

How Nitrogen Deposition is affecting the ability of Ectomycorrhizal fungi to degrade organic material (OM)

Background

Boreal and temperate forests are generally growth limited by nitrogen. Ectomycorrhizal (EM) fungi are adapted to these nutrient poor environments, providing N to plants, which in their turn provide the fungi with carbon, needed for growth. Ectomycorrhizal fungi colonize the roots of the majority of tree species of the boreal and temperate forests.

Over the last fifty-years, anthropogenic emissions, the use of nitrogen fertilizers and other human activities have increased both the availability and mobility of nitrogen over large regions of the earth, particularly the industrial countries. These changes have significant impacts on the nitrogen and carbon cycles, and the activity of organisms in terrestrial ecosystems.

There is an increasing awareness that high-throughput DNA sequencing and functional genomics could transform our understanding of many globally important biogeochemical processes including those of the C and N cycles. Thus genomics are capable of characterizing the biology of the involved organisms and the detailed mechanism of their activities. Molecular markers for these activities could be identified that could be used for studying how specific organisms and processes are affected by human induced changes of the environment like climate change and release of pollutants. Ultimately, information on the genomes and biology of microorganisms involved in C and N cycles could be used to developing novel biogeochemical processes and techniques to mitigate important environmental problems like C sequestration and bioremediation.

This PhD project aims at investigating how EM fungi in boreal forests are affected by increasing N deposition. The main aim is to investigate how the ability of EM-fungi to degrade organic matter changes with different N deposition regimes.

Understanding anthropogenic alteration of the degradability of organic material in forest soils might be of vast importance for understanding contemporary soil C- and N- sequestration- and cycles.

The Project

I am collecting EM material from the field as well as conducting lab experiments. I am searching for patterns in (1) EM fungal communities and in (2) functional genes involved in degradation of organic material that are correlated to inorganic N deposition/addition.

Furthermore I investigate how N is stored in EM fungi using MS-GC (amino acid analysis) and polyacrylamide electrophoresis (SDS-page) (protein analysis).