Biopolymer extraction assay from fungal biomass

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Abstract
The cultivation of Penicillium strain, isolated from rotten vegetables, on potatoe dextrose broth (PDB) medium enriched in arginine and mineral elements, allowed to obtain a yield of 31.7 mg/g of dry biomass and 9 mg/g of dry biomass into chitin and natural chitosan, respectively. The infrared spectroscopy analysis showed a great similarity between the infrared spectra of chitin and natural chitosan obtained and the commercial chitin and chitosan, respectively.
Keywords: Fungal biomass, chitin, natural chitosan, Penicillium, composition of the medium.

1. Introduction

Chitosan is becoming a biopolymer with many applications in different fields. It is a compolymer of glucosamine and N-acetyl glucosamine, is mainly derived from chitin and present in the cell walls of certain organisms such as fungi (Chatterjee *et al.*, 2005). After crustacean shells, fungal biomass is the second most important source of chitin and chitosan, whose quantities and qualities are strongly influenced by the nature and composition of the culture medium. Despite the low percentage of chitin and chitosan in the fungal walls, their interest lies in the fact that chitosan is naturally produced by enzymatic deacetylation. This ultrapure natural chitosan can be extracted and used in the medical, pharmaceutical and nutraceutical fields. Chitosan extracted from fungal sources has the potential to completely replace chitosan from crustaceans. In our work we have studied the influence of the composition of the medium on the quantities and quality of chitin and chitosan extracted from the *Penicillium* wall.

2. Methods

The strain of *Penicillium* sp. was grown on PDB enriched in mineral elements according to Table 1.

At the end of the fermentation, the biomass was recovered by centrifugation at 6000 rpm, for 10 min, after drying at 40 ° C., extraction of chitin and chitosan was carried out according to the method of Synowiecki and AI-Khateeb., (1997).

Table 1. Presentation of the conditions and compositions of the medium for the experiments to be carried out.

Medium N°1	Medium N°2	Medium N°3
100 ml (PDB) 1g arginine 2ml oligochitine 1.4g $FeSO_4$ 0.1g K_2HPO_4 3 weeks of incubation	100 ml (PDB) 3g arginine 1.4g NH_4Cl 1.4g $FeSO_4$ 0.1g K_2HPO_4 0.1g NaCl 3 weeks of incubation	500 ml (PDB) 20g glucose 1g arginine 1.4g NH_4Cl 0.1g NaCl 0.1g $CaCl_2$ 3 Weeks of incubation

3. Results

3.1. The yields of chitin and natural chitosan

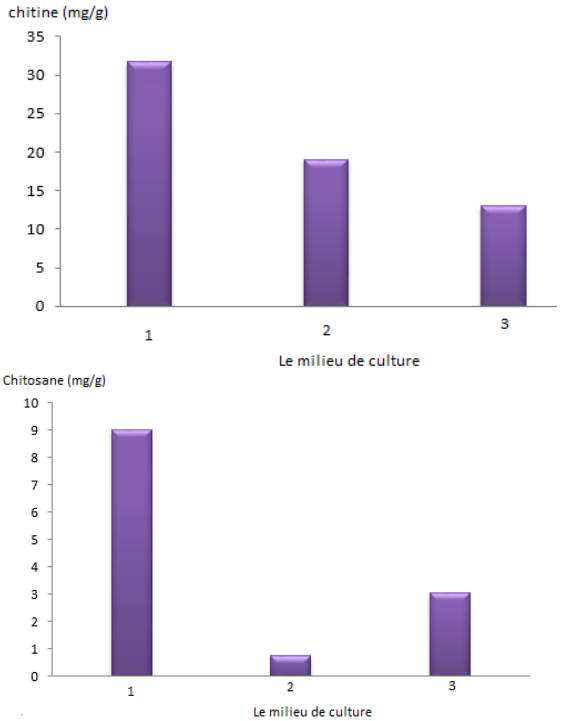

Figure 1. The yields of chitin and natural chitosan, in mg/ gram of dry biomass, depending on the culture medium

The results show that the yield of chitin is 31.7 mg/g of dry biomass and that of chitosan is 9 mg/g of dry biomass.

3.2. Infra-red spectroscopic analysis of chitin and natural chitosan

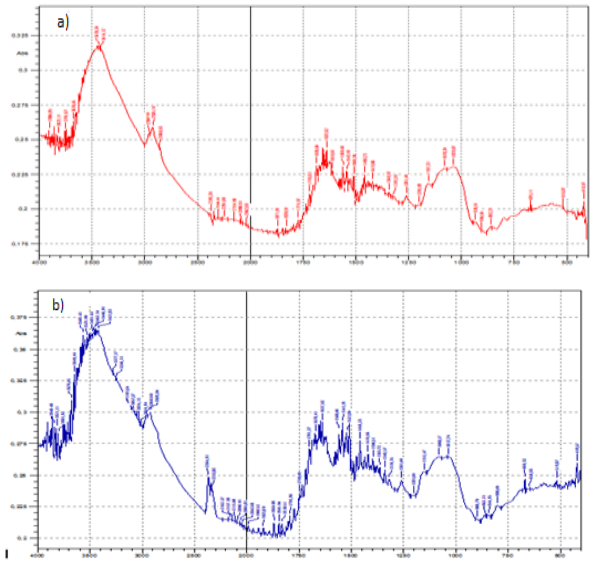

Figure 2. Infra-red spectra of (a) fungal chitin and (b) fungal natural chitosan

The comparison of infra-red spectra of recovered fungal biopolymers with those of chitin and commercial chitosan showed great similarity between them.

4. Conclusion

The objective of our work is the research of the composition of the culture medium which gives the large quantity of chitin and chitosan. The results show that medium N°1 gave the large amount of chitinous biopolymers 31.7 mg chitin/g dry biomass and 9 mg chitosan/g dry biomass. While the best quality of chitin and chitosan was obtained by cultivating the strain on medium N°3, since their infra-red spectra are similar to those of commercial polymers.

References

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Chatterjee S., Adhya M., Guha A.K. and Chatterjee B.P.(2005), Chitosan from *Mucor rouxii* : production and physic-chemical characterization, *Process Biochemistry*, **40**, 395-400.