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Production of chitosan nanoparticles with polyphenols for incorporation in bioactive food formulations

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Abstract

The design of bioactive nanoparticles for food incorporation has been a new challenge for food researchers. Aiming the development of bioactive food formulations with antimicrobial activity against pathogenic intestinal bacteria, the optimization of the production of chitosan nanoparticles loaded with polyphenols was performed. *Bacillus cereus, Escherichia coli O157:H7, Staphylococcus aureus, Salmonella typhimurium, Listeria innocua*, and *Yersinia enterocolitica* strains were the target bacteria. A first study to evaluate the antimicrobial activity of the polyphenols such as rosmarinic acid (RA), protocatechuic acid (PA) and the 2,5-dihydroxybenzoic acid (DHBA) and of chitosan of low (LMWC) and high molecular weights (HMWC) (107 kDa and 624 kDa) was performed. The individual compounds, as well their mixtures were tested using the minimum inhibitory concentration (MIC) determination based on the M07-A8 standard (2009). The effective concentrations of polyphenols and chitosans chosen

for each compound (CS and polyphenols) were the following: for chitosans LMWC 0.2 %, HMWC 0.4 %, RA 0.6 %, PA 0.3 %, and DHBA 0.3 % (m/v), and the nanoparticles were produced by ionic gelation. The physical properties (particle size, polidispersity index and zeta potential) of the nanoparticles were obtained by DLS and the entrapment efficiencies (EE%) were also calculated. The antimicrobial activity of the nanoparticles against the intestinal bacteria was obtained also by MIC determination. The particle sizes of the NP were in the range of 300-800 nm, with zeta potential of ca. 30 mV and EE% of 60-90 %. The nanoparticles also exhibited high % of inhibition especially the ones produced with LMWC and RA and HMWC with DHBA. The highest inhibition observed was against E. coli O157 and B. cereus.

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