Poster T109

Screening and selection of yeast isolates capable of xylose catabolism, from natural and agricultural environments in Mexico

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Bioethanol constitutes a very important alternative to ethers as an additive for gasoline in heavily polluted and populated areas of Mexico. So far, only MTBE and ETBE are used as gas carburant. In order to make use of the vast by-products from the sugarcane, maize and other agro-industries, it is important to develop biotechnologies based on xylose fermenting microorganisms, which could convert entirely hexoses and pentoses from lignocellulose hydrolysates, into ethanol. More than 230 yeast cultures from agave juices, natural and introduced grasses, fruit juices and forestry and agro-industrial by-products, were isolated and tested for their ability to grow in xylose as the only carbon source, and subsequently for their ability to grow and ferment xylose in both minimal (Wickerham defined medium) and complex media (MDS-YM). Selected strains were tested for their ability to produce ethanol in the presence or xylose, mannose, arabinose, glucose, or mixtures of glucose with each pentose sugar. Two strains have a strong potential to be used as bioethanol producers from lignocellulose hydrolysates.

Poster T110

Simplification of the biomass to ethanol conversion process by using the whole medium of filamentous fungi cultivated under solid-state fermentation

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Bioprocess engineering developments aimed at improving the efficiency of biomass conversion into fuels and chemicals can make an important contribution to an environmentally sustainable society. Here, a novel simplified configuration is proposed for the conversion of biomass to ethanol, using whole-medium enzymatic cocktails (WM) and enzymatic extracts (EE) from different filamentous fungi (*Trichoderma reesei, Aspergillus niger*, and *Aspergillus oryzae*), cultivated under solid-state fermentation (SSF), for the hydrolysis of steam-exploded sugarcane bagasse (SESB). The hydrolyzed material derived from the saccharification of SESB using the combinations *A. niger* WM + *T. reesei* EE, *A. oryzae* WM + *A. niger* EE, and *A. niger* EE + *T. reesei* WM resulted in the best biomass conversion yields (66, 65, and 64% of the theoretical reducing sugar yields, respectively). The best ethanol production (84% of the theoretical yield) was obtained using the material hydrolyzed by a combination of *A. oryzae* WM + *A. niger* EE. The enzymatic conversion of SESB using on-site produced enzymes from the whole SSF cultivation medium, followed by an ethanol production step, is a potential configuration for the biomass to ethanol conversion process. This novel simplified configuration would enable the use of a single reactor system, avoiding the need for additional separation steps.

Poster T111

Fungal polysaccharide production from a xylose-containing prairie cordgrass hydrolysate

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The biopolymer pullulan is a commercially available, water soluble polysaccharide gum that has several industrial applications. Various carbon sources can support fungal pullulan production including xylose. It was of interest to learn how effectively pullulan could be produced from the xylose present in a plant biomass hydrolysate. Prairie grasses represent a potential source of plant biomass. These grasses produce a high yield and contain a relatively high hemicellulose level. Currently, prairie grasses, including prairie cordgrass, are used for grazing by livestock or harvested as hay. In this study, the ability of the pullulan-producing fungus *Aureobasidium pullulans* ATCC 42023 to utilize a prairie cordgrass hydrolysate to synthesize pullulan was investigated. A hydrolysate of prairie cordgrass was prepared by autoclaving the dried grass in a phosphate buffer (pH 5.0). The solids were subsequently hydrolyzed at 40oC with a combination of cellulase and cellobiase for 48 hours. After the solids were collected and dried, they were treated with xylanase (pH 6.0) for 48 hours at 50oC. The filtrate was collected and used in the pullulan medium. The fungal cells were grown in a phosphate-buffered medium (pH 6.0) containing prairie cordgrass hydrolysate in shake flask cultures. The strain was grown for 168 hours at 30oC. The concentration of pullulan produced was measured gravimetrically. It was determined that ATCC 42023 synthesized the highest pullulan level after 168 hours of growth on the medium. In conclusion, it was found that the fungus *A. pullulans* ATCC 42023 could utilize a xylose-containing prairie cordgrass hydrolysate to produce pullulan.

Poster T112

Ability of a prairie cordgrass hydrolysate to support fungal pullulan production relative to nitrogen source addition

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The water soluble polysaccharide gum pullulan is a commercially available biopolymer that has industrial applications. The carbon source glucose is known to support fungal pullulan production. Plant biomass contains cellulose which can be degraded to glucose by enzymatic treatment. A possible source of plant biomass are grasses which can be produced in high yield plus contain a high content of cellulose. Most prairie grasses, such as prairie cordgrass, are used for livestock grazing or harvested as hay. In this study, the ability of the pullulan-producing fungus *Aureobasidium pullulans* ATCC 42023 to utilize a prairie cordgrass hydrolysate to synthesize pullulan was investigated relative to nitrogen source addition. A hydrolysate of prairie cordgrass was prepared by autoclaving the ground, dried grass in a phosphate buffer (pH 5.0) and then hydrolyzing the suspension at 40oC with a combination of cellulase and cellobiase for 48 hours. The filtrate was collected and used in the pullulan medium. The phosphate-buffered medium (pH 6.0) either contained ammonium sulfate as the nitrogen source or no nitrogen source was added. The fungal cells were grown in the hydrolysate-containing medium in shake flask cultures for 168 hours at 30oC. The concentration of pullulan produced was measured gravimetrically. It was determined that ATCC 42023 synthesized the highest pullulan level after 168 hours of growth on the medium containing no ammonium sulfate. In summary, it was found that the ability of the fungus *A.pullulans* ATCC 42023 to produce pullulan on the prairie cordgrass hydrolysate was diminished by nitrogen source addition.