

Formulation, characterization and biological activity screening of sodium alginate-gum arabic nanoparticles loaded with curcumin

ABSTRACT

The approach of drug delivery systems emphasizes the use of nanoparticles as a vehicle, offering the optional property of delivering drugs as a single dose rather than in multiple doses. The current study aims to improve antioxidant and drug release properties of curcumin loaded gum Arabic-sodium alginate nanoparticles (Cur/ALG-GANPs). The Cur/ALG-GANPs were prepared using the ionotropic gelation technique and further subjected to physico-chemical characterization using attenuated total reflectance–Fourier transform infrared (ATR-FTIR), X-ray diffractometry (XRD), differential scanning calorimetry (DSC), size distribution, and transmission electron microscopy (TEM). The size of Cur/ALG-GANPs ranged between 10 ± 0.3 nm and 190 ± 0.1 nm and the zeta potential was -15 ± 0.2 mV. The antioxidant study of Cur/ALG-GANPs exhibited effective radical scavenging capacity for 1,1-diphenyl-2-picrylhydrazyl (DPPH) at concentrations that ranged between 30 and 500 $\mu\text{g/mL}$. Cytotoxicity was performed using MTT assay to measure their potential in inhibiting the cell growth and the result demonstrated a significant anticancer activity of Cur/ALG-GANPs against human liver cancer cells (HepG2) than in colon cancer (HT29), lung cancer (A549) and breast cancer (MCF7) cells. Thus, this study indicates that Cur/ALG-GANPs have promising anticancer properties that might aid in future cancer therapy.

Keyword: Curcumin; Gum Arabic; Sodium alginate; Nanoparticles; Cytotoxicity