

Cybernetic Modeling of Growth Dynamics of *Debaryomyces nepalensis* NCYC 3413 and Xylitol Production in Batch Reactor

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Abstract : Growth of *Debaryomyces nepalensis* on mixed substrates in batch culture follows diauxic pattern of completely utilizing glucose during the first exponential growth phase, followed by an intermediate lag phase and a second exponential growth phase consuming xylose. The present study deals with the development of cybernetic mathematical model for prediction of xylitol production and yield. Production of xylitol from xylose in batch fermentation is investigated in the presence of glucose as the co-substrate. Different ratios of glucose and xylose concentrations are assessed to study the impact of multi substrate on production of xylitol in batch reactors. The parameters in the model equations were estimated from experimental observations using integral method. The model equations were solved simultaneously by numerical technique using MATLAB. The developed cybernetic model of xylose fermentation in the presence of a co-substrate can provide answers about how the ratio of glucose to xylose influences the yield and rate of production of xylitol. This model is expected to accurately predict the growth of microorganism on mixed substrate, duration of intermediate lag phase, consumption of substrate, production of xylitol. The model developed based on cybernetic modelling framework can be helpful to simulate the dynamic competition between the metabolic pathways.

Keywords : co-substrate, cybernetic model, diauxic growth, xylose, xylitol

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