Content and Chemical Composition of Essential Oil of “Alecrim-pimenta” in Manaus, Amazonas State, Brazil

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Abstract

Lippia sidoides Cham., a large shrub to small tree, is typical of the scrub vegetation of the Brazilian northeast. The leaves of this plant are rich in essential oil with content reaching 4.5%. The primary oil constituent is thymol, which has antimicrobial activity against fungi and bacteria. Due to the importance of the oil, this species has been cultivated throughout Brazil. In the Amazon, the plant has developed well to local conditions, producing high biomass and satisfactory growth. The objective of this study was to investigate the essential oil content and chemical constituents of plants cultivated under the conditions of Manaus, AM. One-year-old plants, obtained from stems and fertilized every six months with organic fertilizer (cow manure - 2 kg/m²), were cut during the reproductive phase and taken to the Laboratory of Phytochemistry and Medicinal Plants of Embrapa Western Amazon. After separation, two leaf samples of 20.0 g were used to determine moisture content by drying to a constant weight in an oven at 65°C for three days. Two additional leaf samples of 100 g each were used to determine essential oil content and constituents. The essential oil yield, 4.36%, was expressed on dry weight basis. The major oil constituents were thymol - 76.6%, ortho-cymene - 6.3%, β-caryophyllene - 5.0%, γ-terpinene - 2.0%, myrcene - 1.1%, 4-terpineol - 1% and timile-methyl ether - 1%. Constituents below 1.0% were identified as: α-thugene, pinene, γ-terpinene, limonene, 1,8-cineole, ipsdienol, umbelulone, α-terpineol, α-copaene, aromadendrene, ledeno, δ-cadinene and caryophyllene oxide. The content of essential oil and the oil constituents showed values close to that found in conditions in which the local species naturally occur.

INTRODUCTION

Lippia sidoides Cham. (Verbenaceae), a plant that almost exclusively occurs in the Caatinga ecoregion of northeastern Brazil, is a deciduous, large shrub, with many crisp branches and erect growth that reaches 2-3 m tall. The leaves contain essential oils that are rich in thymol (Matos, 2002; Lorenzni and Matos, 2002). Phytochemical analysis of leaves indicates the essential oil can reach 4% of the leaf dry weight and that the oil is more than 60% thymol or a mixture of thymol and carvacrol. These two terpene phenolic endowed oil constituents have a very strong antimicrobial activity against Staphylococcus aureus, an infectious agent on the skin and in the throat; Streptococcus mutans, responsible for dental caries; Corynebacterium xerosis, source of the odor from armpits and feet; Candida albicans and Monilia sp., fungi in thrush; and Trichophyrum rubrum and T. interdigitale, causative agents of mycoses of the skin (Matos, 2000; Lacoste et al., 1996; Lemos et al., 1992). After introduction of this species into phytotherapy in primary health care, the plant is now cultivated in several Brazilian states (Matos and Oliveira, 1998). Environmental factors (climate, nutrition, temperature, light, latitude, among others), however, have direct influences on the agronomic production and the chemistry of secondary metabolites, which include essential oils, tannins, alkaloids, muscilagenous flavonoids, among others. The...
objective of this study was to investigate the essential oil content and chemical constituents of leaves cultivated under the conditions of Manaus, AM.

MATERIALS AND METHODS

The plant material used in this study was one-year-old leaves obtained from stems of plants in the reproductive phase that had been fertilized every six months with organic fertilizer (cow manure at 2 kg m⁻²) and were growing in the cultivated medicinal plants sector of Embrapa Western Amazon. The plant stems were cut and taken to the Laboratory of Phytochemistry and Medicinal Plants of Embrapa Western Amazon for separation of the leaf tissue. A total of two leaf samples of 20.0 g were used for determination of moisture by drying to a constant weight in an oven at 65°C for three days. An additional two samples of 100 g each were used for determination of essential oil content by distillation in a Clevenger apparatus. Yield of the oil was expressed on a dry weight basis.

The chemical composition of the essential oil was determined at Embrapa Food Agroindustry using gas chromatography and mass spectrometry Agilent 5973N instrument equipped with a capillary column HP5MS (5%-phenyl-95%-metilpolisiloxano, 30 m × 0.25 mm) using helium (1.0 ml/min) as the carrier gas. The oven temperature was programmed from 60 to 240°C at 3°C/min. The mass selective detector was operated in electron ionization (70 eV) mode. A 1% solution of oil in dichloromethane was injected with gun operating at 250°C and split flow 1:20. Components were quantified using the area (%) obtained in the chromatogram. For identification, the mass spectra and retention rates were compared with literature values.

RESULTS AND DISCUSSION

The yield was 4.36%. The major constituents of the essential oil were thymol-76.6%, ortho-cymene-6.3%, β-caryophyllene-5.0%, γ-terpinene-2.0%, myrcene-1.1%, 4-terpineol-1% and thymyl-methyl ether-1%. Those constituents below 1.0% were identified as: α-thugene, pinene, γ-terpinene, limonene, 1,8-cineole, ipsdienol, umbululone, α-terpineol, α-copaene, aromadendrene, ledeno, δ-cadinene and oxide Caryophyllene. The content of essential oil and constituents showed values close to that found in the conditions of natural occurrence local of the species.

ACKNOWLEDGEMENTS

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Literature Cited


Table 1. Chemical composition of essential oil of *Lippia sidoides* leaves in Manaus, AM, 2010.

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Percent total oil</th>
<th>Retention index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymol</td>
<td>76.6</td>
<td>1296</td>
</tr>
<tr>
<td>Orto-cymeno</td>
<td>6.3</td>
<td>1027</td>
</tr>
<tr>
<td>Beta-cariophylene</td>
<td>5.0</td>
<td>1417</td>
</tr>
<tr>
<td>Gama-terpinene</td>
<td>2.0</td>
<td>1061</td>
</tr>
<tr>
<td>Myrcene</td>
<td>1.1</td>
<td>992</td>
</tr>
<tr>
<td>4-terpineole</td>
<td>1.0</td>
<td>1178</td>
</tr>
<tr>
<td>Timil-methyl ether</td>
<td>1.0</td>
<td>1236</td>
</tr>
</tbody>
</table>