



EFFECT OF SOLID-LIQUID RATION ON ETHANOL PRODUCTION BY *Saccharomyces cerevisiae* ITV-01 RD IMMOBILIZED IN HYDROLYZED SUGARCANE BAGASSE

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Introduction. Immobilized cell systems are considered as an alternative to enhance process productivity by increasing cell concentration around the support. Therefore the advantages over free cell fermentation systems such as higher ethanol concentration and higher volumetric productivity can be achieved. In recent times, carrier selections have been directed towards industrial by-products, and so lignocellulosic material like sugarcane bagasse has been explored. Pretreatments are usually carried out aimed at increasing the affinity of the biocatalyst for the lignocellulosic material^(1,2).

Therefore, the objective of this work is to establish the best solid:liquid ratio for ethanol production by *S. cerevisiae* ITV-01RD immobilized in hydrolyzed sugarcane bagasse.

Methods. An isotonic (0.9% NaCl) suspension of *Saccharomyces cerevisiae* ITV-01 RD (5 g/L) was placed in contact with hydrolyzed sugarcane bagasse at a 1:20 (w:v) solid:liquid ratio for 8 h in a 150 mL Erlenmeyer flask. Then the liquid was removed and fresh culture in 150 g/L glucose based medium was added at the following tested solid:liquid (w:v) ratios: 1:25, 1:50, 1:75 and 1:100. Substrate and products were analyzed by HPLC method. The free cell concentration was measured using a Thoma chamber.

Results. The results for ethanol, glycerol and acetic acid production are shown in Table 1.

Table 1. Ethanol, glycerol and acetic acid production.

Ratio (w:v) S:L	Ethanol g/L	Glycerol g/L	A. acid g/L	Ethanol Yield g/g
1:25	48	9	1.4	0.32
1:50	49	7.5	1.3	0.38
1:75	56.3	6.6	1.3	0.45
1:100	55.4	6.7	1.2	0.41
Free cell culture	60.6	4.5	-	0.47

As we can see, the increase in the solid:liquid ratio decreases the active cell response to stress. At the 1:75 ratio, both an acceptable ethanol production and

yield were observed, as well as stress related metabolite production. There were no significant differences between free cell concentration values obtained (8.2, 7.9, 8.3, 8.2 and 8 Log free cell/mL). After 24 h, the productivity (in the same order as above) was: 2, 2.1, 2.3, 2.4 and 1.7 g/lh, indicating that this system does improve ethanol productivity. In consequence the 1:75 ratio was used for a repeated batch experiment to analyze the stability of the immobilization. As can be seen in Figure 1, the period from batch one to batch nine can be seen as one of adjustment and from there to batch twenty, ethanol production is stable.

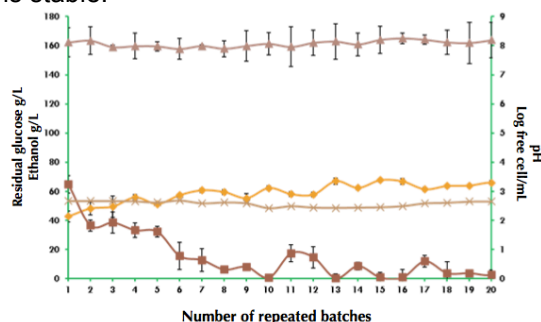


Fig.1 Ethanol production with *S. cerevisiae* ITV-01 RD on repeated batch mode.

Conclusions. The results obtained showed that this system is promising for repeated batch ethanol production.

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