XXIII SINAFERM
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Búzios, Rio de Janeiro, Brasil
28 a 31 de agosto de 2022
XXIII Simpósio Nacional de Bioprocessos
XIV Simpósio de Hidrólise Enzimática de Biomassas
XIV Seminário Brasileiro de Tecnologia Enzimática

CO-CULTIVATION STUDIES OF LACTIC ACID BACTERIA WITH YEAST IN THE PRESENCE OF FURANIC COMPONDS

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1. INTRODUCTION

Second generation ethanol (2G) is produced through the use of lignocellulosic biomass that is previously treated to release the sugars fermentable substances to obtain ethanol (Amorim et al., 2011). However, the fermentation of these lignocellulosic hydrolysates still faces many scientific and technological challenges. Pretreatment processes generate a variety of compounds that act as inhibitors of the metabolism of microorganisms that produce ethanol, and thus reduce the efficiency of fermentation. The present study aimed to evaluate the impact of furanic compounds present in lignocellulosic hydrolysates on the physiology of lactic acid bacteria (LAB) contaminating alcoholic fermentation in the presence of yeasts.

2. METHODS

The assays were carried out in MBL medium with glucose as a source of sugar with the addition of furfural (0.5g/L) and HMF (1.5g/L). Four variations of the experiment were performed: A) *Lactobacillus fermentum* E3 + *Saccharomyces cerevisiae* PE-2; B) *Lactobacillus plantarum* E4 + *S. cerevisiae* PE-2; C) *L. fermentum* E3 + *L. plantarum* E4 + *S. cerevisiae* PE-2 and D) *S. cerevisiae* PE-2. The cultures were carried out in triplicate at 32°C, with aliquots removed every 4 h for the monitoring of the yeast population by counting viable cells in Neubauer chamber. In addition, the aliquots were also used to monitoring sugar consumption and production of metabolites by HPLC.

3. RESULTS

Co-cultivation studies of lactic acid bacteria with yeast in the presence of HMF and furfural, indicating that heterofermentative LAB detoxify the medium quickly, allowing the yeast to ferment the sugars to ethanol. Homofermentative LAB represented another source of stress for the yeast, since in addition to not being able to detoxify the environment, make the environment more hostile by producing lactic acid (Basso et al, 2014). After 24 hours of co-cultivation, it was possible to observe that in the treatment with homofermentative LAB alone, the viability of the yeasts was drastically affected, reaching a value of 50% of cells viable. From the kinetics of substrates and products, it was possible to notice that in the presence of heterofermentative LAB there was a faster consumption of glucose (Liu et al., 2011). This is because the heterofermentative LAB has the ability to detoxify the medium with HMF and furfural. It is likely that both furfural and HMF act on heterofermentative LABs and yeast as external electron acceptors, reoxidating enzymatic cofactors and consequently releasing them for biosynthesis reactions.

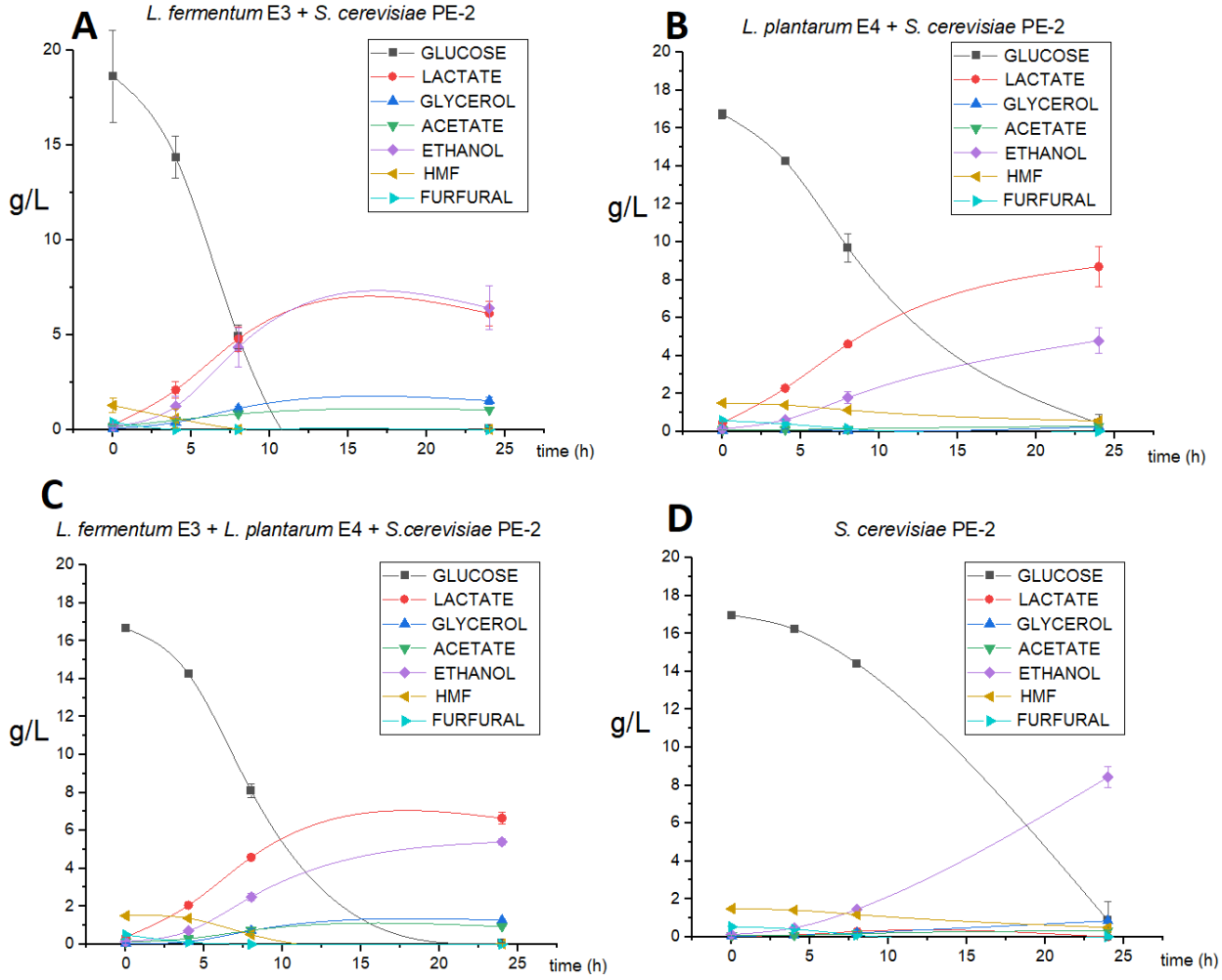

Figure 1. *Kinetics of sugar consumption and production of metabolites for the 4 proposed treatments. A) L. fermentum E3+ S. cerevisiae, B) L. plantarum E4 + S. cerevisiae, C) L. fermentum E3 + L. plantarum E4 + S. cerevisiae and D) S. cerevisiae in the presence of inhibitors*

4. REFERENCES

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5. ACKNOWLEDGMENTS

This work was financially supported in part by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) (140744/2021-5) and Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP - 2019/13826-0)