FERMENTATIVE ABILITY OF BREWER'S YEAST DRIED BY FLUIDIZED BED AND SPRAY DRYING.

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Introduction. The main advantage of dried yeast is that the product can be kept for long periods. Storage studies have shown that such products may have a shelf life two years when stored below 10 ^{o}C (1). The utilization of dried yeast for brewing is a new alternative for Mexican breweries. Previous research on yeast cream dehydration have demonstrated that the drying process produced loss in viability in the yeast cells. In a preliminary work reported the effect of the spray drying and fluidized bed drying on the viability of the brewer's yeast in order to solve pollution problems during transportation (2). In this work we report the effect of using spray or fluidized bed drying on the fermentative ability (growth, glucose consumption and alcohol production) of the dried yeast.

Methodology. The yeast cream was dried using different treatments in fluidized bed drying (F1, F2, F3, F4) and spray drying (A1, A2, A3, A4, A5). These process variables were reported like those in which viability loss was minimal (2). The fermentative ability of the fresh and dehydrated yeast preparations was determined through growth curves, during which glucose consumption and alcohol production were monitored. The growth medium used was YPD (5 g glucose, 2.5 g peptone and 2.5 g yeast extract in 250 ml deionized water). Triplicate runs were incubated (in a shaker) at 25 C for 65 h, and the number of viable cells was determined by reading the absorbance of the culture at 620 nm. Cellular concentration, expressed as cfu/mL, at any time was fit by non-linear regression to the logistic model. Glucose concentration during the fermentation was determined by the dinitrosalicylic acid method. Alcohol production was measured at 20 C after 72 hours of fermentation with an beer analyzer.

Results and Discussion. Growth prediction was obtained with logistic model using the parameters maximum cell concentration (X_{max}) and the maximum specific growth rate (μ_{max}) calculated from experimental results. A 95 % joint confidence interval was calculated to verify if the growth ability of the dehydrated yeast preparation was different with respect to fresh yeast. The intervals obtained are shown in Figure 1. Average values obtained for the yeast cream were μ_{max} = 0.45 h^{-1} and X_{max}= 1.63 X 10^{8} cfu/mL**.** In general the maximum growth rate (μ_{max}) observed in dehydrated yeast was between 0.27 and 0.53 h^{-1}.The maximum viable cell concentrations (X_{max}) obtained in treatments F1, F2 and A2 did not show significant differences with respect to yeast cream. These treatments were reported in which the best viability of dried yeast was obtained (2). This suggests that the drying process may produce a significant decrease of growth rate in yeast, but the highest viable cell concentration reached was similar.

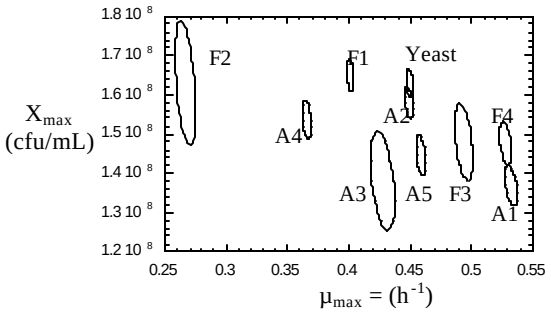

Fig. 1 *Intervalos conjuntos de confianza para la cinética de crecimiento de levadura.*

The greatest glucose consumption was noted between 10 and 20 hours, when the yeast shown their maximum specific growth rate. After 25 hours of fermentation, when the stationary phase of *S. cerevisiae* begins, glucose content was approximately 6 g/L, suggesting that only about 3/4 of the initial glucose content was consumed. The amount of ethanol produced at the end of the fermentation by the dehydrated yeast and yeast cream was 0.83-1.44 % w/w. An ANOVA and a Dunet test with α = 0.05 demonstrated statistical difference for some treatments with respect to yeast cream. This difference may attributed to the metabolic route for ethanol production by acetaldehyde was lightly modified, originating synthesis of other metabolites in amounts greater than normal such as acetate, 2.3 butanediol, isopropanol and butanol.

Conclusions. This work presented evidence that fluidized bed and spray drying may decrease yeast growth kinetics and alcohol production. However the fermentation ability of brewer's yeast dried in some treatments were practically equivalent to that observed for yeast cream. The dried yeast preparation offers the possibility to eliminate the need for propagation and refrigerated handling and transportation of fresh yeast cream.

References.

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