An Innovative Process for the production of ethanol from molasses at 42°C maintaining high yeast viabilities and ethanol yields

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The yeast *Saccharomyces cerevisiae* is the most broadly used microorganism in current fuel ethanol production processes. Yeasts strains for ethanol production are expected to tolerate several stress conditions such as ethanol toxicity, osmotic pressure and high temperatures, since ethanol production at low temperatures cannot be operated in tropical countries especially in summer time. *Issatchenkia orientalis,* also referred to as *Candida Kruzei*, is a thermotolerant yeast found in industrial processes for the manufacturing of bread and drinks. This yeast is not able to convert sucrose into ethanol, although it can produce ethanol from glucose and fructose at temperatures as high as 42°C. In addition, the strain 195B of *I. orientalis* was able to produce ethanol at pH 2.5 and 40°C in YPD medium without significant losses in viability. The aim of the present study was to establish the best fermentation conditions for the operation of a co-culture of S. *cerevisiae* and *I. orientalis*. The mixed culture of strains IQAr/45-1 of *S. cerevisiae* and 195B of *I. orientalis* (1:3, dry mass) converted molasses into ethanol at 42°C in a simple batch culture where 63.0 g/L to 68.0 g/L of ethanol were obtained after 10-12h of fermentation with little loss in viability using a high cell density. When a fed-batch fermentation process was used, it was possible to improve the ethanol production (ethanol yields of 72.0 g/L after 9h) without changes in viability. *I. orientalis* seems to be a promising yeast to ferment under several stress conditions. The development of fermentation processes at high temperatures will be beneficial for reducing cooling costs and risk of contamination.

Keywords: *Saccharomyces cerevisiae, Issatchenkia orientalis*, molasses, co-culture, high temperatures.

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