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Production and Characterization of *laccase* and silver *Nanolaccase* from *S. commune* and their application as Antibacterial and Wastewater Treatment Agents

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ABSTRACT

Laccase is a multicopper blue enzyme with wide industrial and biotechnological applications. In this study, silver nanoparticles and nanolaccase were synthesized from *S. commune* (SCSNPs) and its laccase (SCSNL). Their effectiveness as antibiotics, and in the treatment of printing press wastewater (PPW) were investigated. Both the SCSNPs and SCSNL were characterized using visual observation, UV-Vis spectroscopy, FTIR, SEM, DLS, EDX, and XRD. The development of brown colouration and the presence of a surface plasmon resonance band between 400 and 600 nm indicated nanoparticle formation. The functional groups such as amines, carboxyl, aldehyde, hydroxyl, and carbonyl observed in FTIR spectroscopy were responsible for the capping and stabilization of the nanoparticles. The SCSNPs and SCSNL appeared spherical, with 7.6 and 8.5 nm in size, respectively. DLS shows intensity with an average diameter of 420.5 nm and a poly-dispersity index of 0.522. EDX and XRD confirmed the purity and face cubic structure of nanoparticles and nanolaccase. SCSNPs and SCSNL had the highest antibacterial activities against *Pseudomonas aeruginosa* among the test bacteria, with a zone of inhibition of 24 mm and 27 mm respectively. Effective reduction in physicochemical parameters such as turbidity, COD, BOD, TSS, TDS, DO, salinity, and heavy metals component of the PPW, with the total eradication of Cadmium, were recorded for both Laccase, SCSNPs, and SCSNL.

Keywords: Laccase, Silver nanoparticle, Silver nanolaccase, Printing Press Wastewater.

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