In vitro release and biological activities of Carum copticum essential oil (CEO) loaded chitosan nanoparticles

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In recent years, the unparalleled and functional properties of essential oils have been extensively reported, but the sensitivity of essential oils to environmental factors and their poor aqueous solubility have limited their applications in industries. Hence, we encapsulated CEO in chitosan nanoparticles by an emulsion-ionic gelation with pentasodium tripolyphosphate (TPP) and sodium hexametaphosphte (HMP), separately, as cross-linkers. The nanoparticles were analyzed by Fourier transform infrared spectroscopy (FT-IR), ultraviolet–visible spectroscopy (UV-Vis), differential scanning calorimetry (DSC), scanning electron microscope (SEM) and dynamic light scattering (DLS). The encapsulation efficiency (EE) and loading capacity (LC) of CEO in chitosan nanoparticles increased with the increase of initial CEO amount. The nanoparticles displayed an average size of 30-80 nm with a spherical shape and regular distribution. *In vitro* release profiles exhibited an initial burst release and followed by a sustained CEO release at different pH conditions. The amount of CEO release from chitosan nanoparticles was higher in acidic pH to basic or neutral pH, respectively. The biological properties of CEO, before and after the encapsulation process were evaluated by 2, 2-diphenyl-1-picrylhydrazyl radical (DPPH) and agar disc diffusion method, respectively. The results indicated the encapsulation of CEO in chitosan nanoparticles could be protected the quality.

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