Fermentation of Sugarcane Bagasse Hydrolysate by a widely used Brazilian Industrial Yeast Strain

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A considerable effort in research and development has been allocated worldwide in the bioethanol industry in order to convert lignocellulosic sugars from biomass into biofuels. In Brazil the main source of raw material comes from sugarcane plants and much research has been directed towards sugarcane bagasse utilization. Brazil is the world's greatest exporter of fuel ethanol and together with USA (the biggest producer) detains 70% of the production worldwide. Utilization of bagasse-derived sugars would certainly result in a significant advance for this industry and would also bring many savings to the environment.

The sugarcane bagasse is rich in sugars, including pentoses, and is currently the focus of diverse research projects in major scientific poles, however industrially significant ethanol production based on the bagasse has not yet been achieved. As the sugar in the bagasse is mostly stored as cellulose and hemicellulose, many steps are necessary to process it down to fermentable sugars prior to fermentation, such as enzymatic hydrolysis.

Industrial ethanol fermentation is performed using robust *S. cerevisiae* strains, among others CAT-1 strain. This strain was recently sequenced and it has been proved to be very resistant to the harsh environment within the fermenter, where there is constant stress due to low pH, high osmotic pressure, high temperature, contamination and many others. Together with strain PE-2 they represent 70-80% of the commercialized industrial strains for fuel ethanol in Brazil.

In this project we have investigated the susceptibility of CAT-1 strain towards acetic acid, one of the most abundant growth inhibitors present in lignocellulosic hydrolysates. Shake flasks fermentations were performed with different concentrations of acetic acid in standard laboratory media (YPD) and cell viability, growth rate and product yields were analyzed.

Fermentations of eight different sugarcane bagasse hydrolysates were also executed and the performance of CAT-1 was investigated with respect to cell viability, growth rate and product yields. The bagasse came from five different sources and received different pretreatments, and hydrolysis were performed using Novozymes enzymes prior to fermentation. We expect that the results obtained in this project might be useful to assess the decision making process on which hydrolysis conditions would be optimum to the following fermentation step in an industrial scenario.