

Medically Significant White-Rot Basidiomycetes: Metabolic and Biochemical Characteristics

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Well known edible and medicinal Basidiomycetes such as *Lentinus edodes* (Berk.)Singer, *Flammulina velutipes* (W.Curt.:Fr.) Singer, *Ganoderma lucidum* (W.Curt.:Fr.)Lloyd, *Pleurotus* spp., *Trametes* spp., and some others belong to white-rot xylotrophic species. These Basidiomycetes are active destructors of the woody plants due to their trophy specialization for lignin in substrates.

Cultural investigations of white-rot fungi began in the middle of the 20th century due to identification of their capabilities to grow on different nutrient substrates and to exist for long periods in the mycelium stage. This peculiarity of white-rot fungi makes possible their conservation *ex situ* in culture collections. The ability of basidiome formation during cultivation permits use of some edible

white-rot Basidiomycetes for fruit body production, identification, and verification of strains during experimental conditions. The high enzymatic potential of white-rot fungi and their ability to grow *in* and *on* substrates permits their use in various types of wastes.

Physiological investigations of white-rot fungi established different peculiarities of the second metabolism of this fungi group. It was shown that many low-molecular weight compounds isolated from white-rot Basidiomycetes determine their flavor, pigmentation, and biological activities. The properties, structures, and characteristics of activities of many terpenoid, alkaloid, phenylquinoid, and anthraquinoid metabolites were established. At present some mushrooms produce substances used in aromatherapy and in the preparation of sanative beverages (i.e., *Marasmius* sp., *Gloeophyllum odoratum* (Wulfen) Imazeki, *Lentinus edodes*). Others are used in the preparation of medicinal drugs containing mucidin, inotodiol, and ganodermanes (i.e., *Oudemansiella mucida* (Schrad.)Höhn., *Inonotus obliquus* (Ach. ex Pers.) Pilát, *Ganoderma lucidum*). High-molecular weight substances such as polysaccharides are also the products of the second metabolism of white-rot basidiomycetes. Today, polysaccharides are the main constituents of some drugs and dietary supplements well known in countries of the southeast regions on Earth. These medicinal products are obtained by fermentation—white-rot Basidiomycetes such as *Lentinus edodes*, *Trametes* sp., *Schizophyllum commune* Fr.:Fr., and some others.

Investigations of the hydrolytic enzymes of white-rot fungi allow indicating the presence of different types of proteases and obtaining the se-

creted fibrinolytic proteases from *Flammulina* and *Coprinus* species and milk clotting enzymes from *Mycena pura* (Pers.:Fr.) P.Kumm., *Irpex lacteus* (Fr.) Fr., and *Sparassis crispa* (Wulfen) Fr. In the last three decades, the enzymatic activity of white-rot Basidiomycetes has been causing great interest, resulting in active investigations. It was shown that among Gem-, Flavin-, and Cu-containing oxidases produced by these fungi, the main role in degrading lignin belonged to lignin peroxidases, manganese peroxidases, and laccases. Biochemical investigations of some species from families Polyporaceae, Ganodermataceae, and Strophariaceae have shown that these white-rot Basidiomycetes produce different oxidases, among which laccases were the main enzymes. Some characteristics of isolated laccases were investigated in cooperation with colleagues from the Bach Biochemistry Institute RAS. Great interest in the practical use of oxidative enzymes of Basidiomycetes is explained in their chemical and catalytic features. The possibility of oxidation of different aromatic, principally phenolic substances to quinones is now very well known in different areas of industry and medicine.

ACKNOWLEDGMENTS

The research on conservation of Basidiomycetes *ex situ* is supported by RFFR (Russian Fund of Fundamental Researchers) grant 03-04-49604; biochemical investigations of the lignin-destroying Basidiomycetes and their oxidases are supported by INTAS grant 03-51-5889.