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Saccharomyces cerevisiae PHYSIOLOGY IN DIFFERENT CARBON SOURCES IN THE BRAZILIAN ETHANOL PRODUCTION CONTEXT

Rodrigo S. P. Abreu[1], Kevy P. Eliodório[1], Thamiris G. Giacon[1], Carlos G. A. Rosario[1], Thiago O. Basso[1]

[1] *Universidade de São Paulo, Escola Politécnica, Departamento de Engenharia Química*

E-mail: rodrigospabreu@usp.br

1. INTRODUCTION

Bioethanol is produced varying its carbon source from country to country. Some examples are corn in the U.S. and sugar cane in Brazil (ELIODÓRIO et al., 2019). Brazilian sugarcane-based ethanol production is regarded as one of the most advantageous processes. Meanwhile, corn-based ethanol is starting to show promising results in total bioethanol production in this country (CONAB, 2021). The present study aims to evaluate the effects of different proportions of three feedstocks (corn hydrolysate, sugar cane syrup, and sugar cane juice) in the physiology of the industrial *Saccharomyces cerevisiae* strain Ethanol Red ® regarding cellular growth and industrial ethanol yield (IEY).

2. MATERIALS AND METHODS

To observe the effect of feedstocks in the physiology of Ethanol Red ®, an experiment was performed with five proportions of corn hydrolysate (CH), sugar cane juice (SCJ), and sugar cane syrup (SCS), scaling up 5% CH and scaling down 5% of other substrates (SCS or SCJ) in a range from 70% to 90% (v/v) of corn hydrolysate. The corn hydrolysate and sugar cane syrup were obtained from Escola Superior de Agricultura Luiz de Queiroz - USP (ESALQ), and the sugar cane juice was obtained from a local seller. All three carbon sources were centrifuged at 5000 g for 15 minutes and further characterized in TRS via high-performance liquid chromatography (HPLC) (Cola et al., 2020).

The experiments were performed in a 96-well microplate (Tecan Infinite Pro 200) and 15 mL-centrifuge tubes for 48 hours at 30ºC in static conditions using fermentation media prepared with an initial 20 $g \cdot L^{-1}$ TRS concentration. The cellular growth was monitored by optical density (600 nm), and the intermediate profiles of metabolites were determined by HPLC. The value for IEY was determined according to Equation 1.

$$Industrial\ Ethanol\ Yield(\%) = \left(\frac{Ethanol\ concentration\ g/L}{Initial\ TRS\ g/L}\right) / 0{,}51111 \times 100 \quad (1)$$

3. RESULTS AND DISCUSSION

Figure 1 gathers the results of industrial ethanol yields (IEY) (a) and the final cell concentration for each media composition (b). The IEY was higher with increasing concentrations of SCJ, which was not observed with increasing proportions of SCS.

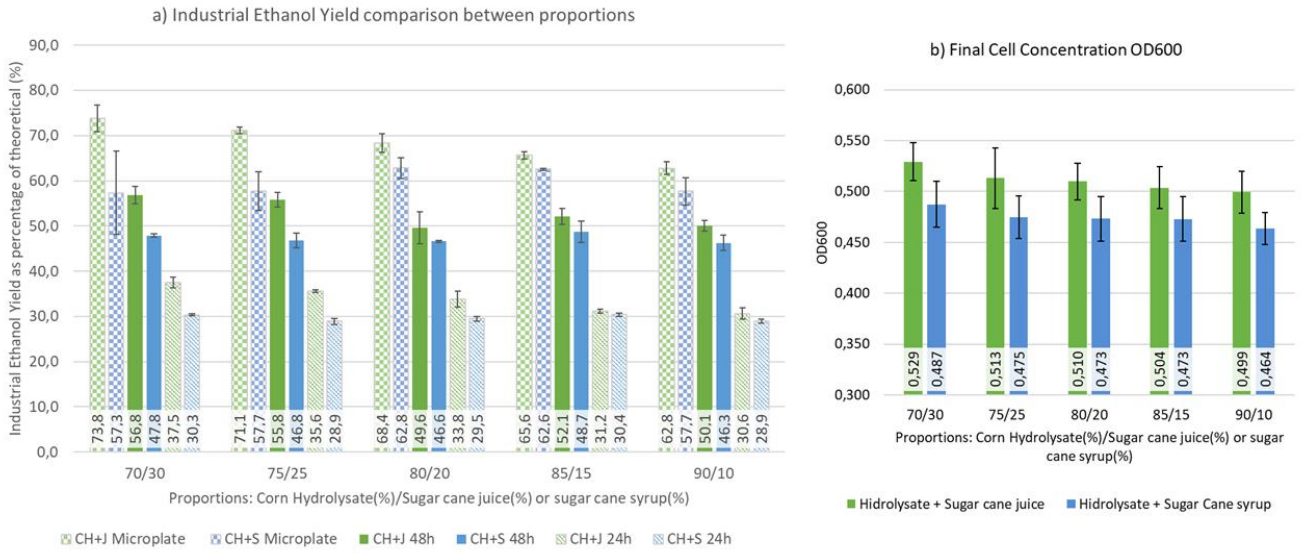

Figure 1. *a) Industrial Ethanol Yield in different proportions and carbon sources in both experiments b) Final cell concentration in all proportions studied.*

The same profile was observed for the first and second experiments, although higher IEY was obtained in microplate experiments. Additionally, the SCJ medium favored cellular growth, as observed in the final cell concentration in Figure 1b. Higher O.D. readings were obtained for SCJ in comparison to SCS, indicating higher cellular growth.

4. CONCLUSIONS

The industrial yeast strain Ethanol Red performed better in higher proportions of sugar cane juice composed media regarding its ethanol yield and final cell concentration. Significant differences were observed, especially under proportions of 25 and 30% of SCJ. Besides that, the IEY results for the second experiment closely followed the ones obtained from the first experiment. These initial results obtained for Ethanol Red, a strain originating from corn production, showed a better performance in terms of ethanol yield and cellular growth in increasing concentrations of sugar cane juice, showing the potential of a mixed sugar cane juice- and corn-based ethanol production.

5. REFERENCES

COLA, P., PROCÓPIO, D.P., ALVES, A.T.C., CARNEVALLI, L.R., SAMPAIO, I.V., COSTA, B.L.V., BASSO, T.O. 2020. Differential effects of major inhibitory compounds from sugarcane-based lignocellulosic hydrolysates on the physiology of yeast strains and lactic acid bacteria. Biotechnol Lett 42, 571–582.

CONAB - COMPANHIA NACIONAL DE ABASTCIMENTO. Acompanhamento da safra brasileira de cana-de-açúcar, Brasília, DF,v. 8, n. 3, novembro 2021.

ELIODÓRIO, K.P., CUNHA, G.C.G., MÜLLER, C., LUCARONI, A., GIUDICI, R., WALKER, G.M., ALVES, S.L., BASSO, T.O. 2019. Advances in yeast alcoholic fermentations for the production of bioethanol, beer and wine. Advances in Applied Microbiology., 3: 63-65.

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