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XIV Congreso Nacional de Biotecnología y Bioingeniería

PROCESS CONDITIONS THAT MAXIMIZE THE FRUCTOOLIGOSACCHARIDES AND β-FRUCTOFURANOSIDASE PRODUCTION BY *Aspergillus japonicus* UNDER SOLID-STATE FERMENTATION CONDITIONS

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Keywords: fructooligosaccharides; β-fructofuranosidase; solid-state fermentation

Introduction. Several factors must be considered for the development of a successful bioprocess under solid-state fermentation (SSF) conditions. Some of them include the selection of the solid support, and determination of the operational conditions to be used. In a recent study, coffee silverskin (CS) was demonstrated to be a material with great potential for use as support and nutrient source for fructooligosaccharides (FOS) and β-fructofuranosidase (FFase) production by *Aspergillus japonicus* under SSF conditions (1).
As a sequence of this study, the present work aimed to establish the best operational conditions (temperature, inoculum rate, and moisture content) to be used in this process, aiming to maximize FOS and FFase production.

Methodology. Fermentation assays were performed in Petri plates containing the support material (CS) moistened to 60, 70 or 80% with a 240 g/L sucrose solution, and inoculated with a spore suspension to obtain 2×10^5, 2×10^6 or 2×10^7 spores/g dry substrate. The plates were statically incubated at 26, 30 or 34 ºC, during 20 h. During this period, samples were periodically withdrawn to determine sucrose and FOS concentrations, and FFase activity. Fermentation conditions were combined according to a 2^3 central composite design with four replicates at the center point.

Results and Discussion. All the studied variables significantly influenced the responses (FOS productivity and FFase activity), but the temperature and inoculum rate had the most significant effects. As can be seen in Figure 1, a region where the values of FOS and FFase are maximized (black region) can be found by using the suitable temperature (T), inoculum rate (I) and moisture content (M) values. Maximum values of the responses (12.4 g/L.h and 64.12 U/mL) may be achieved by using a temperature of 30 ºC, 2×10^7 spores/g dry material, and 70% moisture content. Equations describing the FOS productivity and FFase activity variations as a function of (T), (I) and (M) in the studied range of values were established:

FOS (g/L.h) $= 10.65 + 1.34T - 5.09T^2 + 3.93I + 0.92\,TxM - 1.13\,TxI$ (R^2=0.85)

FFase (U/mL) $= 56.39 - 21.26T^2 + 18.89I - 6.08I^2 + 5.45\,TxM$ (R^2= 0.85)

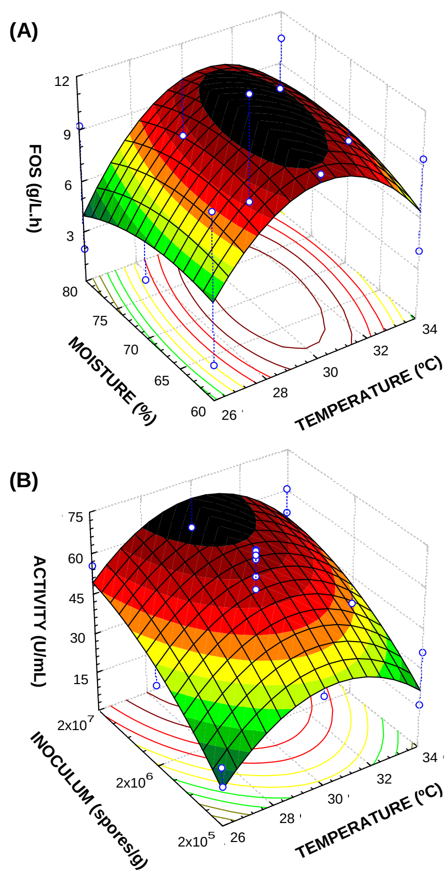

Figure 1. Response surfaces representing the variations of FOS productivity (A) and FFase activity (B) according to the operational conditions used during SSF.

Conclusion. FOS and FFase production were maximized after determined the best conditions of temperature, inoculum rate and moisture content to be used in the SSF process. The results here achieved were highest than those previously found under no optimized fermentation conditions (1), and represent an important advance for the production of both products on industrial scale.

Acknowledgments. FCT, grant SFRH/BPD/38212/2007.

References.

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