

ABSTRACT

Centella asiatica (CA, Bao-bog, Pennywort) has been highlighted for its high phytochemical content, particularly of phenolic compounds. The bioavailability, stability, and bioactivity of these compounds can be enhanced by nanoencapsulation. Poly lactic-co-glycolic acid (PLGA) nanoparticles containing phenolic extract of CA were synthesized by an adapted emulsion-evaporation method at the ratio (CA-Crude extract : PLGA) 1:2, 1:3, and 1:4 with Ethanol, Hexane, and Chloroform extraction solvents. The antioxidant activity was evaluated by DPPH assay, FRAP assay and total phenolic content (TPC). The modified agar well diffusion method was used to detect the antibacterial activity of CA-PLGA-NPs (100, 200, and 300 $\mu\text{g}/\text{mL}$) against 7 foodborne bacteria. The entrapment and loading efficiencies, solubility, stability, release kinetic in vitro and simulated gastrointestinal conditions were also used to test the efficiency of the nanoparticles.

The result from the DPPH and FRAP assay showed that crude extract has the best antioxidant value ($75.83 \pm .82 \mu\text{g}/\text{mL}$ (IC_{50}) and $1.85 \pm 0.53 \text{ mmol Fe}^{2+}/\text{mg}$ dried wt.). While the highest amount of antioxidant represented by TPC was CA-PLGA-NPs.1:4 ($55.95 \pm 27.24 \mu\text{g GAE}/\text{mg}$.) For antibacterial activity, the CA-PLGA-NPs showed almost 5 times significantly higher than crude extract. and it was significantly affected on gram-positive bacteria *S. aureus* and *B. subtilis* ($p < 0.05$). The entrapment and loading efficiencies of CA-PLGA-NPs. were 1:4 > 1:3 > 1:2 and Ethanol > Hexane > Chloroform. While crude has the highest solubility ($682.89 \pm 22.28 \mu\text{g}/\text{mL}$). CA-PLGA-NPs. also showed stability in constant releasing of CA in PBS (0.01M, pH 2.0 and pH 7.4). In addition, pH 2.0 the sample tends to release CA faster and better, while at pH 7.4 it releases slower and lower in percentage. These results indicated that CA-PLGA-NPs provide promising to increase the bioavailability of CA, which can be developed into a broad spectrum of usage.