



FRUCTOOLIGOSACCHARIDES PRODUCTION BY SOLID-STATE FERMENTATION WITH Aspergillus niger PSH

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Introduction. Fructooligosaccharides (FOS) belong to prebiotics group that are nondigestible oligosaccharides but fermentable by the bacteria in the gut microbiota¹. FOS can be produced by inulin degradation, which results in products with long fructooligomer chains². Alternatively, FOS can be obtained conversion of the sucrose bv using fructosyltransferase (FTase) or fructofuranosidase (FFase) enzymes from bacterial and fungal sources². The current process for industrial production of FOS uses FTase produced by Aspergillus niger, and reaches an yield value of approx. 60%³. The present study evaluated the FOS production by solid-state fermentation (SSF) with the objective of finding a technology able to produce FOS with higher yield.

Methods. The biotransformation of sucrose to FOS by Aspergillus niger PSH using agave fibers as solid substrate under SSF conditions was studied. Assavs were carried out under different conditions of temperature, moisture content, inoculum concentration, pH, substrate concentration, time, and packing density, and the effects of these variables on FOS production was evaluated a Plackett-Burman experimental usina design. FFase activity, FOS (1-kestose, 1nystose, and 1- -fructofuranosyl nystose) and other residual sugars (sucrose, glucose, and fructose) were quantified by HPLC as described by Mussatto et al. $(2009)^4$. STATISTICA® 7.0 was the software used for statistical analysis, and a significance level of 1% (p<0.01) was considered.

Results. Table 1 and Figure 1 show the experimental design and correspondent Pareto chart for the production of FOS, respectively. An important influence of the temperature on the response was evidenced. The bioreactor packing density also affected the FOS production at 90% confidence level.

Table 1. Plackett-Burman experimental design with the
values of the variables used during the FOS production
by solid-state fermentation

	Factors						
Run	Inoculum	Temperature	pH	Substratum	Time	Moisture	Packing density
1	2.00E+05	34	4	300	16	GO	0.1624
2	2.00E+05	26	6	400	10	60	0.1624
3	2.00E+07	34	6	400	15	80	0.1624
4	2.00E+05	34	6	300	10	80	0.11
5	2.00E+07	34	4	400	10	60	0.11
6	2.00E+07	26	4	300	10	80	0.1624
7	2.00E+05	26	4	400	16	80	0.11
8	2.00E+07	26	0	300	15	60	0.11
9	2.00E+06	30	5	200	13	70	0.135



Fig.1 Pareto chart with the effect of the studied variables on the production of FOS by *A. niger* PSH.

Conclusions. *A. niger* PSH has great ability to synthesize FOS under SSF using agave fibers as solid substrate. Temperature and packing density were variables with important influence on the production of FOS by using this fermentation system.

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