An Ultrastructural Observation of White Rot Fungus

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White rot fungi are a type of fungus which digests the dying wood of trees causing it to rot. These are lignicolous fungi and grow on the wood permeating its fibrous structure and causing decay. Oyster and shiitake mushrooms are two of the common white rot fungus which are grown as a sources for food[5].

Phanerochaete chrysosporium is also one of the species of white-rot fungus. This type of fungi causes the breakdown of the wood which allow nutrients to the soil. Phanerochaete chrysosporium, because it produces enzymes needed to break down lignin and other complex organic molecules, have been investigated of use in mycoremediation applications [4]. Phanerochaete chrysosporium have a specialized ability to degrade lignin in wood while leaving the white cellulose[3]. As a result, the wood changes texture becoming moist, soft, spongy, or stringy. Its color becomes white or yellow. Instead of the more familiar mushroom structure, these fungi form flat fused reproductive fruiting bodies consisting of hyphae and spores. The hyphae network has some branching, with diameters ranging from 3-9 μm. At the ends of the hyphae are chlamydospores, thick-walled spores varying from 50-60μm[1,2].

Hyphae consist of one or more cells surrounded by a tubular cell wall. These hyphae are divided into cells by internal cross-walls called septa. Septum are perforated by pores large enough for organelles to flow between cells and are flanked on both sides by parenthosomes. Parenthosomes are electron dense arched organelles flanking both sides of the pores. The spores of these fungi are thick walled cells containing various organelles including lipid containing organelles.

For this study a fallen branch from a redwood tree was found. It appeared the wood had turned white and was soft and spongy. A small portion of the affected wood was removed and prepared for TEM using standard bench protocols. Sections were cut on a Leica UC7 ultramicrotome using a Diatome diamond knife, picked up on copper grids and post stained with uranyl acetate and lead citrate. The sections were viewed on an FEI Talos 120C TEM and images were acquired using the FEI Ceta CMOS camera.

Observations in the TEM exhibit cell walls of the wood disrupted and compromised. Numerous hyphae cells are seen, many containing septa perforated with pores. Parenthosome fragments are seen in many of the hyphae. Spores are visualized as dense, thick walled round or odd shaped cells whose dense cytoplasm has lipid containing organelles.

[1] Burdsall, H Mycologia Memoir 10 (1985), 61-63
[2] Nakasone, K, Mycologia Memoir 15 (1990), 224-225
[3] Burdsall, H, Mycotaxon 1 (1974) 124
[4] Cohen, R. *et al* Applied Microbiology and Biotechnology (2002). 58 (5): 582–94
[5] Vane, C. H., *et al* Journal of Agricultural and Food Chemistry 51(4) (2003) 947–956.

