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Exploring nutritional composition and bioactive properties of Gymnema lactiferum (Ceylon cow plant) for food applications

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Abstract

Gymnema lactiferum (*G. lactiferum*) is a medicinal plant that has played a significant role in traditional medical systems(1). This plant has been used in Ayurveda, Siddha, and Unani medicinal practices to address various health conditions, including diabetes, rheumatoid arthritis, as a diuretic agent, and for digestive disorders. However, there are few scientific studies on its nutritional value and bioactive compounds. Additionally, no prior study has endeavoured to introduce this plant's extracts into food and beverages. Accordingly, the objectives of this study were to extract bioactive compounds from *G. lactiferum* using different extraction methods and to analyse its nutritional value and bioactivity. *G. lactiferum* leaf powder was extracted using different techniques and quantified for mineral and proximate composition, as well as phenolic, flavonoid, and antioxidant properties. Accelerated solvent extraction (ASE), water bath extraction (WB), and ultrasonication (US) techniques were used with 100% water extract (WE) and 50% aqueous ethanol extract (EE) as extracting solvents. Total phenolic content (TPC), total flavonoid content (TFC), and total antioxidant capacity (TAC) using 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity(2) were measured. Statistical analysis was carried out using one-way analysis of variance (ANOVA), followed by Tukey's test for post hoc comparison analyses. The composition included carbohydrates (19.3%), crude protein (17.5%), dietary fibre (35.1%), and fat content (4.8%). The mineral profile included potassium (4200 mg/100g), calcium (950 mg/100g), phosphorus (240 mg/100g), magnesium (240 mg/100g), iron, zinc, copper, and chromium. The extracts yielding the highest TPC (11.12 ± 0.32 mg gallic acid equivalents/g), TFC (4.73 ± 0.22 mg quercetin equivalents/g), and TAC (791.00 ± 18.9 mg ascorbic acid equivalents/mg) values were for WB-WE, ASE-EE, and WB-EE, respectively. The results indicate that water extracts in all three methods exhibited pronounced efficacy in the extraction of phenolic compounds. All 50% ethanol extracts demonstrated heightened efficiency in the extraction of flavonoids from *G. lactiferum* leaf powder. Furthermore, ethanol extracts exhibited higher antioxidant activity compared to the water extracts across all extraction methods. The results of this study show that *G. lactiferum* is a significant source of various nutritional compounds, such as crude protein, dietary fibre, and potassium-like minerals, as well as bioactive compounds. The phenolic, flavonoid, and antioxidant characteristics varied greatly depending on the extraction method and solvent used. These results provide a better understanding of the possible uses of *G. lactiferum* in the development of functional food.

Keywords: *G. lactiferum*, extraction efficiency, nutritional analyses, bioactivity, functional foods

Ethics Declaration: Yes

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