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KINETICS OF BIOETHANOL PRODUCTION USING SACCHAROMYCES CEREVISIAE STRAIN Y-35

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ABSTRACT

In the present work, an attempt was made to explore the potential of *S. cerevisiae* Y-35 for fermentation of glucose to produce ethanol in batch culture. Effects of parameters, such as initial inoculum loading in the range of 5-40 gL^{-1} dry cell weight (DCW) and glucose concentration (in the range of 5-26% by weight) were investigated. Maximum ethanol yield and volumetric productivity were obtained at inoculum loading of 20 gL^{-1} DCW and increased marginally at 40 gL^{-1} DCW. With increased initial sugar concentration, volumetric productivity was increased and the maximum productivity of 10.46 $gL^{-1}.h^{-1}$ was obtained with 13% sugar concentration at 4 h, corresponding to 94% of the maximum theoretical possible conversion. At high sugar concentrations, high productivity was obtained up to 10 h, corresponding to 6.9 and 5.9 $gL^{-1}h^{-1}$ at 20% and 26% initial glucose concentrations, respectively. The high productivities obtained with the yeast, even at 20-26% sugar concentrations, implies the robustness of the yeast strain and potential for its industrial use. Furthermore, in order to understand the kinetic behavior, the experimental data was fitted into a kinetic model based on modified Monod equation to predict the inhibitory effects of ethanol and glucose on fermentation performance. A MATLAB® program was employed to estimate the kinetic parameters in the model. High R^2 and low RMSE values supported good agreements between experimental data and model predictions.

KEYWORDS: Bioethanol, Dry Cell Weight, Fermentation, Kinetics, Monod Equation, *Saccharomyces Cerevisiae* Y-35