ISSN (ONLINE) : 2395-695X
ISSN (PRINT) : 2395-695X
Available online at www.ijarbest.com

International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST)
Vol. 2, Special Issue 8, February 2016 in association with
KAMARAJ COLLEGE OF ENGINEERING AND TECHNOLOGY, VIRUDHUNAGAR
DEPARTMENT OF BIOTECHNOLOGY
ORGANIZES
DBT, NEW DELHI SPONSORED NATIONAL LEVEL CONFERENCE ON CONTEMPORARY TRENDS IN BIOENERGY AND GREEN TECHNOLOGY: CHALLENGES AND OPPORTUNITIES [ORA-2016]
(25-26TH FEBRUARY 2016)

SCREENING OF FERMENTATION FACTORS FOR DEXTRAN PRODUCTION BY Leuconostoc sp USING STATISTICAL DESIGNS

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Abstract

Dextran is an FDA approved bacterial extracellular polymeric carbohydrate composed of long chains of glucose units connected mainly by α (1-6) linkage. Dextrans are often preferred over synthetic polymers due to their solubility in water, nontoxic, low cost, availability, biocompatible and biodegradable. They are mainly produced by lactic acid bacteria, particularly *Leuconostoc mesenteroides* by fermenting sucrose into dextran with dextransucrase enzyme. A dextran producing *Leuconostoc sp* was isolated from deteriorated sugar cane juice. The present study is focused to screen fermentation factors to improve dextran production for the isolated strain *Leuconostoc sp* at shake flask level using statistical approaches. The most influencing factors were selected and their levels were set by one variable at a time design (OVAT). The Effect of eight fermentation variables, namely Sucrose, Yeast extract, Peptone, Sodium Acetate, K_2HPO_4, Temperature, Time, and Tween 80 were screened for their significance on dextran production by Plackett Burman factorial design and Taguchi orthogonal array $L_{12}(2^8)$ designs in twelve experimental trials. Both the design showed a wide variation in dextran production from 0.421mg/ml to 6.493mg/ml. It is inferred from the analysis of variance that the factors considered in Plackett Burman and Taguchi design are statistically significant at 95% confidence limit. Analysis of response of Plackett Burman and Taguchi orthogonal array design showed a high co-efficient of determination (R^2) value of 98.99% and 98.46%, respectively, which indicated that good correlation between observed and predicted values of dextran production. The ANOVA of dextran production by Plackett Burman and Taguchi design has the model F ratio of 36.75 (P>F=0.007) and 23.92 (P>F =0.012) which implies that the models are significant. The most significant factors were determined by the P value (P<0.05) and T value (T>0) evaluation of each individual effect, in Plackett Burman design the independent variables showed positive effects on dextran production were time, sucrose, K_2HPO_4 and time, sucrose and K_2HPO_4 were significant in Taguchi design. The study concludes that Time, Sucrose, and K_2HPO_4 were found to influence dextran production significantly for the isolated Leuconostoc sp.

Keywords: *Leuconostoc sp; Dextran; Plackett Burman and Taguchi design.*