LACTIC ACID PRODUCTION BY FERMENTATIVE VIA FROM MOLASSES

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Introduction. Lactic acid (LA) production has been an important topic in investigation and industries fields in the recent decades, its most interesting application is as monomer to obtain poly-lactic which is a thermoplastic biodegradable and environmentally friendly alternative to replace plastics derived from petrochemicals (1). 90% of worldwide LA produced is obtained by fermentative via (2), Glucose is the conventional substrate, but it is expensive, for that reason there are many studies about economical carbon, such as molasses, which is an interesting choice because its high sugar content (3).
In this study was evaluated the effect of the concentration of nitrogen source (yeast extract) and carbon source in the LA production, using acid-pretreatment molasses. Besides would obtained the fermentation parameters at different initial sugar concentration.

Methods. *Lactobacillus delbrueckii* ATCC 9649 was used throughout this study. Molasses was pretreated with 98% H_2SO_4 adjusted to pH 3.0 and heated at 60 °C for 1h, after centrifugation, supernatant was used in the fermentation. At first, a response surface methodology was used in order to determinate the influence of the yeast extract (5 -15g/L) and sugar content (50 – 150g/L) in 100mL matraz at 38°C. Then, Different initial sugar concentrations from molasses was evaluated (55 – 160 g/L), fermentation were carried out in a 5-L stirred-tank fermentor (B. Braun) at 38°C, 200 rpm, and pH controlled at 6.5, LA, sucrose, glucose and fructose was measured by HPLC (4). The biomass dry weight (g/L) was determined by a calibration curve related with optical density at 600 nm.

Results. Response surface methodology showed that the better ration between sugar and yeast extract is 10:1 with a R^2 =0.9952 and F-value= 209.1 which proof the statistical significance of the model. In Figure 1 and table 1 are the result for the fermentation process, despite the higher concentrations of LA were achieved at 130 g/L, the best result was 80g/L because productivity and the specific growth rate were higher, which is better for the economic optimization of the process. Yields were independent of the sugar concentration; perhaps this is because the ration between the amount of sugar and protein remained constant in all runs. Pretreatment of molasses is a necessary process because this increases productivity by 101%. The decrease in productivity at 160g/L was because high sugar concentrations inhibit microorganism growth.

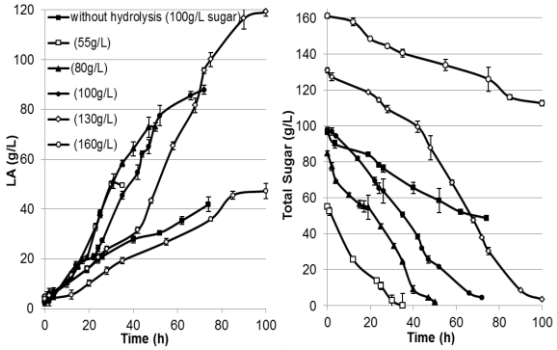

Fig.1 Lactic acid production in batch fermentation

Table 1. Fermentation parameters in the exponential phase, LA concentration was in the end of the fermentations.

Sugar concentration (g/L)	LA (g/L)	Pp (g/L*h)	Y P/S	Y X/S	µmax (1/h)
without hydrolysis (100g/L sugar)	41.90	0.70	0.79	0.05	0.034
55	49.55	1.52	0.88	0.05	0.101
80	72.96	1.67	0.93	0.07	0.121
100	87.92	1.41	0.92	0.06	0.076
130	119.20	1.33	0.95	0.05	0.054
160	47.30	0.49	0.92	0.05	0.039

Conclusions. Pretreatment of the molasses in the production of lactic acid is imperative. Best conditions for the production of lactic acid from molasses were 80g/L of sugar from molasses with a 10:1 ratio between carbon and nitrogen source.

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