Microscopy of progressive decay of fungi isolated from meranti tree canker

by Erwin Erwin

Submission date: 09-Apr-2023 01:02AM (UTC+0700)
Submission ID: 2059097508
File name: rogressive_decay_of_fungi_isolated_from_meranti_tree_canker.pdf (168.35K)
Word count: 777
Character count: 4109

Microscopy of progressive decay of fungi isolated from meranti tree canker

E. Erwin{ XE "Erwin, E." }[A], Won-Joung Hwang[B], Shuhei Takemoto[C] and Yuji Imamura[D]
[A]Forestry Faculty, University of Mulawarman, Jln. Ki Hajar Dewantara No.1, Samarinda 75123, Indonesia
[B]Institute of Wood Technology, Akita Prefectural University, 11-1 Kaieizaka, Noshiro, Akita 016-0876, Japan
[C]Plant Pathology Research Team, National Institute of Fruit Tree Science, Tsukuba, Ibaraki 305-8605, Japan
[D]Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Uji, Kyoto 611–0011, Japan

INTRODUCTION

White rot basidiomycetes are especially important in the forest ecosystem because they are the only fungi capable of degrading all cell wall components (cellulose, lignin, hemicelluloses) of wood. Micromorphological aspects of two main types of white rot, selective delignification and simultaneous rot, have been distinguished [1]. Light red meranti (*Shorea smithiana*) and yellow meranti (*Shorea gibossa*) trees which growing in one area of natural dipterocaprs in Kalimantan, Indonesia inhabited by white-rot fungi, *Schizophyllum commune* [2] and *Phlebia brevispora* [3], respectively. It is of interest that *S. commune* and *P. brevispora* in the decayed wood of standing *S. smithiana* and *S. gibbosa* and have been causing simultaneous decay.

This study was performed to confirm their progressive decay patterns in artificial laboratory conditions (*in vitro*).

MATERIALS AND METHODS

Fungal strain and decay test procedure. The decay fungi isolated from decayed wood of *S. smithiana* and *S. gibbosa* cankerous trees, were genetically identified by their ITS sequence as *Schizophyllum commune* [2] and *Phlebia brevispora* [3], respectively. Twelve sound wood-blocks (20 x 20 mm in cross-section x 10 mm in length) obtained from the uninfected portions of the stem disks were inoculated with the identified fungi, and incubated in accordance with the JIS K 1571 soil-block test procedure [4].

Microscopic observations. Various stages of the decay wood were examined using light and scanning electron microcopy. Six exposure times were analyzed: 2, 4, 6, 8, 10 and 12 weeks.

RESULTS

After 12 weeks of exposure in the laboratory decay test, wood blocks of *S. smithiana* that had been inoculated with *S. commune* fungus sustained an average weight loss of 1.82%, whereas *P. breviospora* decayed *S. gibbosa* wood more aggressively than *S. commune* (Table 1).

Table 1. Weight loss in *S. smithiana* and *S. gibbosa* wood infected with *S. commune* and *P. brevispora*, respectively.

Incubation period (weeks)	Weight loss percentage (Mean±SE)	
	S. smithiana	*S. gibbosa*
2	0.42 ± 0.32	0.91 ± 0.10
4	0.50 ± 0.44	2.24 ± 0.60
6	0.54 ± 0.50	5.02 ± 1.03
8	0.60 ± 0.62	8.23 ± 1.22
10	0.80 ± 0.40	11.80 ± 5.15
12	1.82 ± 0.40	12.34 ± 2.76

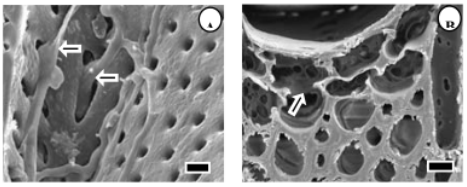

Figure 1. Decay wood caused by fungus for 12 weeks incubation. (A) Hyphal branches of *S. commune* fungus passed through pits in vessels of *S. smithiana* (arrows). *Bar* 5 μm; (B) Erosion channels in parenchyma cells adjacent to infected vessels of *S. gibbosa* (arrow). *Bar* 10 μm.

DISCUSSION

Slight erosion of wood cell walls in *S. smithiana* over 12 weeks' incubation was classified as the early stage of simultaneous decay, and showed a similar pattern to that observed in naturally decayed wood samples.

P. brevispora reduced *S. gibbosa* wood weight by 0.91–12.34% and produced progressive simultaneous decay over 2–12 weeks' incubation *in vitro*. The first 6 weeks of incubation was classified as the early stages decay, in which pit erosion and slight erosion of cell walls facilitated hyphal between cells. Numerous and conspicuous holes as well as erosion troughs in cell walls, which were found at the end of 8 weeks' incubation, showed that an intermediate stage of decay had occurred. Furthermore, complete degradation of wood cell components, termed the advanced stage of decay, was found in some areas of wood blocks after 12 week's incubation.

REFERENCES

1. Blanchette RA (1984) Screening wood decayed by white-rot fungi for preferential lignin degradation. Appl Environ Microbiol 48:647–653
2. Erwin, Takemoto S, Hwang WJ, Takeuchi M, Itoh T, Imamura Y (2008) Anatomical characterization of decayed wood in standing light red meranti and identification of the fungi isolated from the decayed area. Journal of Wood Science 5:233–241
3. Erwin, Hwang WJ, Takemoto S and Imamura, Y (2007) Micromorphological changes of wood and decay fungi in yellow meranti (*Shorea gibossa*) stem canker. 57th Annual Meeting of the Japan Wood Research Society. Hiroshima, August 8–10.
4. JIS K 1571 (2004) Test methods for determining the effectiveness of wood preservatives and their performance requirements. Japanese Industrial Standard (JIS), Japanese Standards Association, Tokyo.

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