Sustainable Production and Effective Utilization of Tropical Forest Resources
Proceedings of the 5th International Wood Science Symposium JSPS-IPI Core University Program in the Field of Wood Science

September 17-19, 2004
Kyoto University
Clock Tower Centennial Hall
Kyoto, Japan

Research Institute for Sustainable Humanosphere, Kyoto University RISH
Indonesian Institute of Sciences LIPI
Japan Society for the Promotion of Science JSPS
Subcellular localization of isocitrate lyase in the wood-destroying basidiomycete Fomitopsis palustris

Shunsuke Sakai¹, Tatsunori Nishide¹, Erman Munir², Takefumi Hattori¹, Kei'ichi Baba¹, Hiroshi Inui³, Yoshihisa Nakano⁴ and Mikio Shimada¹

¹Laboratory of Metabolic Science of Forest Plants and Microorganisms, Research Institute for Sustainable Humanosphere, Kyoto University, Uji, Kyoto 611-0011, Japan
²Faculty of Mathematics and Natural Sciences, University of North Sumatra, Jl. Bioteknologi No.1 Kampus USU, Medan 20513, Indonesia
³Laboratory of Biomass Morphogenesis and Information, Research Institute for Sustainable Humanosphere, Kyoto University, Uji, Kyoto 611-0011, Japan
⁴Department of Applied Biological Chemistry, University of Osaka Prefecture, Sakai, Osaka 599-8231, Japan

Introduction
Oxalate biosynthesis in wood-destroying fungi, including Fomitopsis palustris, has been receiving much attention, because the acid is closely associated with wood decay processes and inactivation of copper-containing wood preservatives [1,2]. Recently, Erman et al. have reported a new physiological role of oxalate biosynthesis that is metabolically linked to both the glyoxylate (GLOX) and TCA cycles in F. palustris; this fungus acquires biochemical energy by use of this bi-cycles system coordinating with the oxalate biosynthesis during glucose oxidation [3,4]. Especially, isocitrate lyase (ICL), the key enzyme of GLOX cycle, has been revealed to be a pivotal enzyme in the metabolic system for the fungal vegetative growth [3].

This study aims to clarify the subcellular localization of the key enzyme for the oxalate biosynthesis of F. palustris. This investigation will contribute to elucidation of the carbon flux and its transportation system related to the oxalate biosynthesis in wood-destroying fungi.

Results and Discussion
We conducted subcellular fractionation of mycelial homogenate of F. palustris by sucrose density gradient centrifugation. Both activities of ICL and malate synthase (MS), the key enzymes of GLOX cycle, were detected in the fraction containing the peroxisomal marker enzyme catalase, but not in the mitochondrial fraction identified by the mitochondrial marker enzyme succinate dehydrogenase. Furthermore, immunoelectron microscopy showed that gold particles with antigenic sites of ICL were present mainly in the peroxisomes.

These results clearly indicate that both ICL and MS are peroxisomal enzymes in F. palustris mycelia.

References