Robust yeast isolates with great potential for industrial fermentation of lignocellulose

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Robust second generation bio-ethanol processes require microorganisms able to ferment inhibitory lignocellulose hydrolysates. Since the discovery of the capacity of yeast to in situ detoxification of biomass-derived inhibitors, mostly 2-furfural, 5-hydroxymethylfurfural and acetic acid, significant progress has been made in understanding of yeast tolerance mechanisms avoiding the expensive step of detoxification (biological or chemical) prior to fermentation. In this work, the inhibitor tolerance and fermentation performance of ten *Saccharomyces cerevisiae* and four *Kluyveromyces marxianus* strains isolated from harshly industrial environments (Bio-ethanol, "cachaça", cocoa and beer plants) was evaluated in comparison with four laboratory background strains. Our results highlight one *S. cerevisiae* strain isolated from Brazilian bio-ethanol production plant, as a very robust strain with outstanding fermentation performance in inhibitory *Eucalyptus globulus* wood hydrothermal hydrolysate pre-treatment (Furfural 1.1 g/L, HMF 0.2 g/L and Acetic acid 2.5 g/L). This natural adapted isolate rapidly ferment all hexoses content and produced over 50 g/L ethanol corresponding to 94 % of the theorical yield and a batch productivity close to 0.8 g/L/h, while the others industrial isolates and, mainly, CEN.PK 113-7D and NRRL Y-265 laboratory strains were strongly inhibited in this medium. Moreover, implications regarding inhibitor kinetics degradation of the highly tolerant industrial isolate, mainly concerning a rapid reduction of furan compounds to their corresponding and less toxic alcohols will be discussed. These results are of practical importance for the selection of robust yeast strains for highly efficient and economic industrial lignocellulosic fermentation systems.

Keywords: Bio-ethanol, *Saccharomyces cerevisiae*, Lignocellulose fermentation, industrial isolates