Geophysical Research Abstracts
Vol. 19, EGU2017-15767, 2017
EGU General Assembly 2017

Nutrient availability controls the decomposition activities of the ectomycorrhizal fungi *Paxillus involutus* and *Laccaria bicolor*

César Nicolás (1), Tomas Martin-Bertelsen (2), Johan Bentzer (1), Tomas Johansson (1), Mark Smits (3), Carl Troein (2), Per Persson (4), and Anders Tunlid (1)

(1) Microbial Ecology Group, Lund University, Biology, MEMEG, Lund, Sweden (cesar_nicolas.cuevas@biol.lu.se), (2) Computational Biology and Biological Physics, Department of Astronomy and Theoretical Physic, Lund University, Lund, Sweden, (3) Centre for Environmental Sciences, Research Group Environmental Biology, Hasselt University, Diepenbeek, Belgium, (4) Centre for Environmental and Climate Research & Department of Biology, Lund University, Lund, Sweden.

Ectomycorrhizal (ECM) fungi play an important role in the ecological sustainability of northern temperate and boreal forests by foraging and mining soil organic matter for nutrients to their host plants. In this process, the fungal partner provides the plant host with nutrients and receives in return carbon, which supports the growth of extramatrical mycelium. Here, we examine the chemical changes in the soil organic matter (SOM) and physiological response of two species of ECM fungi *Paxillus involutus* and *Laccaria bicolor* during the decomposition of SOM and utilization of glucose.

These two ECM fungi were grown in axenic cultures containing a water extract of organic matter (WEOM), which was supplemented with glucose at the start of the experiment. The fungi then went through two phases: a decomposition phase characterized by a WEOM with glucose followed by a starvation phase, with no glucose left in the media. The chemical modifications in the WEOM were followed using techniques such as infrared and X-ray absorption spectroscopy, while the fungal physiological response was studied using transcriptomic (RNAseq) analysis.

The spectroscopic techniques showed that both fungi enhanced the amount of oxidized compounds while uptaking glucose or nitrogen from the media. In case of *P. involutus*, this oxidation process was more pronounced than that occurring with *L. bicolor*. In addition, the X-ray absorption spectroscopy showed a higher reduced iron content in WEOM incubated with *P. involutus* in comparison to *L. bicolor*, which may suggest the preference of *P. involutus* for oxidative mechanisms via Fenton chemistry.

During the decomposition phase, both fungi expressed a large number of transcripts encoding proteins associated with oxidation of lignocellulose in wood decomposing fungi. In parallel, the expression levels of extracellular peptidases, and enzymes involved in the metabolism of amino acids and assimilated glucose were regulated. However, during prolonged starvation, transcripts encoding extracellular enzymes such as peptidases and laccases were up-regulated concomitantly with transporters and metabolic enzymes, which suggest that some of the released cellular material were re-assimilated by the mycelium.

These results show the concomitant changes in gene expression of EMF and in nutrient availability in the WEOM and reveal the combination of transcriptomic and spectroscopic techniques as a useful tool to better understand the decomposition process in soil.