Optimization of the BETA-glucosidase Enzyme and Inhibition by Glucose in Various Fungal Species

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BETA-glucosidase, an enzyme found mainly in fungal species, is essential in the breakdown of plant material and participates in a lysis reaction that cleaves cellobiose into glucose, which is involved in the fermenting process in ethanol production. Because of this, BETA-glucosidase has the potential to be used in the efficient production of ethanol. However, glucose acts as a competitive inhibitor to the enzyme, which is evolutionarily advantageous. Regarding scientific applications, BETA-glucosidase enzymes that are least inhibited by glucose would be most beneficial, so more glucose can be produced. To find an optimal fungal enzyme for glucose production, glucose inhibition tests were conducted on Agaricus bisporus, Lentinula edodes, Agrocybe dura, Auricularia auricula-judae, and Parasola plicatilis over a time period of 64 min. BETA-glucosidase from each species was incubated with 0mM, 2mM, 5mM, and 10mM concentrations of glucose. P-nitrophenyl glucoside (pNPG), an artificial substrate that yields a yellow color when cleaved, was used to measure enzyme activity, and measurements were taken at 0, 4, 16, 32, 48, and 64 min. In order to isolate and amplify the BETA-glucosidase gene for future uses, DNA extraction and PCR (polymerase chain reaction) were performed on Agaricus bisporus, Lentinula edodes, and Agrocybe dura. Of the species tested,the BETA-glucosidase activity of the Agrocybe dura was least inhibited by glucose. The BETA-glucosidase of Auricularia auricula-judae would be most efficient in ethanol production. This study measured the glucose inhibition of five species of mushrooms, contributing to the overall search for viable biofuel candidates.

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