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Gmelina arborea Roxb. Aqueous Extract Loaded Chitosan Nanoparticles: Formulation and Characterization

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Decoctions prepared from the bark of *Gmelina arborea* have been employed in Sri Lankan traditional medicine as a remedy against diabetes mellitus. Encapsulation of bioactive secondary metabolites of *G. arborea* could enhance their therapeutic potential and provide controlled release. Amongst the different matrices available as options to encapsulate bioactive compounds, chitosan-based nanoformulations have received favourable attention due to their advantageous biological properties such as biodegradability, biocompatibility and nontoxicity. Dried powdered stem-bark *G. arborea* (30 g) was separately extracted using deionized water, acetone, ethyl acetate, dichloromethane (400 mL each) under ultrasonication (40 kHz, 37 ºC, 30 min). The α-amylase inhibitory assay was conducted on each dried extract dissolved in buffer or DMSO, in triplicate. The total phenol content (TPC) and flavonoid content (TFC) were determined according to Folin-Ciocalteu and aluminium chloride methods, respectively. The aqueous extract which showed the highest α-amylase inhibitory activity (IC_{50} 0.19±0.04 mg/mL), TPC (12.97±0.12 mgGAE/g) and TFC (1.58±0.02 mgGAE/g) was subjected to nanoencapsulation. The aqueous extract of *G. arborea* was encapsulated in chitosan-tripolyphosphate (CS-TPP) by ionotropic gelation method under magnetic stirring and homogenizing. Dynamic light scattering analysis of Z-average and polydispersity index (PDI) indicated that magnetic stirring method (104.92±1.22 nm, PDI 0.418) was more suitable for nanoformulations than homogenizing (140.28±5.34 nm, PDI = 0.403). Aqueous extracts at varying (i.e. 0.125% w/v, 0.250% w/v, 0.375% w/v) were encapsulated to CS-TPP nanoformulations. Unloaded polyphenols were separated by centrifugation (10,000 rpm, 4 ºC, 30 min) and free polyphenol contents were determined by Folin Ciocalteu assay in triplicates. The highest encapsulation efficiency (EE) (57.64±2.38%) and loading capacity (LC) (0.25±0.07%) were observed for 0.375% w/v aqueous extract. Further studies on α-amylase inhibitory activity of loaded CS-TPP nanoformulations are in progress to investigate the antidiabetic activity towards the development of commercial nano-nutraceuticals with enhanced therapeutic potential.

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