



## PRODUCTION OF HYDROGEN WITH A STRAIN OF *Citrobacter freundii* IN BATCH REACTORS UNDER ANAEROBIC CONDITIONS.

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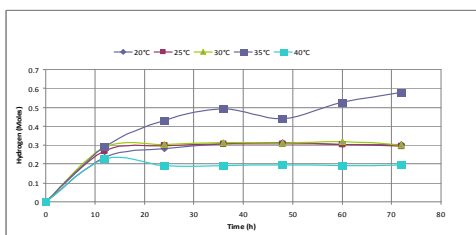
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**Introduction.** Biologically produced hydrogen (biohydrogen) is a valuable gas that is seen as a future energy carrier, since its utilization via combustion or fuel cells produces pure water. Heterotrophic fermentations for biohydrogen production are driven by a wide variety of microorganisms such as strict anaerobes, facultative anaerobes and aerobes kept under anoxic conditions<sup>1</sup>. The aim of this study was to establish the optimal conditions for hydrogen production with a strain of *Citrobacter freundii* in batch reactors.

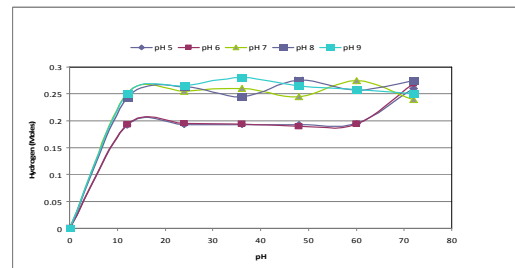
**Methods.** We used a strain of *C. freundii* provided by the Department of Biotechnology of the U. A. de C. Hydrogen production was performed in reactors containing 50 ml of thioglycollate broth under anaerobic condition and inoculated with *C. freundii*. We studied the influence of temperature (20, 25, 30, 35, 37 and 40 °C), the influence of pH (5, 6, 7, 8 and 9), glucose concentration (1, 2 and 3%) and stirring speed (200, 250 and 300 rpm). The hydrogen produced was measured by gas chromatography from aliquots taken at 12, 24, 36, 48 and 72 hours. It was also measured the amount of reducing sugars by the Somogyi-Nelson method.

**Results.** Figure 1 shows that the temperature of 35°C was the best in the hydrogen production and was statistically different from the rest of the temperatures tested. It was further determined that this is also the temperature at which *C. freundii* reaches its highest growth rate.



**Figure 1.** Influence of temperature on hydrogen production.

Figure 2 shows no significant difference in hydrogen production at pH 7, 8 and 9, so that, according to several authors, is considered that a neutral pH is suitable for high productivity<sup>2,3</sup>.



**Figure 2.** Influence of pH on hydrogen production.

In the case of glucose concentration in the fermentation medium, no difference was found in the production of hydrogen among the three concentrations tested in this study. Moreover, it was found that the hydrogen production is better with an agitation of 200 rpm.

**Conclusions.** The hydrogen production is possible with the use of *C. freundii* under anaerobic conditions; achieving productivities of up to 0.9 moles in a time not exceeding 72 hours, using a temperature of 35 C, pH 7.0, 1% glucose and agitation of 200 rpm.

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### References.

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