Synthesis of Biocompatible Bacterial Cellulose-Chitosan Composite from Nata de Coco and Squid Gladius

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ABSTRACT

Recently, studies have been conducted utilizing the pellicle of Nata de Coco (NC) as the sustainable source of bacterial cellulose (BC) and Squid Gladius (SG) for chitosan. In this work, the synthesis of biocompatible bacterial cellulose–chitosan composite (BCC) from NC and SG was conducted. In addition, the effect of varying chitosan concentration (2%, 5%, 8% w/v) on the physicochemical properties (morphology, water holding capacity, and tensile strength) and biocompatibility using Simulated Body Fluid (SBF) was investigated. The BCC composite showed a denser and more homogenized structure compared to the BC pellicle as was seen from the scanning electron microscopy (SEM). The Fourier Transform-infrared spectroscopy (FTIR) results demonstrated the spectra of the pellicles in the 2800 to 1200 cm^{-1} wave range while the bands for the amide groups were observed at peaks 1613, 1550, and 1337 cm^{-1} associated with the presence of chitosan. The highest water holding capacity of 581% was performed by 8% w/v chitosan containing BCC while the 5% w/v chitosan containing BCC tends to endure more tensile force. The SEM images of the BCC pellicles that had undergone the SBF process showed the gradual progress of the formation of the hydroxyapatite (HaP) crystals with Ca-P ratio of 1.67 on the third day as revealed by the X-ray Fluorescence (XRF) indicating a biocompatible property. The FTIR analysis showed all typical absorption characteristics of HaP, ranging from bands observed at 3555 and 622 cm^{-1} due to the stretching mode of hydrogen-bonded ions and liberational mode of hydrogen-bonded ions, respectively. The results of this study showed the potential of producing biopolymers from biomass for possible wound dressing products for biomedical applications.

Keywords: *bacterial cellulose, chitosan, simulated body fluid, hydroxyapatite crystals*