Physiological Characterization of Xylose-Fermenting Yeasts

Campos, V.J.[1], Ribeiro, L.E.[2], Galvão, G.R.[1], Albuini, F.[1], De Souza, C.J.A.[3], Rosa, C.A. [4], Fietto, L.G.[1]

[1]Departamento de Bioquímica e Biologia Molecular, Universidade Federal de Viçosa; [2]Departamento de Microbiologia, Universidade Federal de Viçosa; [3]Departamento de Ensino, Instituto Federal da Bahia e [4]Departamento de Microbiologia, Universidade Federal de Minas Gerais.

INTRODUCTION: In order to produce second generation ethanol in an economically feasible way, it is important to discover microorganisms that can ferment xylose, the hemicellulose's main sugar. *Saccharomyces cerevisiae* cannot utilize xylose once it does not have the specific transporter for this sugar, and its xylose metabolizing genes are expressed in low levels. Thus, *Spathaspora arborariae*, *Spathaspora passalidarum* and *Sheffersomyces stipitis* arise as promising for industrial fermentation of lignocellulosic hydrolysates, since them efficiently convert xylose into ethanol. **OBJECTIVE:** To define the best fermentation conditions and the physiological characteristics of these yeasts. **MATERIAL AND METHODS:** Fermentation was performed in batch experiments with different xylose concentrations (4, 8 and 10%) and temperatures (28, 32 and 35 °C). The best conditions were then evaluated in co-fermentation with glucose (2 and 4%). During the 70 hours' processes, samples were collected for further evaluation of kinetic and fermentation parameters. **RESULTS AND DISCUSSION:** All yeasts grew at similar rates in different sugar concentrations, showing tolerance to high levels of it. The temperature range of 28 to 35 °C was the optimal for all of them. *S. arborariae* showed the highest yield of ethanol at 10% xylose and 28 °C (27.6 g/L), while *S. passalidarum* and *S. stipitis'* best condition was 10% xylose and 32 °C (38.4 g/L and 37.8g/L, respectively). They preferentially consumed glucose in co-fermentation assays. Cell viability was not affected. The inhibitor furfural reduced *S. arborariae* growth. Acetic acid showed inhibitory effect in all of them. *S. passalidarum* grew at 6% ethanol, while the others did not. **CONCLUSIONS:** *S. passalidarum* was the most promising yeast for ethanol production because it generated the highest yields of ethanol in the shortest period

of time, showed low levels of xylitol and glycerol production, and also proved to be more tolerant to the inhibitors tested in this study.

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