

Optimization of microwave-assisted extraction of flavonoids and antioxidants from *Vernonia amygdalina* leaf using response surface methodology

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A B S T R A C T

In this study, the microwave-assisted extraction (MAE) variables were optimized using a face-centered central composite design of response surface methodology for optimal recoveries of total flavonoid content (TFC) and antioxidant capacities (DPPH and ABTS) of *Vernonia amygdalina* leaf extract. The independent variables were irradiation time (5–15 min), microwave power level (400–600 W), temperature (90–110 °C), and feed-to-solvent ratio (0.08–0.13 g/ml). The ANOVA results showed that TFC, DPPH and ABTS radical scavenging activities were significantly ($p < 0.0001$) affected by irradiation time, microwave power level and feed-to-solvent ratio, indicating a good agreement between the experimental and pre-dicted values. The optimal conditions for maximum recoveries of TFC (87.05 ± 1.03 mg QE/g d.w. ($n = 3$)) and antioxidant capacities (DPPH scavenging of $94.05 \pm 1.03\%$ ($n = 3$), and ABTS scavenging of $95.93 \pm 0.99\%$ ($n = 3$)) were 7 min of irradiation time, 416 W of microwave power level, 100 °C of temperature, and 0.10 g/ml of feed-to-solvent ratio. More so, the optimized extract from MAE was compared with that of Soxhlet extraction technique, the extract from MAE possesses a high capacity of inhibiting antioxidants. Likewise, more chemical components from the GC–MS analysis were identified for the extract from MAE.

Keywords: *Vernonia amygdalina* leaf Flavonoid; Antioxidant; Extraction; GC–MS analysis; Response surface methodology