Saprotrophy of ectomycorrhizal fungi and interactions with decomposers

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ABSTRACT BOOK

S.04-14-P

Soil organic carbon under Miscanthus - Assessing the impacts of land-use change from grassland to a perennial bioenergy crop.

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The use of biomass for energy production is considered a promising way to reduce net carbon emissions and mitigate climate change. However, the introduction of bioenergy crops can have a substantial impact on the ecosystem services provided by the land-use they replace. In Ireland the introduction of the perennial grass Miscanthus x giganteus has recently been subsidised by the government. It offers a high soil carbon sequestration potential with measurements on experimental plots as well as modelling showing carbon sequestration rates between 0.13 and 3.2 Mg ha-1 yr-1. However, in Ireland it is likely to replace permanent grasslands which are also considered carbon sinks, with average carbon sequestration potentials between 0.33 and 0.52 Mg ha-1 yr-1. Furthermore the plantation of Miscanthus on grasslands requires ploughing, leading to an additional soil carbon loss due to disturbance. In this study soil carbon sequestration by Miscanthus planted on grassland as well as the potential loss of soil organic carbon due to plantation were measured on eight commercial farms in SE Ireland. A direct comparison between the 2 to 3 year old Miscanthus fields and adjacent grasslands showed no significant difference in soil organic carbon contents, indicating no major loss due to planting. Furthermore, an average soil carbon sequestration rate of 0.9 ±0.53 Mg ha-1 yr-1 was measured. The results suggest that land-use change from grasslands to Miscanthus has no negative effects on soil organic carbon contents, the potential to improve soil carbon sequestration when replacing grasslands.

S.05- The role of ectomycorrhizal communities in carbon cycling: New perspectives and emerging concepts

S.05-01-O

Saprotrophy of ECM fungi and interactions with decomposers.

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In temperate forests, fungi play a central role in the circulation of carbon and nutrients through the ecosystem. Saprotrophic fungi are the main decomposers of wood and litter and obtain energy by degrading dead organic matter. However, even if ectomycorrhizal (ECM) fungi obtain energy mainly as photoassimilates provided by symbiotically associated plants, they are also able, as saprotrophic fungi, to mobilize nutrients from organic matter. Since many years, studies clearly demonstrate that ECM fungi posses many of the genes (i.e. laccases, classII peroxidases) shared with their more recent saprophytic common ancestors. ECM fungi could shift between their biotrophic or their saprotrophic behaviour depending on their carbon demand and on the host carbon availability. This discovery is interesting and can potentially shift paradigms in our understanding of mycorrhizal interactions. The previous distinction between ECM and saprotrophic fungi is artificial and now, we should consider that ECM fungi occur along a biotrophy-saprotrophy continuum. This capability is of interest in microbial ecology to understand the role and the contribution of ECM communities in re-circulating carbon, nitrogen and phosphorus from organic matter in forest soils. In this respect, I present here (i) recent advances in our knowledge on the saprotrophic capabilities of ECM fungi, (ii) some strategies which could be applied to address these features in ECM communities in field experiments, and (iii) how ECM and saprotrophic fungi could interact in the recycling of nutrients from organic matter.