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Citation	Sustainable humanosphere : bulletin of Research Institute for Sustainable Humanosphere Kyoto University (2013), 8: 31-31
Issue Date	2013-02-01
URL	http://hdl.handle.net/2433/182593
Right	
Type	Departmental Bulletin Paper
Textversion	publisher

ABSTRACTS (MASTER THESIS)

Effects of copper on oxalate biosynthesis in the brown-rot fungus *Fomitopsis palustris*

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Wood-rotting basidiomycetes cause severe damage on wooden structures. To protect the wooden structures from the wood-rotting fungi, copper-containing wood preservatives have been used. However, many species of wood-rotting brown-rot fungi can degrade even the wood materials treated with the copper-containing preservatives, by which these wood-rotting fungi are called copper-tolerant fungi. The copper-tolerant ability has been recognized as being associated primarily with oxalic acid excretion, in which oxalic acid produced by copper-tolerant fungi reacts with copper in wood to form insoluble, bio-unavailable inert forms.

From a viewpoint of wood protection from the fungal degradation, the copper-tolerance of these wood-rotting fungi should be diminished. At the same time, the copper-tolerant wood-rotting fungi are promising to be used for bioremediation of wastes of woods treated with copper-containing preservatives [1]. Therefore, it is important to elucidate effects of copper on oxalate biosynthesis to develop bioremediation of copper from wood waste containing wood preservatives including copper.

Brown-rot fungus *Fomitopsis palustris* possesses two metabolic pathways for oxalate biosynthesis: one is hydrolysis of oxaloacetate catalyzed by oxaloacetate acetylhydrolase (*Fomitopsis palustris* oxaloacetate acetylhydrolase, FpOAH) in cytosol and the other is dehydrogenation of glyoxylate catalyzed by cytochrome *c* dependent glyoxylate dehydrogenase (*Fomitopsis palustris* glyoxylate dehydrogenase, FpGLOXDH) in peroxisome [2-4].

This author investigated effects of Cu^{2+} on oxalate biosynthesis including expressions of *FpOAH* and *FpGLOXDH*. In the absence of Cu^{2+}, amounts of *FpOAH* transcripts were 22 – 140 times greater than those of *FpGLOXDH*. The results suggest that FpOAH plays the more significant role than FpGLOXDH and the pathway including FpOAH as a key enzyme is a major pathway for oxalate biosynthesis, supporting our proposed idea that oxalate is biosynthesized mainly in the cytosol by FpOAH but not in the peroxisome by FpGLOXDH [2-4]. On the other hand, under the condition in the presence of Cu^{2+} an amount of *FpOAH* transcript was 19.4 times greater on day 4 (minimal magnitude) and 151.1 times greater on day 9 (maximal magnitude) than those of *FpGLOXDH*. The results suggest that FpOAH also plays a major role in oxalate biosynthesis regardless of absence or presence of Cu^{2+}.

However, the amounts of *FpOAH* and *FpGLOXDH* transcripts increased 2.2 and 7 times as their maximal rates by the presence of Cu^{2+}. The results indicate that Cu^{2+} increased expressions of *FpOAH* and *FpGLOXDH*, but the rates of the increments are suggested to be just several times.

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