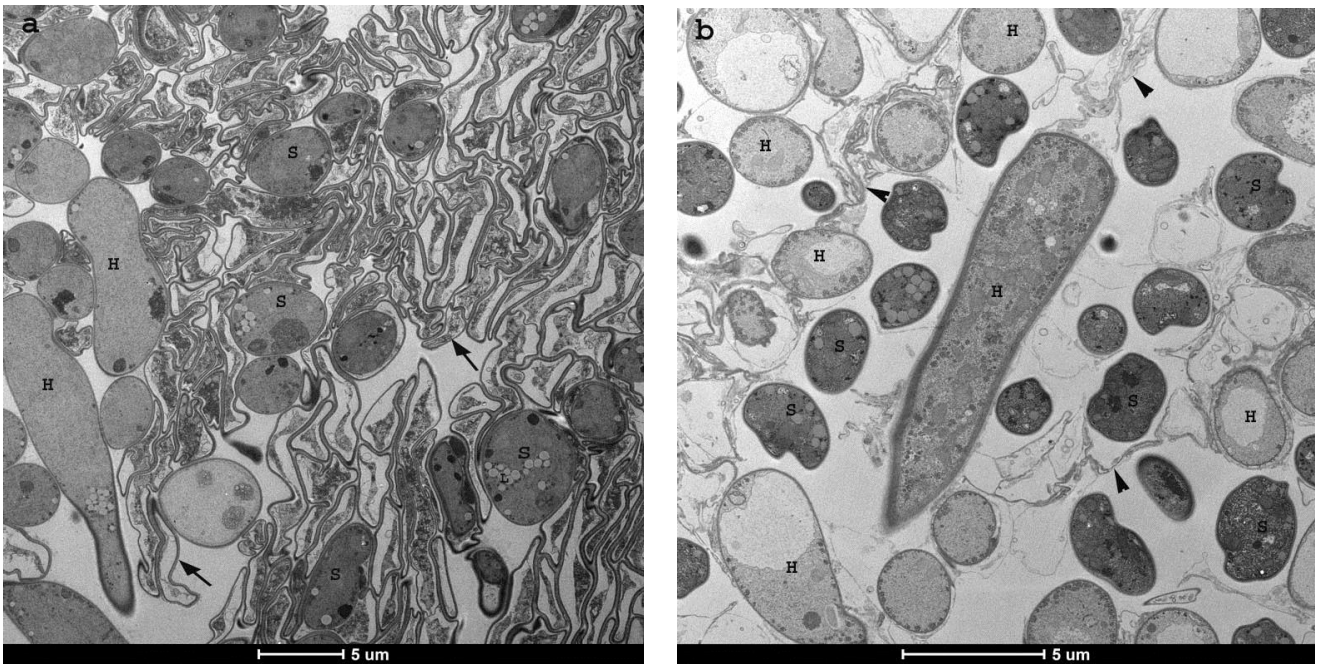

Figure 1. a) The disruption of the wood's cell wall (arrow heads) is evident showing numerous hyphae (H) and spores (S). b) Hyphae (H) and spores (S) at a higher magnification. Lipid containing organelles (L) and noted.

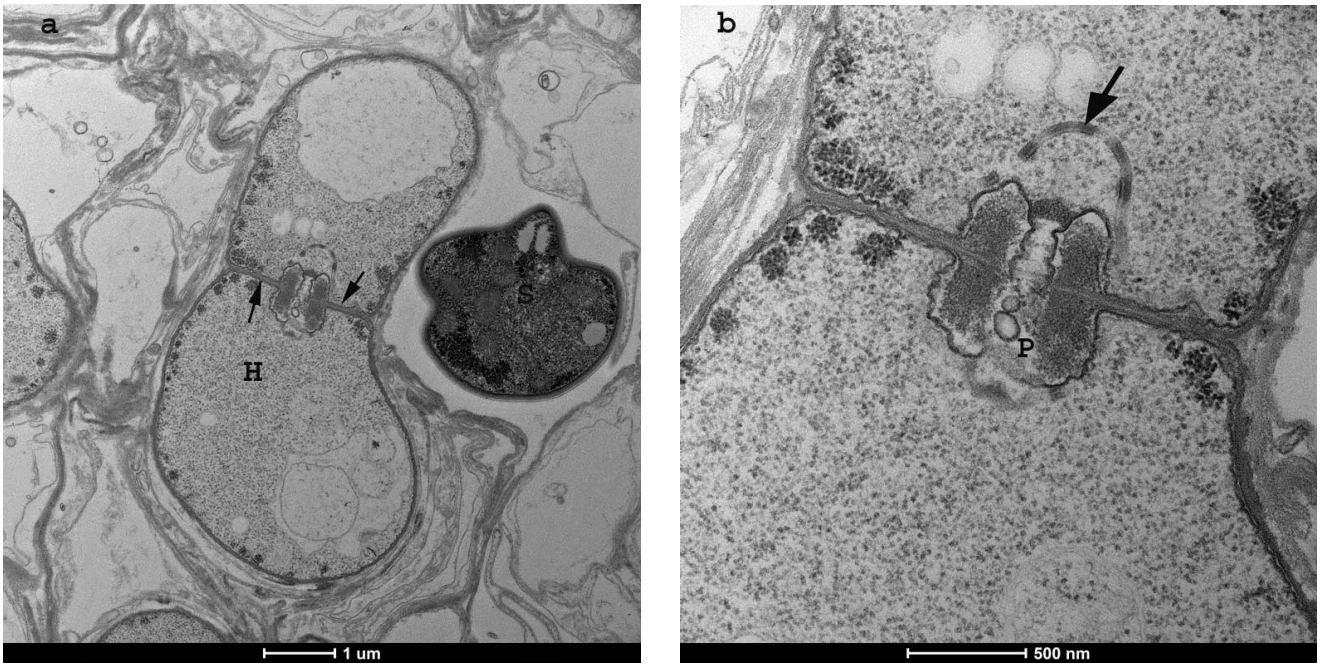

Figure 2. a) Hyphae (H) septum (arrows) and irregularly shaped spore (S). Note lack of visible organelles in hyphae. b) Higher magnification of b showing a definite pore (P) formed in the septum. One side of the parenthosome is evident (arrow).