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Synthesis and characterization of chitosan nanoparticles loaded with greater celandine (Chelidonium majus L.) essential oil as an anticancer agent on MCF-7 cell line

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Abstract

Essential oils (EOs) of greater celandine (GC) roots and leaves were extracted, and gas chromatography-mass spectrometry (GC-MS) was used for analyzing them. Then they were loaded into chitosan nanoparticles (CNPs) using emulsion-ionic gelation method. CNPs loaded with greater celandine root essential oil (GCREO) and leave essential oil (GCLEO) were synthesized (size 76.5-115.3 nm) using an emulsion-ionic gelation method. Fourier Transform Infrared (FT-IR), spectroscopy, scanning electron microscope (SEM), and dynamic light scattering (DLS) were used for characterization of the formed NPs. Good encapsulation efficiency was confirmed for GCREO (62.5%) and GCLEO (69.1%) in CNPs. According to the MTT results, the synthesized NPs showed a dose-dependent effect on MCF-7 cell line. The inhibitory concentration (IC_{50}) values for GCREO, GCLEO, CSNRs-GCREO and CNPs-GCLEO samples were 126.4, 90.2, 77.6, and 41.5 µg/mL, respectively. The highest rate of apoptosis was obtained in the CNPs-GCLEO group (63.73%). The results revealed that the cytotoxicity of CSNRs-GCREO and CNPs-GCLEO against MCF-7 cell line was significantly higher than that of their free form, implying that encapsulation of GCREO and GCLEO in CNPs is an efficient technique for improving their anti-cancer activity against MCF-7 cell line.

Keywords: Apoptosis; Breast cancer; Chelidonium majus L.; Chitosan nanoparticles; Encapsulation.

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