

Ligninolytic System of A White Rot Fungus *Trametes polyzona* with Novel Enzymes Promising for Bioremediation of Dye

Lerluck Chitradon¹⁾, Piyangkun Lueangjaroenkit¹⁾, Churapa Teerapatsakul¹⁾, Kazuo Sakka²⁾, Makiko Sakka²⁾, Tetsuya Kimura²⁾, Emi Kunitake²⁾

¹⁾Department of Microbiology, Faculty of Science, Kasetsart University, Thailand

²⁾Graduate school of Bioresources, Mie University, Japan

Purpose: Ligninolytic system of *Trametes polyzona* was proposed its high efficiency in dye degradation in enzymatic and genetic levels. The fungal enzyme system explained a success in dye bioremediation in mediator-free system.

Methods: Purification and characterization of three main ligninolytic enzymes were done. Genes encoding the two manganese peroxidases (MnPs) and a laccase were cloned and identified. Phylogenetic relationships of MnPs and laccase were analyzed by their deduced amino acid sequence similarities.

Results: Two MnPs and a laccase of *Trametes polyzona* played important roles as main enzymes in dye degradation. The degradation abilities were driven without mediator. Complete degradation of Remazol Brilliant Blue R (25mg/L) was within 10-30 min by either enzymes. Laccase completely degraded Remazol Navy Blue and removed 75% Remazol Red in 7 days. Remazol Navy Blue and Remazol Brilliant Yellow were more than 70% removed by MnPs. Cloning of *mnp1* and *mnp2* revealed distinct deduced amino acid sequence with classification as new members of short-type hybrid manganese peroxidase in subfamily A2, Class II fungal secretion heme peroxidase. The new MnPs had novel properties in stability against organic solvents and metal ions, which triggered their activities at certain concentrations.

Conclusion: Ligninolytic system of *Trametes polyzona* was proved to be important for dye degradation and had high efficiency under the mediator-free system. The system consisted of three main enzymes, two MnPs and one laccase that showed high abilities and individually interesting properties. Herewith, a new insight into two new MnPs with novel properties of high stability against organic solvents and metal ions was found and offered an advantage of using *Trametes polyzona* in environment contaminated with such reagents.