REHYDRATION AND ANTIOXIDANT ABILITY OF BACTERIAL CELLULOSE NANO-COMPOSITES FILM FORTIFIED BY HYDROLYZED GELATIN PEPTIDES

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Bacterial cellulose (BC) is a nanoscale and useful biomaterial with a fine fiber network and high water holding capacity. However, dried BC exhibits poor rehydration ability. The modified BC (HBC) prepared with in-situ fermentation by adding hydroxypropylmethylcellulose (HPMC) exhibited desirable rehydration ratio and low-molecular-weight-protein adsorption by decreasing crystallinity and modifying BC structure. The present study investigated the rehydration ability and antioxidant activity of composites of hydrolyzed gelatin peptides (HGP) and HBC. The HGP with molecular weights less than 9 kDa were obtained by hydrolyzing gelatin with a combination of 1% alcalase and 1.5% pronase E at 50 °C for 2 h, and exhibited the highest scavenging effect on DPPH radical and reducing power. The HGP/HBC nanocomposites exhibited higher rehydration ratios than composites prepared with gelatin. According to SEM images, gelatin and HGP successfully penetrated the cellulose network in composite films prepared using both immersion (IM) and adsorption (DA) methods. The high hydrophilic property of HGP resulted in a rehydration ratio of approximately 180% at a HGP/HBC ratio of 4.5:1 (W/W) in DA composites. These dried HGP/HBC composites also displayed highest efficiency for restoring their original thickness and appearance. The 1 min rehydrated HGP/HBC composites possessed similar mechanical properties to the original wet type composites. Owing to these characteristics, the modified BC has potential use in preparation of composites for application in rehydratable biomembranes, such as food package, cosmetic and biomedicine materials, with high storage ability and multifunctional properties.