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**Optimisation of thyme essential oil extraction by microwave: an investigation
by Box–Wilson central composite design (CCD)**

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A B S T R A C T

In this study, response surface methodology based on the Box–Wilson central composite design (CCD) was employed to optimise the extraction of thyme essential oil using microwave-Assisted Steam Distillation (MASD). Two principal factors, steam flow rate (Q) and microwave heating power (P), were systematically investigated to evaluate their effects on essential oil yield and extraction kinetics. Statistical analysis via ANOVA confirmed the significance of the model, revealing complex interactions between parameters. An optimal condition was established, achieving a high essential oil yield with enhanced extraction speed. The strong determination coefficient ($R^2 = 0.97$) validated the model's robustness, suggesting promising applications for industrial scaling.

Keywords: Thyme essential oil; Microwave extraction; Response surface methodology; Central composite design; ANOVA.

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