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Optimization of the extraction of phenolic compounds from *Ganoderma lucidum*.

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Ganoderma lucidum (Curtis) P. Karst, a rich source of several bioactive compounds, has been utilized for its medicinal and nutraceutical purposes since earliest history. Among its bioactive constituents, the phenolic content has been widely reported to be responsible for some its bioactive properties. Recent trends in bioactive compounds' recovery have been focused on finding the best techniques that maximally extract valuable compounds from natural matrices.

This study is aimed at optimizing the extraction of phenolic compounds (Ph) from *G. lucidum* using conventional techniques such as Soxhlet extraction (SE), heat assisted extraction (HAE) and comparing with ultrasound assisted extraction (UAE), considered a more sustainable method. The SE technique was optimized by applying 7 cycles while to effectively carry out the optimization of HAE and UAE, response surface methodology (RSM) was applied using a circumscribed central composite design with three independent variables (time, ethanol content, temperature or ultrasonic power). The extraction yield and total Ph were maximized and the optimal conditions were determined.

For the SE technique, a positive linear dependency was achieved for the extraction yield, while for the Ph content expressed in terms of mg equiv. gallic acid (EGA) per g dw (dry weight), a significantly increase was observed up to the 5th cycle before a gradual decrease. The conditions that maximize the responses (extraction yield and total phenolics) were: 78.9 min, 90.0 °C and 62.5 % ethanol and 40 min, 100.0 W and 89.5% ethanol for HAE and UAE, respectively. The latter was the most effective, capable of achieving 4.9 ± 0.6 % extraction yield and 106.6 ± 16.2 mg EGA/g dw. The extraction process optimization proved to be a viable option for obtaining phenolic rich extracts from *G. lucidum* that can be used as bio-based ingredients.

Keywords: *Ganoderma lucidum*; Phenolic compounds; Extraction; Response surface methodology.

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