A BIOLOGICAL APPROACH TO CLEANING UP FERMENTATION INHIBITORS PRESENT IN BIOMASS SUGARS

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A major constraint to conversion of biomass to value added-products is the presence, in the sugar stream, of substances that are toxic to microbes. Inhibitory compounds including organic acids, phenolics, and furan compounds arise during acid hydrolysis of biomass, and may cause a fermentation to stall or fail. However, the same compounds that inhibit the fermenting microorganism can serve as a source of carbon and energy for other microbes, and so a bioremediation strategy may be useful to detoxify the biomass sugars and allow conversion to end-product. Toward this end, a soil isolate, an ascomycete fungus, was identified by selective screening and found to be uniquely suited for mitigating fermentation inhibitors. The isolate, *Coniochaeta ligniaria* NRRL30616, metabolizes a wide range of inhibitory compounds found in biomass dilute acid hydrolysates. During bioabatement using the fungal strain, compounds from all classes of inhibitors were removed. Bioabatement using strain NRRL30616 was incorporated into a fermentation scheme for converting biomass to ethanol. The bioabatement process has been evaluated for inhibitor abatement prior to fermentations of crop residues and potential energy crops, and demonstrated in 100 liter fermentations of wheat straw hydrolysate. Conditioning the pretreated hydolysate by inoculating with the fungal strain prior to fermentation improves fermentability of the sugars.