

Distribution and localization of hyphae on natural lignocellulose samples

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Renewable products derived from plant biomass are an important field of biotechnological research and applications. The recalcitrant and heterogenic nature of lignocellulose makes its deconstruction and fractionation to be the principal bottleneck for further utilization. In nature, plant cell-wall degrading filamentous fungi are able to decompose and assimilate the recalcitrant lignocellulose components by releasing into the environment a complex set of carbohydrate acting enzymes [1]. In this context, the ERC-COG OXIDISE project focuses on the role of fungal extracellular enzymes from the brown-rot *Fomitopsis pinicola* and white-rot *Phanerochaete chrysosporium* as biocatalysts for lignocellulose depolymerisation and intends to determine their distribution and their interaction in natural lignocellulosic samples. In the present study we investigate the detection of poplar wood colonization by brown-rot and white-rot hyphae and the ultrastructural changes experimented during the decay process [2]. Freshly cut wood blocks were debarked and heat treated to inactivate possible endogenous bacteria or fungi. Subsequently, the wood blocks were inoculated with a mycelium plug and incubated for specific periods of time at 30°C and different relative humidity values. Finally, wood blocks were sectioned and stained to visualize the hyphae distribution and interaction within the wood structure. Preliminary results confirm that the degradation initiates at the innermost cell wall layers and spread towards the adjacent cell walls and the middle lamella. A combination of fluorescence labeling techniques and RAMAN microscopy will be further employed to investigate the changes in the cell walls induced by fungal extracellular enzymes.

[1] Cragg, S. M. et al. (2015) Lignocellulose degradation mechanisms across the tree of life. *Curr. Opin. Chem. Biol.* 29:108–119.

[2] Daniel, Geoffrey. (2016). Secondary Xylem Biology; Origins, Functions, and Applications. Chapter 8: Fungal Degradation of Wood Cell Walls *Elsevier Inc.* 8:131-167.