

Author's Accepted Manuscript

Mathematical modeling of lactic acid fermentation
in bioreactor with carob extract

Mustafa Germec, Mustafa Karhan, Katherine L.
Bialka, Ali Demirci, Irfan Turhan



www.elsevier.com/locate/bab

PII: S1878-8181(18)30077-X
DOI: <https://doi.org/10.1016/j.bcab.2018.03.018>
Reference: BCAB730

To appear in: *Biocatalysis and Agricultural Biotechnology*

Received date: 22 January 2018
Revised date: 21 March 2018
Accepted date: 22 March 2018

Cite this article as: Mustafa Germec, Mustafa Karhan, Katherine L. Bialka, Ali Demirci and Irfan Turhan, Mathematical modeling of lactic acid fermentation in bioreactor with carob extract, *Biocatalysis and Agricultural Biotechnology*, <https://doi.org/10.1016/j.bcab.2018.03.018>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Mathematical modeling of lactic acid fermentation in bioreactor with carob extract

Mustafa Germec^a, Mustafa Karhan^a, Katherine L. Bialka^b, Ali Demirci^b, and Irfan Turhan^{a*}

^aDepartment of Food Engineering, Akdeniz University, Antalya 07058, Turkey

^bDepartment of Agricultural and Biological Engineering, The Pennsylvania State University, University Park, PA 16802, USA

*Corresponding author. Tel: +90 (242) 310 6573. iturhan@akdeniz.edu.tr

Abstract

In this study, nonlinear sixteen mathematical models including Gompertz (G), generalized Gompertz (GG), modified Gompertz (MG), re-modified Gompertz (RMG), logistic (L), generalized logistic (GL), modified logistic (ML), re-modified logistic (RML), Richards (R), generalized Richards (GR), modified Richards (MR), re-modified Richards (RMR), Stannard (S), Baranyi (B), Weibull (W), and Morgan-Mercer-Flodin (MMF) were applied to fit cell growth, product formation, and sugar consumption of batch lactic acid (LA) fermentation in stirred tank bioreactor with carob extract. To determine the modeling success, root-mean-square-error (RMSE), mean-absolute-error (MAE), R^2 , slope, bias factor (BF), and accuracy factor (AF) were used. Results indicated that the best model for cell growth was MMF model (RMSE=0.24 g/L, MAE=0.16 g/L, R^2 =1.00, Slope=1.06, BF=1.04 and AF=1.16). For product formation, the best models selected were RMG (RMSE=1.33 g/L, MAE=1.00 g/L, R^2 =0.99, Slope=0.95, BF=0.94 and AF=1.11) and RMR (RMSE=1.33 g/L, MAE=1.01 g/L, R^2 =0.99, Slope=0.96, BF=0.94 and AF=1.12) models. As for sugar consumption, B model was the best model for estimation of experimental data (RMSE=0.88 g/L, MAE=0.52 g/L, R^2 =1.00, Slope=1.00, BF=1.00 and AF=1.01). Additionally, the most successful models that predict experimental kinetic data were GG, GL, S, and W models. Consequently, the best models selected could be used for more progress of LA production process in bioreactor with carob extract.

Download English Version:

<https://daneshyari.com/en/article/8405909>

Download Persian Version:

<https://daneshyari.com/article/8405909>

[Daneshyari.com](https://daneshyari.com)