FROM BURNING TO BIOENERGY: HARNESSING MARINE-DERIVED EXTREMOZYMES FOR BIOMASS VALORIZATION AND CLIMATE MITIGATION

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Abstract

Every year India produces more than 100 million tons of agricultural residue which gets openly burned thus generating extreme CO emission levels while releasing hazardous PM2.5 air particles and leading to dangerous "global boiling" climate and health conditions. This study develops a sustainable microbial solution for biomass saccharification by applying poly-extremozymes, including cellulase and laccase from Indian mangrove microbial sources.
A Bacillus strain was isolated for the purpose of studying functional cellulase enzymes and laccases with pH 5.0 and 80∘C thermal endurance. The strong enzymatic pair operates by having laccase break down lignin structures to expose cellulose fibers which subsequently become hydrolyzed by cellulase to create hydrolysates containing glucose. The biological process avoids chemical method inhibitors and toxic byproducts because it enables straightforward use in bio-saccrification as well as bioelectrochemical systems for creating green electricity.
Future inspections will investigate both the durability and practicality of this method alongside finding strategies to resolve efficiency and activity problems with enzymes. Experimental studies indicate that this system demonstrates potential as a viable system for organic material-based bio-electricity production and fulfills ISRU requirements, which play a critical role in space exploration technology development. The researchers use biological energy solutions to advance ongoing extraterrestrial efforts toward sustainable power alternatives.

Keywords: Cellulase, Laccase, Bioelectricity, Global boiling, Poly extremozymes

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