

RECENT RESEARCH ACTIVITIES

Novel unsaturated ceriporic acids involved in ligninolytic lipid peroxidation produced by *Ceriporiopsis subvermispora*

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Photosynthetic plants are the principal solar energy converter sustaining life on Earth. White-rot fungi play an important role in the carbon cycle in earth's ecosystems because they efficiently degrade plant cell walls that are impregnated with lignin. In lignin biodegradation, the cleavage of recalcitrant non-phenolic substructures has been regarded as an essential prerequisite for the efficient degradability of lignin by enzymatic reactions. For instance, lignin peroxidase (LiP) has been proposed to drive lignin degradation because of its high oxidation potential, which is sufficiently high to degrade the non-phenolic lignin substructure. However, the selective white-rot fungus *Ceriporiopsis subvermispora* degrades the recalcitrant non-phenolic lignin substructure without expressing detectable LiP. Lipid peroxidation catalyzed by manganese peroxidase (MnP) was proposed as a mechanism for the lignin biodegradation, because the reaction decomposed the non-phenolic lignin dimer model compound. Accumulation profiles of fatty acids, lipid hydroperoxides, aldehydes, and titers of MnP in wood cultures of *C. subvermispora* supported the fact that lipid peroxidation by MnP is involved in the incipient stage of wood decay by the fungus. In this study, new ceriporic acids—alkadienyl, alkenyl and epoxy itaconic acids (ceriporic acid G, H and epoxy ceriporic acid)—were isolated from the cultures of the selective lignin-degrading fungus *C. subvermispora*.¹⁻³ The new metabolites ceriporic acid G and H were synthesized by a cross-aldol condensation and a Grignard reaction, respectively. Ceriporic acid G triggered the MnP-catalyzed lipid peroxidation and decomposed a recalcitrant non-phenolic lignin substructure model compound (Figure 1). Except for simple fatty acids, this is the first report of a fungal metabolite that induced ligninolytic lipid peroxidation.

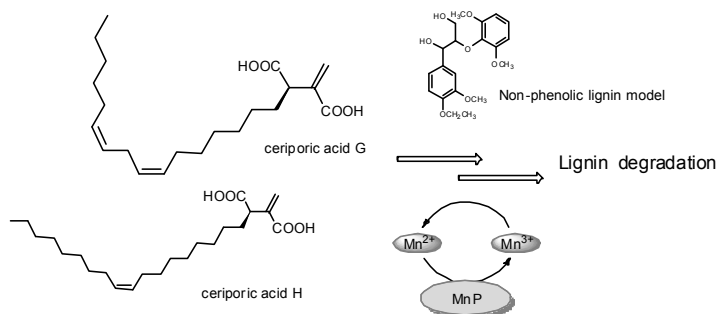


Figure 1. MnP and the novel ceriporic acids initiate lipid peroxidation to degrade a recalcitrant non-phenolic lignin substructure model compound.

References

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