EXPLORING THE ROLE OF CRUDE LACCASE FROM *C. TROGII* 2SMKN IN THE BIODEGRADATION OF BRILLIANT GREEN DYE: IMPACT OF TEMPERATURE AND pH, PHYTOTOXICITY ASSESSMENT AND ANTIMICROBIAL ACTIVITY

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Abstract

Brilliant Green dye is widely used in industries such as paper, textiles, rubber, and plastics, primarily for dyeing wood and silk. However, it poses serious health risks, including toxicity through skin and eye contact, ingestion, and inhalation, which can lead to organ damage if exposure is prolonged. Therefore, the removal of Brilliant Green dye from water is an important environmental concern. This study investigates the potential of crude laccase, extracted from the white rot fungus Coriolopsis trogii 2SMKN, to biodegrade this harmful triphenylmethane dye. The white rot fungus was cultivated on lignocellulosic agro-industrial waste (brewer's spent grain) at 28°C in the dark for six days, producing crude laccase with a total activity of 31.43 IU/g. To test the dye decolorization efficiency, experiments were conducted at temperatures ranging from 20°C to 50°C and pH values between 2.5 and 6.0. The best decolorization rate of 69% was achieved at pH 2.5 and 30°C after 90 min, while only 12% of decolorization was observed at pH 6 and 50°C under the same conditions. After complete dye decolorization, phytotoxicity tests were performed on Triticum aestivum, an agriculturally important crop. The results showed a germination index of 102%, suggesting that the biodegradation products had a phytostimulatory effect. In contrast, test of antimicrobial activity indicated that undegraded dye inhibited the growth of Candida albicans and Lactobacillus rhamnosus by 42% and 30%, respectively, while it had no effect on Saccharomyces cerevisiae. The biodegradation products, however, did not inhibit any of the tested microorganisms. These findings indicate that crude laccases from fungi, when optimal conditions are applied, can effectively decolorize Brilliant Green dye in a relatively short period. Furthermore, the biodegradation products have potential as phytostimulants, offering promising applications in agriculture. This study highlights the utility of fungal enzymes in the bioremediation of harmful dyes, as well as their potential role in promoting sustainable farming practices.

Keywords: *laccase, white rot fungi, lignocellulosic waste, biodegradation, decolorization, phytotoxicity tests*