Synthetic materials colonization by *Aureobasidium pullulans* fungi for fructooligosaccharides production

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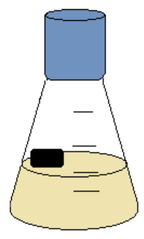
Introduction

Fructo-oligossacharides (FOS) are fructose oligomers with important functional properties [1]. They have been mainly used in food and pharmaceutical industries, as non-digestible and non-cariogenic sweeteners. FOS are known also to control the intestinal flora and thus prevent and treat a large number of intestinal disorders [2]. At the industrial scale, FOS can be produced by microbial transfructosylating enzymes, such as *Aureobasidium pullulans* enzymes, through sucrose [3]. Cells immobilization can be performed in order to increase the yield and the percentage of FOS in a mixture, since it allows obtaining more concentrated and stable cell cultures [4]. The improved performance of the immobilization systems is although dependent of the accurate selection of the suitable carrier to be used through fermentations [5].

The capacity of *A. pullulans* to colonize different synthetic materials, namely, foams, vegetal and synthetic fibers, clay, pumice, porous stone and glass wool, was evaluated. Cells were immobilized through direct contact to the carriers at the beginning of the batch fermentations.

Material and Methods

- **Batch fermentations using optimized medium**
  - ✓ [Sucrose]: 200 $g.L^{-1}$
  - ✓ Volume: 100 mL
  - ✓ Agitation: 150 rpm
  - ✓ Temperature: 32 ºC



Aureobasidium pullulans **$1x10^7$ spores/ml**

Synthetic Carrier (± 1g)

Synthetic carriers

C1: Polyurethane foam ϕ=1.5mm

C2: Polyurethane foam ϕ=1mm

C3: Vegetal foam

C4: Vegetal fiber mop

C5: Synthetic fiber mop

C6: Clay

C7: Pumice stone

C8: Porous stone

C9: Glass wool

C10: Polyester staple fiber

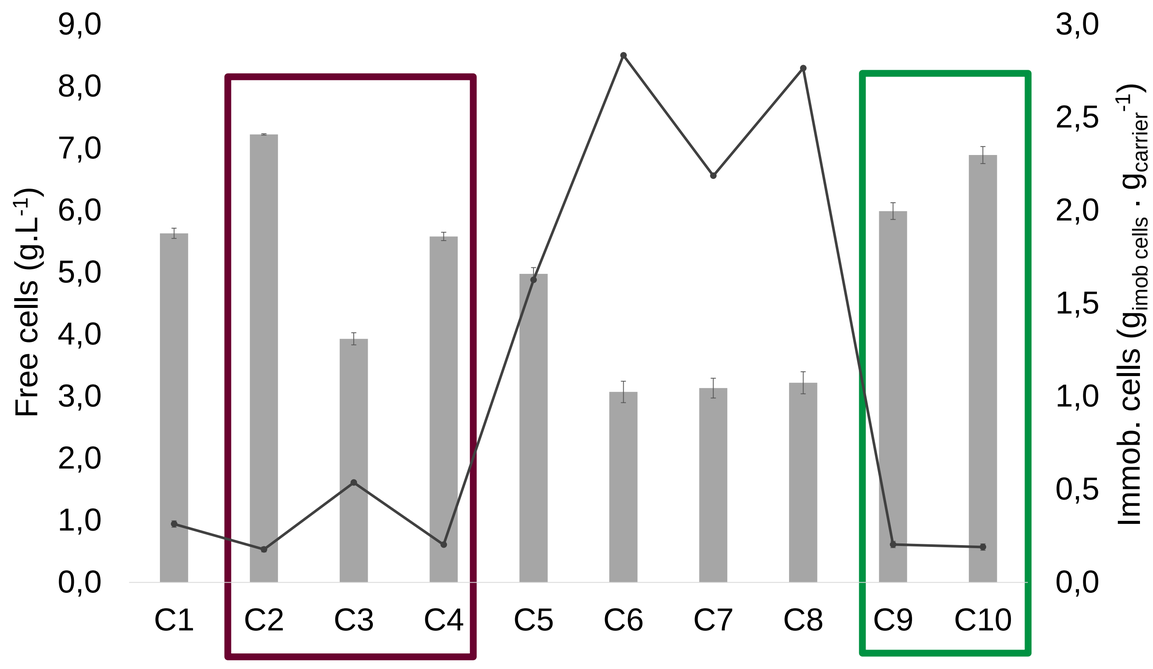
Results and Discussion

- **Water absorption index (WAI) and Critical humidity point (CHP)**

Carrier	WAI ($g.g_{dried\ matter}$)	CHP (%)
C1	5.9	50
C2	12.5	40
C3	12.9	25
C4	9.9	24
C5	7.6	43
C6	2.0	50
C7	1.8	50
C8	1.8	50
C9	26.2	13
C10	26.1	40

- ✓ WAI indicates the quantity of water that can be adsorbed by the material;
- ✓ CHP represents the quantity of water linked to the support that is not used by the microorganisms;
- ✓ Glass wool and polyester staple fiber presented higher WAI values and lower values of CHP, suggesting increased capability to adsorb *A. pullulans* cells.

- ***Aureobasidium pullulans*** **cells immobilization capability of the selected carriers**



- ✓ The studied carriers were able to adsorb cells, although some of the materials released an increased amount of cells to the fermentation medium;
- ✓ Polyurethane foams (C1, C2), glass wool (C9) and polyester staple fiber (C10) immobilized higher amount of cells;
- ✓ Mop (C6), pumice stone (C7) and porous stone (C8) presented lower ability to immobilize cells, and obtained higher free cells in the medium.

Conclusions

- ➢ The selected materials showed different capacities of immobilizing cells;
- ➢ The immobilization ability can be related to the physical-chemical properties, WAI and CHP, of the materials;
- ➢ Physical-chemical characterization and immobilization capability tests suggest that glass wool and polyester staple fiber are the most suitable materials to use during the fermentation processes;
- ➢ It is still crucial the understanding of the impact of the immobilization ability of the carriers on FOS production.

References

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