XV Biotechnology and Bioengineering
microorganisms
Cancun Convention Center

FRUCTOOLIGOSACCHARIDES PRODUCTION BY SOLID-STATE FERMENTATION WITH *Aspergillus niger* PSH

DA Flores-Maltos[1], SI Mussatto[2], JC Contreras Esquivel[1], R. Rodríguez[1] JA Teixeira[2] & CN Aguilar[1]*
[1]Food Research Department. School of Chemistry. Universidad Autónoma de Coahuila. Saltillo, Coahuila, México. *Email: cristobal.aguilar@uadec.edu.mx
[2]Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, University of Minho. Braga, Portugal.

Key words: Agave fibers, solid-state fermentation, fructooligosaccharides.

Introduction. Fructooligosaccharides (FOS) belong to prebiotics group that are non-digestible oligosaccharides but fermentable by the bacteria in the gut microbiota[1]. FOS can be produced by inulin degradation, which results in products with long fructooligomer chains[2]. Alternatively, FOS can be obtained by conversion of the sucrose using fructosyltransferase (FTase) or β-fructofuranosidase (FFase) enzymes from bacterial and fungal sources[2]. 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. Assays 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 using a Plackett-Burman experimental design. FFase activity, FOS (1-kestose, 1-nystose, and 1-β-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	60	0.1624
2	2.00E+05	26	6	400	10	60	0.1624
3	2.00E+07	34	6	400	16	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+06	26	4	400	16	80	0.11
8	2.00E+07	26	6	300	16	60	0.11
9	2.00E+06	30	5	200	13	70	0.135

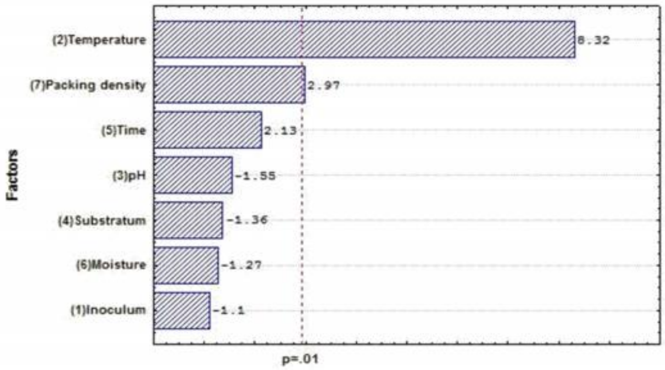

Fig.1 Pareto chart with the effect of the studied variables on the production of FOS by *A. niger* PSH**.**

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.

Acknowledgements. Flores-Maltos thank CONACYT for the financial support to study her Postgraduate Program at Universidad Autónoma de Coahuila**.**

References.

1. Gibson GR, Roberfroid, MB. (1995). *J Nutr* 125:1401-12.
2. Vanková K., Onderková Z., Antošová M., Polakovic M. (2007). *Chemical Papers* 62 (4) 375–381.
3. Yun JW. (1996).*Enzyme Microb Tech* 19:107-17
4. Mussatto, S. I., Aguilar, C. N., Rodrigues, L. R. & Teixeira, J. A. (2009). *Journal of Molecular Catalysis B: Enzymatic,* 59**,** 76-81.