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Comprehensive Chemical Profiling of Sweet Basil (*Ocimum Basilicum* L.) Essential Oil: Insights from Hydrodistillation and GC-MS Analysis

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Structured Abstract

Background: The integration of culinary herbs into both cuisine and traditional medicine has been a longstanding practice across cultures, reflecting their unique aromatic, flavoring, and therapeutic properties. Despite, the escalating threat of antibiotic resistance underscores the urgent need for novel antimicrobial agents. While *Ocimum basilicum* L. (sweet basil) is globally recognized for its bioactive potential, its chemical composition and antimicrobial properties in Malaysian cultivars remain underexplored.

Methods: This study extracted essential oil from Malaysian-grown *O. basilicum* leaves via hydrodistillation (Clevenger apparatus). The heating mantle will be set to boiling point 100°C, and the mixture will be allowed to boil for 6 hours. and characterized its chemical profile using gas chromatography-mass spectrometry (GC-MS).

Results: The hydrodistillation of fresh leaves yielded 0.26% (v/w) of aromatic, light-yellow essential oil. GC-MS analysis identified 35 bioactive compounds (79.51% of total composition), dominated by sesquiterpene hydrocarbons (38.86%) and phenylpropanoids (35.87%). Methyl chavicol (29.08%), trans-α-bergamotene (13.91%), and tau-cadinol (11.06%) emerged as major constituents, revealing a chemotype distinct from basil oils reported in Europe, the Middle East, and South Asia. Notably, the exceptionally low linalool content (1.75%) and high tau-cadinol concentration—rarely documented in prior studies—highlight the influence of Malaysia's unique agroclimatic conditions on phytochemical biosynthesis.

Conclusion: These findings not only demonstrate the efficacy of hydrodistillation in capturing oxygenated sesquiterpenes like tau-cadinol but also position Malaysian basil as a promising source of region-specific bioactive compounds. The study provides critical insights into optimizing extraction protocols and underscores the potential of *O. basilicum* essential oil as a natural antimicrobial alternative, offering a strategic avenue to combat antibiotic-resistant pathogens.

Keywords: Sweet Basil, Essential Oil, *Ocimum Basilicum* L. and hydroditillation

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