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Standardization, Release Kinetics, Acute Toxicity Assessment of Nanoencapsulated Aqueous Extract of *Coccinia grandis* L. (Ivy Gourd)

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Abstract

Coccinia grandis L. (Ivy Gourd) has been widely used in traditional medicine preparations as a glucose-lowering agent. Polyphenols were found to be mainly responsible for the antidiabetic activity of *C. grandis*. Nano-encapsulation of aqueous extract of *C. grandis* (ACG) is a timely approach to enhanced controlled release of polyphenol and to preserve the stability of phytoconstituents in developing novel pharmaceutical agents. Our research group confirmed the successful loading of ACG into the alginate matrix through standard characterization techniques previously. The present study aimed to standardize ACG, assess release kinetics, and determine the acute toxicity/adverse effects of ACG-loaded alginate nanoparticles. Standardization of ACG was conducted based on the standard protocols. The *in vitro* release of bioactives from nano-encapsulated ACG was determined at both pH 1.2 and pH 6.8 and data were fixed into zero-order, first-order, Hixon-Crowell and Higuchi models. The accelerated stability of nano-encapsulated ACG was evaluated based on total polyphenol content and thin layer chromatography fingerprints over a month at 27 °C and 5 °C. Acute toxicity assessment was carried out with the oral administration of nano-encapsulated ACG at a range of selected doses (110–2000 mg/kg) in healthy Wistar rats, complying with Organisation for Economic Co-operation and Development (OECD) guidelines. Proximate analysis showed moisture content, total ash, acid-insoluble ash, and water-soluble ash values of 0.49±0.00%, 3.96±0.44%, 0.70±0.01%, and 1.13±0.02%, respectively. Phenolics, flavonoids, tannins, alkaloids, saponins, steroids, and terpenoids were present in ACG as phytoconstituents. The ACG did not detect heavy metals, including lead, arsenic, cadmium, and mercury. The release of polyphenols was obtained in a controlled manner, and the release pattern was best fitted to zero-order and first-order kinetic models at pH 6.8. In contrast, the release of polyphenols was restricted at pH 1.2 due to forming a compact acid-gel structure of ACG-loaded nanoparticles. The accelerated stability assessment revealed that phytoconstituents were well-preserved upon encapsulation. The acute toxicity assessment revealed that the selected doses were safe for further studies. In conclusion, nanoencapsulated ACG was found to be a safe, stable drug lead with a controlled release profile that can be used to develop commercially viable pharmaceutical agents.

Keywords: Alginate nanoparticles, *Coccinia grandis* L., Standardization

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