Current status, gaps in knowledge and research needs for aromatic plants in Mexico

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Aromatic plants and essential oils in Mexico, one of the biodiversity hotspots, have been scantly studied. Approximately 30,000 plant species have been described in this country, from which *ca.* 600 have been considered aromatic plants (1). In 1949 the first study related with essential oils in Mexico was published, since then the number of scientific publications has been scarce (ca. 300). From 2004 up to date this number has shown an exponential growth, representing less than 1% of worldwide publications. Thirty-one botanical families have been studied, including 117 species, with 75% of them being natives. Asteraceae had the highest number of records (27%), followed by Lamiaceae (18%), Burseraceae (8%), Myrtaceae (7%) and Verbenaceae (6%). *Lippia graveolens*, Mexican oregano, is by far the most thoroughly studied species; 40% of the records included this aromatic plant. Research topics are dominated by biological activity assessments for human health and food technology (55%), as well as essential oil characterization (25%). As part of an ongoing research project, we have studied native species in southeast Mexico along an edaphoclimatic gradient. The project main objective is to understand the factors that influence the variation found in essential oil quantity and quality. Results for three widely-distributed species, *Lippia graveolens, Ocimum campechianum and Turnera diffusa,* are presented. Essential oil was extracted by hydrodistillation and characterized using GC and GC-MS. Chemometric analysis (PCA and Hierarchical Cluster Analysis) were used to describe the variation in essential oil composition. In the case of *Lippia graveolens*, the analysis showed three distinct groups with contrasting essential oil composition: two phenolic chemotypes where either carvacrol or thymol represented more than 75% of the total chromatogram area, and a non-phenolic chemotype dominated by oxygenated sesquiterpenes (2). Likewise, *Ocimum campechianum*, presented considerable chemical variation that was grouped in four chemotypes: eugenol-camphor, eucaliptol-β-elemene, β-caryophyllene-limonene and α-copaene. Regarding *Turnera diffusa*, the essential oil composition was highly diverse (*ca.* 95 metabolites), with sesqui and oxygenated-sesquiterpenes predominating. Chemometric analysis showed no clear groups for this species. Aridity index as well as soil characteristics (pH, rockiness, macro- and micronutrients) are among the influential factors that help us explain the variation observed in essential oil yield and composition of *Lippia graveolens, Ocimum campechianum* and *Turnera diffusa*. Field experiments represent a useful approach to study native aromatic species in order to identify target populations that could be used as parental material for scientific and commercial breeding programs.

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