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A STATISTICAL APPROACH FOR SCREENING THE INFLUENCE OF MEDIA COMPONENTS AND PROCESS VARIABLES ON XYLITOL PRODUCTION BY *Candida guilliermondii* USING CORNCOB HEMICELLULOSE HYDROLYSATE

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Introduction

The influence of media components, and process variables on xylitol production was evaluated using a Plackett-Burman design. After discriminating the variables with lower effect, a linear model was built; this model showed to accurately predict the experimental response.
This study's objective was to identify the most influential variables on xylitol production for further optimization.

Materials and Methods

Plackett-Burman screening experimental design of 8 runs was employed to determine the influence of independent variables on the production of xylitol by *Candida guilliermondii*. A total number of 7 variables were selected for this study. In this experimental design, each component is represented at two levels, high (+1) and low (-1) as shown in Table 1.

Table 1. Values for the Plackett-Burnman design.

Variable	Parameter	-1	+1
A	pH	6	6.5
B	Agitation speed (rpm)	125	175
C	C/N ratio	15	20
D	Yeast extract (g/L)	1.5	3
E	Trace element solution (mL/L)	2	3
F	KH_2PO_4 (g/L)	1	2
G	$MgSO_4$ (g/L)	0.1	0.3

A total of 8 experiments were done in duplicate for measuring the conversion yield of xylose to xylitol.
Experiments were carried out in 500 mL baffled Erlenmeyer flasks containing 100 mL of medium. Samples were taken every 6 hours until 60 hours of fermentation were reached. HPLC was used for analyzing substrate and product concentration.

Results and Discussion

Plackett-Burnman experiments showed a wide variation in xylitol production. This variation reflected the importance of optimization to attain a higher yield of conversion.
After calculating the effect of each parameter it was determined that pH, agitation speed and yeast extract were the most influential variables in xylitol production. The trace element solution and C/N ratio did not represent an important impact on xylitol synthesis. Table 2 shows the calculated effect for each parameter.

Using the overall response average and the effect for each parameter, a linear model was built; the least influential effects were not used in the model. The experimental average responses for each run as well as the response predicted by the model are shown in Table 3.

Table 2. Effect of each parameter.

Variable	Parameter	Effect
A	pH	0.0963
B	Agitation speed	-0.0546
C	C/N ratio	-0.0037
D	Yeast extract	0.0524
E	Trace element solution	0.0315
F	KH_2PO_4	0.0150
G	$MgSO_4$	0.0317

Table 3. Experimental and predicted response for each run.

Experiment	Experimental $Y_{P/S}$ (g/g)	Predicted $Y_{P/S}$ (g/g)
1	0.55	0.53
2	0.37	0.38
3	0.26	0.25
4	0.21	0.23
5	0.51	0.53
6	0.24	0.23
7	0.30	0.29
8	0.16	0.17

Conclusions

The screening done by Plackett-Burman design was proved to be efficient. The linear model obtained shows to predict the experimental response with an experimental error of $4x10^{-4}$. Further work is needed in order to optimize the media used for xylitol production.

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References

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