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Improvement of fructooligosaccharides yield and productivity by solid-state cultivation of *Aspergillus japonicus* on corn cobs

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Abstract

Fructooligosaccharides (FOS) are oligosaccharides of fructose containing a single glucose moiety, which are widely used as an ingredient in functional foods. Conventionally, FOS is mainly produced on industrial scale from the disaccharide sucrose by microbial enzymes having transfructosylating activity, but the FOS production yields by this process are normally low (55–60%) [1]. In a previous work it was observed that *Aspergillus japonicus* ATCC 20236 immobilized in corn cobs has great potential for industrial application in FOS production, because high amounts of cells adhered to this material and produced FOS with high yield (66%) and productivity (6.61 g/l.h) [2]. Solid-state fermentation systems, which consist in a fermentation process allowing the growth of microorganisms on moist solid materials in the absence of free-flowing water [3], have been few explored for FOS production. Therefore, aiming to improve the previously obtained results, the present work evaluated the FOS production by *Aspergillus japonicus* cultivated on corn cobs under solid-state cultivation conditions.

A medium containing (% w/v): sucrose 20, yeast extract 2.75, $NaNO_3$ 0.2, K_2HPO_4 0.5, $MgSO_4´7H_2O$ 0.05, and KCl 0.05, was prepared for the substrate (corn cobs) moistening. For the reactions, 3.5 grams of the autoclaved substrate were mixed with the required volume of medium to give 70% moisture content, and inoculated with a spore suspension to obtain $2´10^6$ spores/gram dry substrate. The spore suspension was prepared by scrap down the spores of *Aspergillus japonicus* ATCC 20236 from PDA plates with a sterilized solution of 0.1% (w/v) Tween 80, and counted in a Neubauer chamber. Experiments were carried out in Petri plates statically incubated at 28ºC for 48 h.

FOS production in absence of free-flowing water (present work) was higher and faster than in submerged fermentation. By solid-state cultivation, total FOS concentration of 172.1 g/l was obtained after only 16 h of fermentation, corresponding to a yield of 87% and productivity of 10.76 g/l.h. Such values are 32% and 63% higher than those attained in submerged fermentation with immobilized cells. These results are of great relevance and contribute for the development of a process able to maximize FOS production at industrial level.

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