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Abstract

Enhancement of Lignolytic Enzyme Activity in Ganoderma Lucidum by Co-Cultivation with Bacteria †

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Fungi are known for their capacity to produce two main categories of enzymes, cellulolytic and lignolytic, both valuable for biodegradation of lignocellulosic biomass. Ganoderma lucidum represents one of the widely grown basidiomycete white fungi for the production of lignolytic enzymes. Co-cultures of macrofungi with different microorganisms were previously shown to boost the production of bioactive components and expression of functional enzymes [1]. Our aim was to co-cultivate G. lucidum with several bacterial strains in order to identify optimal co-cultures that increase the production of lignolytic enzymes [2].

G. lucidum was tested in interactions with 9 strains of bacteria. The growth medium used was potato dextrose agar (PDA) for the synergistic–antagonistic test since both fungi and the bacterial species studied grew well on the medium and potato dextrose broth (PDB) for the enzymatic study [3]. All enzymatic activities were determined by UV-Vis spectroscopy. Laccase (Lac) activity was determined measuring the absorbance of ABTS at 420 nm (ε = 36,000 $M^{-1}cm^{-1}$), Ligninperoxidase (LiP) the oxidation of veratryl alcohol at 310 nm (ε = 9300 $M^{-1}cm^{-1}$), Manganese peroxidase (MnP) the absorbance of 2,6-dimethoxyphenol at 469 nm (ε = 53,200 $M^{-1}cm^{-1}$) and Veratryl alcohol oxidase (VAO) the absorbance of veratryl alcohol at 310 nm (ε = 9300 $M^{-1}cm^{-1}$) [4].

In the case of Lac, there was no significant improvement in the enzymatic activity provided by co-cultivation of G. lucidum with bacteria. For MnP and VAO, there was a slight increase in the activity for the experimental variants containing G. lucidum and bacterial strains. LiP activity improved significantly due to co-cultivation. The bacteria cultures did not exhibit enzymatic activity.

We co-cultivated *G. lucidum* with several bacterial strains, achieving an improvement in the activity of certain lignolytic enzymes—Figure 1.

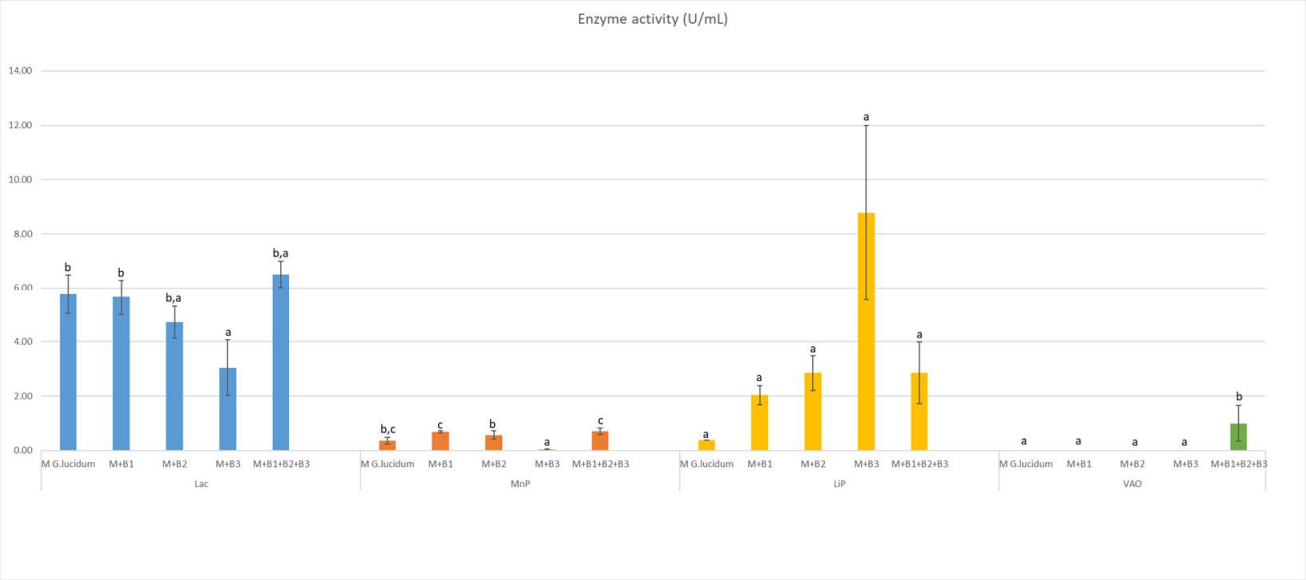

Figure 1. Enzyme activity of Lac, MnP, LiP and VAO in (U/mL), where a, b, and c are homogenoues subsets (from one way ANOVA analysis).

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