

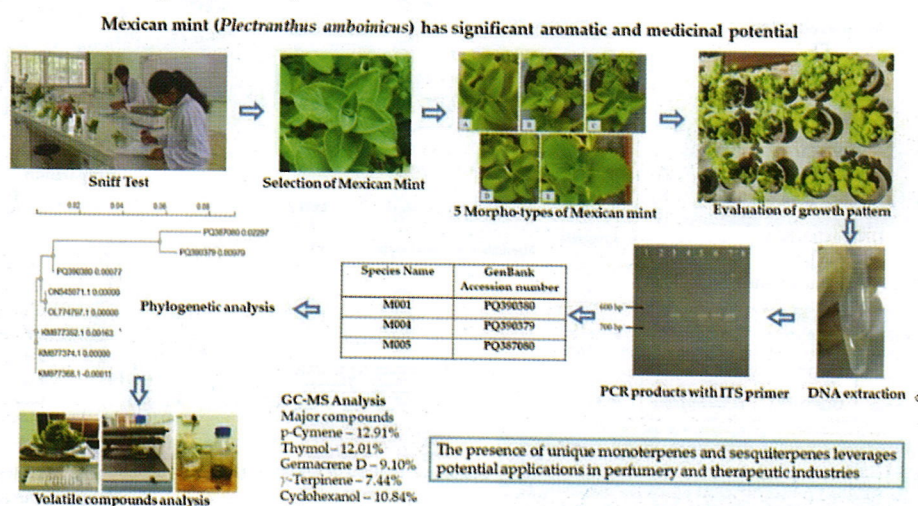
## Characterization of Aromatic, Morphological, and Genetic Diversity in Mexican Mint (*Plectranthus amboinicus*) for Sustainable Fragrance and Medicinal Applications

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Mexican mint (*Plectranthus amboinicus*), an aromatic and medicinal herb from the family Lamiaceae, holds immense potential for the fragrance and pharmaceutical industries. As an indigenous plant, its utilization aligns with sustainable and eco-friendly agricultural practices. This study evaluated its aromatic, morphological, and genetic diversity to support its sustainable use and value-added applications. An initial sniff test of 38 aromatic plants from home gardens and public markets in Jaffna, Mullaitivu, and Kilinochchi ranked Mexican mint highly in aroma preference and intensity. Five distinct morphotypes were identified and coded as M001, M002, M003, M004, and M005 based on morphological traits such as leaf margin type and dentation count. Three morphotypes (M001, M004, M005) with higher aroma intensity were selected for molecular analysis. Internal Transcribed Spacer (ITS) markers confirmed species identity and genetic diversity. Phylogenetic analysis of Sri Lankan sequences (GenBank: PQ387080, PQ390379, PQ390380) revealed unique genetic traits compared to Indian and Indonesian sequences. Sequence PQ390380 from Jaffna, exhibited a distinct grouping pattern, indicating local adaptations. M001, the morphotype with the highest aroma, underwent GC-MS analysis, identifying 28 volatile organic compounds (VOCs), including *p*-Cymene (12.91%), Thymol (12.01%), Cyclohexanol (10.84%), and Gamma-Terpinene (7.44%). These compounds, linked to antimicrobial, anti-inflammatory, and antioxidant properties, highlight the plant's therapeutic potential. The unique chemical composition of *P. amboinicus* suggests broader pharmacological applications. Its indigenous status, genetic, and aromatic diversity support selective breeding, essential oil production, and eco-friendly agriculture, contributing to the sustainable utilization of local plant resources.

**KEYWORDS:** GC-MS analysis, Genetic diversity, Morphological diversity, *Plectranthus amboinicus*, Volatile organic compounds



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