Potential Application of Chitosan Nanoparticles Derived from Marine Fish Scales as Preservatives for Fishery Products

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Abstract

The establishment of nanotechnology to convert raw biomass material to useful lower weight molecules is potentially applied to produce chitosan nanoparticles as a food additive and preservative. This study aims to develop chitosan and its nanoparticles derived from chitin of different marine fish species as nutraceuticals for improving food quality, in particular as natural preservatives for fishery products by evaluating its nutritional values and antibacterial properties. The fish scales wastes of five marine fish species were used as raw materials for chemical extraction of chitin and further processed to become chitosan following the standard steps of deproteination, demineralisation and deacetyation. Chitosan was molecularly proven using Fourier Transform Infrared Spectroscopy (FTIR). Nanochitosan was prepared by adding drop wise a tripolyphosphate-pentasodium solution to chitosan solutions under stirring. Results of compositional analysis of the fish scales revealed that protein content was high (25–32 %), as well ashes (36–45 %) which attributed to minerals, while carbohydrates (12–19 %), and fat (4–7 %). Chitin yields (%) ranged from 17 to 61 %. Chitosan is a derivative of chitin if the percentage of diacetyl degree exceeds 50 % The absorption bands of FTIR of chitosan were within the range of standard chitosan. Nanoparticles of chitosan were obtained as particulate dispersions or solid particles with a size in the range of 255 to 438 nm. Nanoparticles of chitosan were sprayed onto the surface of the fishery products. Improved nutritional value of the nanoparticle coated products and its antibacterial ability have been proven. Nutraceutical applications of chitosan nanoparticles are discussed along with considering variation in the type of fishery products and storage duration.

Keywords: Chitosan, fish scales, fishery products, nanoparticles, preservatives

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