichment in a Mediterranean ecosystem.

Dias T (1), Chaves S (2), Tenreiro R (2), Carolino M (1), Martins-Loução MA (1), Sheppard L (3), Cruz C (1)

(2) Universidade de Lisboa, Faculdade de Ciências, Center for Biodiversity, Functional & Integrative Genomics (BioFIG). Campo Grande, 1749-016 Lisboa, Portugal
(3) Centre of Ecology and Hydrology (CEH), Bush Estate, Penicuik, EH26 0QB, United Kingdom

Nitrogen (N) enrichment is a key driver for biodiversity change. However, most of our understanding of effects is based on northern European and American ecosystems, Mediterranean ecosystems have been largely neglected, despite them being biodiversity hotspots for vascular plants. Here we report the short-term effects of an N-manipulation (both dose – 0, 40 and 80 kg N ha⁻¹ yr⁻¹ - and form – ammonium or ammonium nitrate) experiment on a severely nutrient-limited Mediterranean ecosystem. We examined the changes in soil microbial community diversity, especially that of nitrifying bacteria (AOB) and archaea (AOA) in relation to changes in soil enzymes and N availability. The soil was sampled in spring 2008 and 2009 (the second and third years following the first N addition). Microbial community structure was assessed with Temperature Gradient Gel Electrophoresis (TGGE) fingerprinting after DNA extraction from soil samples, universal primers defined for rRNA genes of bacteria, archaea and fungi and for amoA gene of ammonia oxidizing bacteria (AOB) and archaea (AOA) were used for PCR amplification. The resulting products were separated by TGGE. The resulting amplification products were separated by TGGE. Soil samples were also analyzed for moisture, nitrate, ammonium, total N, phosphate and nitrification potential.

Bacteria, archaea and fungi all responded to N enrichment and the year of sampling. Their response included changes in band composition and diversity, and were correlated with the availability of soil N, phosphate and nitrification potential. In the first year, bacterial band richness from fertilized plots was greater than from unfertilized plots. In year two soil bacterial band richness decreased in all treatments particularly those receiving ammonium nitrate. However, the diversity of soil AOB increased from one year to the next, especially in fertilized plots. In 2008, soil archaea were only detected in the fertilized plots. In 2009, soil archaea were detected in all treatments but their band diversity was highest in fertilized plots. The diversity of AOA followed the same pattern. In 2008, soil fungi were only detected in a few plots receiving 40 kg N ha⁻¹ yr⁻¹, while in 2009 soil fungi were detected in all treatments irrespective of the treatment. Diversity and composition of AOB and AOA could potentially be used to indicate N enrichment in Mediterranean maquis.