1.4 Soil microbial diversity and forest ecosystem functioning

M. Carnol*

Life Sciences, University of Liège, Institute of Plant Biology B22, Plant and Microbial Ecology, Bld du Rectorat 27, Sart Tilman, B-4000, Liège, Belgium. m.carnol@ulg.ac.be

The term "biodiversity" has been defined as "The variety of life in all its forms, levels and combinations,, with the concept including several scales (ecosystem diversity, species diversity, and genetic diversity) and processes related to ecosystem functioning (role in food webs, primary productivity, biogeochemical cycling)". Ecosystem diversity comprises plant, animal and microbial diversity. Whereas much research focuses on plant and animal diversity, complexity of interactions and methodological difficulties have so far limited research on microbial diversity. However, within the soils of forest ecosystems, microorganisms are responsible for key functions such as organic matter decomposition and mineralisation, in particular within the C and N cycles. These processes are closely linked to nutrient availability and therefore play an important role in stand productivity, tree health and ecosystem functioning. Within the attempts to use soil microbial communities as indicators of soil health, microorganisms and their functions have been classified according to their sensitivity to perturbations. Processes of mineralization, linked to soil productivity, were ranked with the highest priority. Because of the small number of organisms involved and their key role in nutrient cycling, nitrifying bacteria and the nitrification process were identified as very sensitive to environmental perturbation.

In this paper, I present an overview of ongoing studies investigating the link between the nitrification process and the diversity of ammonia-oxidisers, bacteria responsible for the first, rate-limiting step of the nitrification process. Ammonia-oxidiser community structure was investigated using a PCR-based approach targeting the 16S rRNA gene of beta-subgroup ammonia oxidisers, followed by DGGE (Denaturing Gradient Gel Electrophoresis) and sequence analysis. The analysis of community structure was combined with more traditional measurements of nitrate production and soil characteristics. Investigations included several Belgian forest ecosystems and the effects of environmental factors, such as liming and the effects of a 4-year exposure to elevated CO2.

1.5 Interactions between spatial forest structure in relation to activity and biodiversity of humus and to efficiency of bio-geochemistry of the horizon A11

M.-S.Duchiron*

Private consultant Forest-ecology and Forest-management, 15 rue de Guise, F-54000, Nancy, France marie.duchiron@wanadoo.fr

Seven forest-stands in North-West-Germany (Lower Saxony) have been analysed. They all have the same origin as pioneer-plantation of *Pinus sylvestris* on sandy soils of former heath without stagnant moisture. They differ from each other by their phase of evolution within the dynamic forest-cycle and it is possible to construct snapshots of the different stages at the same time for the vegetal dynamic and the forest-structure. So we have at present seven forest-stands of which the structure varies between monospecific regularity to multispecific irregularity. The transects and grids have been installed in each forest-stand and at each grid-point the lighting was measured with