MOLECULAR AND STRUCTURAL CHARACTERISTICS OF CHITOSANS PRODUCED BY ENZYME TREATMENT

Laidson P. Gomes(1), Eduardo M. Del Aguila(1), Cristina T. Andrade(2), Joab T. Silva(1), Vânia M. F. Paschoalin(1) Instituto de Química (1), Instituto de Macromoléculas Professora Eloisa Mano(2) - Universidade Federal do Rio de Janeiro, Cidade Universitária, Rio de Janeiro, CEP 21.949-909, Brazil. E-mail: emda@iq.ufrj.br

The physicochemical nature of chitin and chitosan, which influences the biomedical activities of these compounds as antimicrobials, food additives and agricultural materials, is strongly related to the source of chitin and the conditions of the chitin/chitosan production process. The principal characteristics of the polymers, degree of N-acetylation (DA) and crystallinity (Ic) have to be taken into consideration according to food application. The present work focuses on the study of the molecular features) of chitosan samples prepared from shrimp chitin conditioned by enzyme treatment (chitinase and chitin deacetylase). Chito-oligosaccharides obtained after chitinase hydrolysis were subsequently used as substrates for enzyme deacetylation with a purified form of chitin deacetylase. The decrease in crystallinity index (Ic) was evaluated by X-ray diffraction (XDR), obtained under the speed of 1° (2θ)/min with a pitch of 0.05° in the reflection mode, within the 2-35° (2θ) range. Fourier Transform Infrared (FT-IR) was used to estimate the DA from the transmittance ratio at 1320 cm⁻¹ and 1420 cm⁻¹. The resultant samples showed a DA of chitosan molecules inferior to 30%, a reduction of Ic from 57 to 15% for chitin and Ic of chitosan ranged between 57 and 32%. Hydrolysis of chitin polymers by chitinase reduced the hydrogen-type crystallinity of the molecule, resulting in the exposition of radicals present on the acetamide chitin and making those groups more accessible for deacetylation by chitin deacetylase.