

Optimization of extraction methods for Coumarin from *Mikania glomerata* using conventional and non-conventional techniques

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Highlights

Evaluated different extraction methods for coumarin from *Mikania glomerata*.

Cellulase-assisted extraction presented the highest coumarin yield, reaching 97%, followed by the turbulization method with 74.4%, and maceration with 66.9%.

Enzymatic extraction demonstrated notable advantages, including high reproducibility and shorter extraction times. The cost of the cellulase enzyme remains a limiting factor for large-scale or industrial applications.

Abstract

Mikania glomerata (guaco) is a medicinal plant traditionally employed in phytotherapeutic preparations aimed at treating respiratory disorders such as cough and bronchitis. Its therapeutic effectiveness is primarily attributed to the presence of coumarin, a compound belonging to the benzopyrone class, along with other secondary metabolites such as o-coumaric acid, which may enhance the pharmacological effects of the species. Given the increasing interest in extracts enriched with active compounds, the optimization of extraction techniques is crucial for improving both yield and quality of the obtained extracts. This study aimed to investigate and compare different extraction methodologies to maximize the concentration of coumarin in guaco extracts. Two non-conventional methods—turbulization and cellulase enzyme-assisted extraction followed by turbulization—were optimized and compared to the traditional method of maceration in 70% ethanol. Quantification of bioactive compounds was performed via high-performance liquid chromatography (HPLC), using a Thermo Scientific Ultimate 3000 UHPLC+ focused system, C18 column, and a mobile phase consisting of methanol and water acidified with 0.1% phosphoric acid. Detection was carried out at multiple wavelengths (220 nm, 254 nm, 280 nm, and 340 nm), enabling precise identification of target metabolites. Statistical analysis was conducted using Statistica software, version 10, ensuring consistency and robustness of the results. The findings demonstrated that the enzymatic method using cellulase yielded significantly higher extraction efficiency, reaching 97% for coumarin, while the turbulization method achieved 74.4% and maceration only 66.9%. The superior performance of enzymatic extraction is associated with advantages such as high reproducibility, faster processing, and elevated yields, although the cost of the enzyme remains a limitation for large-scale implementation. In conclusion, the method employing cellulase enzyme is the most effective for obtaining *M. glomerata* extracts with high coumarin concentration, presenting a promising alternative for the pharmaceutical and phytotherapeutic industries interested in the valorization of bioactive compounds from medicinal plants.

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References:

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