Employing White-Rot Fungi for Superior Delignification Combined with Fungal Biosynthesis to Produce Biofuels

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Fungal synthesis of lipids and ethanol using biologically pretreated biomass was investigated. Aspen, confined in modified soil-block microcosms, was treated with Ceriporiopsis subvermispora and Sclerotium cepivorum. Over four weeks, eighty pretreated samples were harvested. Acid hydrolysis confirmed that these selective strains targeted lignin, allowing the release of 90 percent of all the sugars. For fungal synthesis, a culture medium was created and added to the pretreated biomass and then autoclaved to eliminate undesirable organisms. Fusarium equiseti and Mucor circinelloides were introduced into the treated biomass and incubated at 27-degrees Celsius and 150 RPMs for ten days to create the ideal environment for optimal fungal growth and for lipid and ethanol synthesis. The cultures were centrifuged and the filtrate retained to establish enzyme activity and ethanol percentages. High-performance liquid chromatography (HPLC) was employed to determine ethanol content. All samples underwent a chloroform and methanol solvent extraction to determine lipid content. After analyzing the test results, it was concluded that lipid and ethanol production from biomass—utilizing the biological pretreatment and fungal synthesis—can generate increased energy yields between 39 and 45 percent over the current industrial standards using enzymes and yeast.