Poster presentation at Ecology of Microorganisms, Prague, Czech Republic, Nov 29 – Dec 3, 2015

**Title:** Organic N decomposition by fungal community under fertilized spruce forest

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Nitrogen fertilization in boreal and northern temperate forests diminishes the allocation of photosynthate C to the roots and reduces the growth of ectomycorrhizal fungi. Furthermore, the N addition in these ecosystems may lead to a reduced exploitation of the soil organic N by both plants and microorganism. In this study, we examined the organic material from mesh bags with maize compost placed in control and fertilized soils after colonization of fungal communities using infrared and near-edge X-ray absorption fine structure (NEXAFS) spectroscopies.

These mesh bags were filled with 70 g quartz sand particles and 2% (d.w.) of composted maize materials and placed in a Norway spruce forest at Tönnersjöheden research park (southern Sweden). In this experimental site, three plots (30-40 m by 25 m) were amended with 200 kg N ha-1 in form of NH4NO3 and three were used as control. Six bags per plot were placed vertically along the soil profile to cover the humus layer and the upper part of the mineral soil. The mesh size of the bags (50 µm) allowed fungal hyphae to grow inside the bags but excluded the roots. The bags were collected after 17 months and the content was separated into one portion corresponding to the mineral layer and another one corresponding to the mineral soil part.

The diminution of total C and N content in the mesh bags from the mineral soil layer indicated a stronger modification of the organic material compared to the humus layer. The infrared spectroscopy showed that the dissolved organic matter of the mesh bags from the mineral layer in the fertilized soils had higher amidic compounds in comparison to that in the control soils, while the humus layer did not show significant differences between treatments. A further analysis of the mesh bag content from the mineral layer using NEXAFS spectroscopy showed that its organic material had been oxidized regardless of the N fertilization treatment and that a selective decrease of the peaks corresponding to amino acids and heterocyclic N had occurred in that from the control plots.

These results suggest that the decline of soil organic N species in the mesh bags from control plots was probably an effect of uptake and transport of N to the trees by the ectomycorrhizal fungi colonizing the bags. This effect diminishes when the forest is fertilized since the demand for N declines. Therefore, N fertilization may then be an important factor controlling decomposition of the organic N in forest soils.