

Physicochemical characterization and antimicrobial analysis of vegetal chitosan extracted from distinct forest fungi species

ABSTRACT

The main goal of this investigation is to conduct a thorough analysis of the physical, chemical, and morphological characteristics of chitosan derived from various forest fungi. Additionally, the study aims to determine the effectiveness of this vegetal chitosan as an antimicrobial agent. In this study, *Auricularia auricula-judae*, *Hericium erinaceus*, *Pleurotus ostreatus*, *Tremella fuciformis*, and *Lentinula edodes* were examined. The fungi samples were subjected to a series of rigorous chemical extraction procedures, including demineralization, deproteinization, discoloration, and deacetylation. Subsequently, the chitosan samples were subjected to a comprehensive physicochemical characterization analysis, encompassing Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD), degree of deacetylation determination, ash content determination, moisture content determination, and solubility determination. To evaluate the antimicrobial efficacy of the vegetal chitosan samples, two different sampling parameters were employed, namely human hand and banana, to assess their effectiveness in inhibiting microbial growth. Notably, the percentage of chitin and chitosan varied significantly among the distinct fungal species examined. Moreover, EDX spectroscopy confirmed the extraction of chitosan from *H. erinaceus*, *L. edodes*, *P. ostreatus*, and *T. fuciformis*. The FTIR spectra of all samples revealed a similar absorbance pattern, albeit with varying peak intensities. Furthermore, the XRD patterns for each sample were nearly identical, with the exception of the *A. auricula-judae* sample, which exhibited sharp peaks at $\sim 37^\circ$ and $\sim 51^\circ$, while the crystallinity index of this same sample was approximately 17% lower than the others. The moisture content results indicated that the *L. edodes* sample was the least stable, while the *P. ostreatus* sample was the most stable, in terms of degradation rate. Similarly, the solubility of the samples showed substantial variation among each species, with the *H. erinaceus* sample displaying the highest solubility among the rest. Lastly, the antimicrobial activity of the chitosan solutions exhibited different efficacies in inhibiting microbial growth of skin microflora and microbes found on the peel of *Musa acuminata* × *balbisiana*.