



## Bioethanol production by immobilized *Saccharomyces cerevisiae* using sugarcane juice

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### Abstract

Cells of *Saccharomyces cerevisiae*, immobilized in calcium alginate beads coated with chitosan, were used to produce bioethanol with sugarcane juice on a semi-continue-batch bioreactor (0.5 L) for 168 h, furnished 88% yield and 1,92 g/Lh of productivity. The beads show high stability and without ruptures front.

### Key words:

Bioethanol, *Saccharomyces cerevisiae*, immobilization

### Introduction

Bioethanol is one of the most successful renewable fuels developed. In Brazil, it is produced from sugarcane fermentation using *Saccharomyces cerevisiae*.

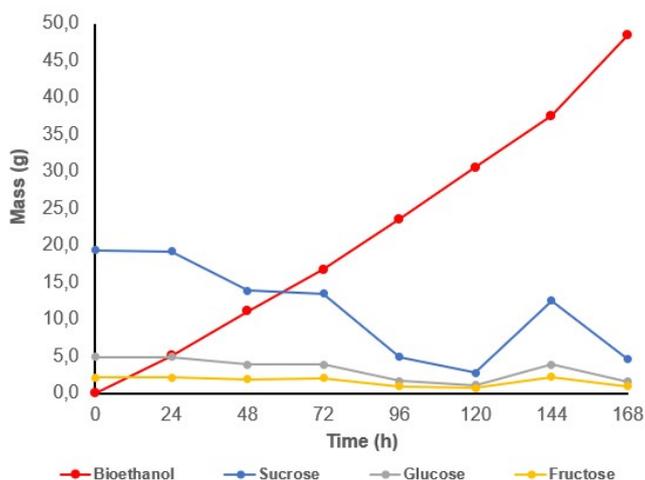
Aiming for better productivity, easier product purification, longer biocatalyst reuse<sup>1,2</sup>, the yeast was immobilized in calcium alginate beads coated with chitosan by using citric acid.

In this work, we report the results of semi-continue-batch process using sugarcane juice.

### Results and Discussion

The sugarcane juice utilized was obtained in a local commerce, being properly treated by pasteurization. Fermentation process was carried on a 0,5 L bioreactor, using 75 g of beads and calcium chloride 3 g/L. Every 24 h, 2/3 of fermentation broth was replaced by fresh media, until 168 h.

The total bioethanol production profile and the sugars consumption in each 24 h cycle are both shown in Image 1.



**Image 1.** Bioethanol production and sugars consumption profiles of sugarcane juice fermentation using immobilized yeast.

The ethanol profile approximates to a straight line, which means a constant production rate, indicating that cells keep stable inside alginate matrix. The yield obtained was 88% with 1,92 g/Lh of productivity.

The immobilization support resistance also is important, because CO<sub>2</sub> production can promote ruptures on the matrix. Image 2 show a photo from the beads at the end of experiment.



**Image 2.** Detail of bioreactor at the end of fermentation.

Alginate beads maintained intact at the end of 168 h fermentation, even already being reused from previous experiments, totalizing 672 h (4 reuses). So, the methodology developed led to a high stable and resistant matrix.

### Conclusions

Fermentation of sugarcane juice utilizing the immobilized *S. cerevisiae* resulted in 88% yield and 1,92 g/Lh productivity, at constant rate all the experiment. Beads show great resistance, keeping intact after 672 h of intermittent use, showing potential to be even more reutilized. Further experiments may contemplate use of hydrolysate as carbon source or diffusional studies to improve even more the yield and productivity.

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