Hydrogel beads bio-nanocomposite based on *Kappa-Carrageenan* and green synthesized silver nanoparticles for biomedical applications

ABSTRACT

This paper describes the fabrication and characterization of bio-nanocomposite hydrogel beads based on Kappa-Carrageenan (κ-Carrageenan) and bio-synthesized silver nanoparticles (Ag-NPs). The silver nanoparticles were prepared in aqueous Citrullus colocynthis seed extract as both reducing and capping agent. Cross-linked κ-Carrageenan/Ag-NPs hydrogel beads were prepared using potassium chloride as the cross-linker. The hydrogel beads were characterized using XRD and FESEM. Moreover, swelling property of the hydrogel beads was investigated. The Ag release profile of the hydrogels was obtained by fitting the experimental data to power law equation. The direct visualization of the green synthesized Ag-NPs using TEM shows particle size in the range of 23 ± 2 nm. The bio-nanocomposite hydrogels showed lesser swelling behavior in comparison with pure κ-Carrageenan hydrogel. Regardless the slow Ag release, κ-Carrageenan/Ag-NPs presented good antibacterial activities against Staphylococcus aureus, Methicilin Resistant Staphylococcus aurous, Peseudomonas aeruginosa and Escherichia coli with maximum zones of inhibition 11 ± 2 mm. Cytotoxicity study showed that the bio-nanocomposite hydrogels with non-toxic effect of concentration below 1000 μg/mL have great pharmacological potential and a suitable level of safety for use in the biological systems.

Keyword: Hydrogel; Silver nanoparticles; Green method; Citrullus colocynthis