



PRODUCTION OF ETHANOL BY *Zymomonas mobilis* IN SOLID-STATE FERMENTATION UTILIZING AN ETHANOL RECOVERY SYSTEM

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Introduction. *Zymomonas mobilis* (*Zm*) is a microaerophilic bacteria (1, 2) which metabolizes glucose, fructose and sucrose by the Entner-Doudoroff pathway (1). From glucose, *Zm* produces stoichiometrically nearly two mol of ethanol and two mol of carbon dioxide. This bacteria supports up to 300 g/L glucose and 147 g/L ethanol, yielding 96% of the theoretical value (3). There are no reports of ethanol production in solid-state fermentation (SSF) by *Zm* utilizing perlite as inert support.

The aim of this work was to design and evaluate an ethanol recovery system (ERS).

Methods. The SSF was carried out in serological bottles (120 mL) with 3 g of perlite and 0.9 mL (50 and 100 g/L glucose) and 10.7 mL (200 g/L glucose) of culture medium containing (in g/L): glucose, 50, 100 or 200; yeast extract, 10; $(\text{NH}_4)_2\text{SO}_4$, 1; KH_2PO_4 , 3.3; K_2HPO_4 , 3.3; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.5 and casein peptone, 5. Initial pH was of 6.19 ± 0.03 . pH was measured with a potentiometer Conductronic pH 120.

Results. Figure 1 shows the ERS. This is an open system that connects the reactor with a trap formed by two test tubes containing 20 and 10 mL of water respectively.

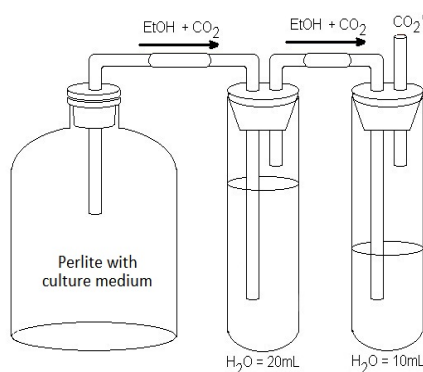


Fig. 1. Outline ERS.

Figure 2 presents the ethanol concentration values obtained with and without the ethanol recovery system described in Fig. 1. Ethanol concentrations in presence of the ERS were higher (up to 18%) than those obtained without the ERS.

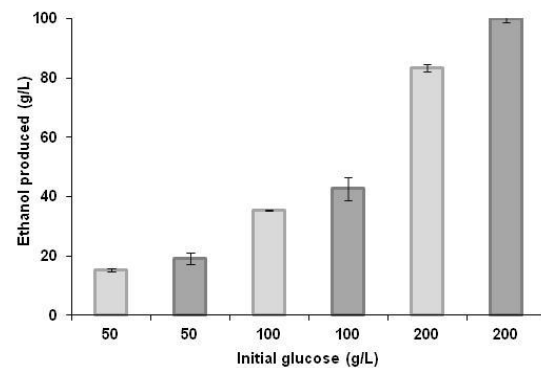


Fig. 2. Recovery of the produced ethanol by *Zm* in SSF with (□) and without (■) the ERS.

The ethanol yield for glucose concentrations from 50 to 200 g/L was around 0.46 g/g (Fig. 3).

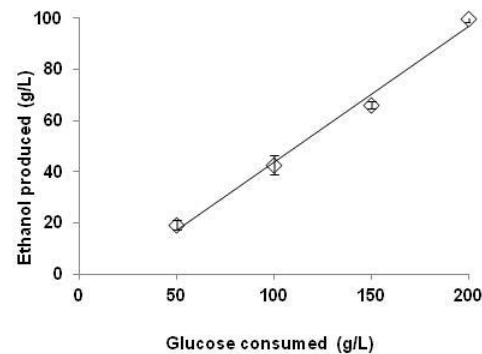


Fig. 3. Yield theoretical of ethanol is of $0.51 \frac{\text{g}_{\text{ethanol}}}{\text{g}_{\text{fermented glucose}}}$

The final pH was of 4.41 ± 0.31 favoring the production of ethanol.

Conclusions. The ERS designed and evaluated in this work allowed to accurately quantify the production of ethanol by SSF.

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