

## Essential Oil Composition of *Aloysia triphylla* (L'Herit) Britton Leaves Cultivated in Botucatu, São Paulo, Brazil

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### Abstract

The family Verbenaceae comprises about 175 genera and 2300 species, distributed in tropics and subtropics, mainly in temperate zone of southern hemisphere. The lemon verbena (*Aloysia triphylla* (L'Herit) Britton) is a perennial, bushy plant originally from South America. The essential oil of this plant is used in pharmaceutical, cosmetic and perfumery industry. Therapeutic properties include febrifuge, sedative, stomachical, diuretic, and antispasmodic activities. The present work aimed to identify the chemical composition of essential oil of *Aloysia triphylla* leaves. The study was done in Lageado Experimental Farm of the Department of Plant Production-Horticulture, Agronomical Sciences College, São Paulo State University Campus of Botucatu. Leaves of lemon verbena from Medicinal and Aromatic Plant Garden, were collected in the end of winter (September/2001). The essential oil was extracted by hydrodistillation, in Clevenger apparatus. 100 g of leaves were used in each extraction. Four extractions were performed during three hours. The essential oils of the leaves were analyzed in Gas Chromatography Mass spectrometry (CG-MS, Shimadzu, QP-5000), equipped with capillary column DB-5 (30 m x 0,25 mm x 0,25 mm), split 1/35, injector for 220 C°, detector for 230 C°, dragged by gas He (1,0 mL/min), with programmed temperature for 60 C° to 240 C°, 3 C°/min. The identification of the substances was held by comparison of their mass spectra with data of the CG-MS (Nist 62 lib), literature references and retention index of Kovats. The main constituents of essential oils were geranial (29.54 %), neral (27.01 %), limonene (15.93 %), geranyl acetate (4.0 %) and geraniol (3.96 %). This species possesses high quantity of monoterpenes and low quantity of sesquiterpenes.

### INTRODUCTION

The Verbenaceae family comprises 2300 species and about 175 genera distributed over the tropics and subtropics, in temperate regions of the southern hemisphere and a few of them in the northern hemisphere. *Aloysia triphylla* (L'Herit) Britton, originally from Chile and western Argentina is commonly known in Brazil as “erva-cidreira” or “cidró”. It has many synonymies: *Lippia citriodora*, *Lippia triphylla* and *Aloysia citriodora*. It is characterized as perennial, bushy plant, measuring from 1.50 to 3.00 m height, owing green, round striated stem. Its leaves are entire, simple and verticillate in a rough texture. Small and white flowers are joined in a spike shape forming panicles

(Castro & Chemale, 1995).

In Brazil the leaves have been used by the population through infusion due to their stomachical, digestive, carminative, analgesic and sedative properties (Font Quer, 1980). The leaf essential oil is characterized by strong and pleasant aroma, in a light yellow color. Neral and Geranial oils, the main compounds, have also been used a lot in food, perfumery and cosmetic industry (Cavassin et al. 2000).

This work aimed to identify the essential oil chemical composition of *Aloysia triphylla* (L' Herit) Britton grown in Botucatu city-SP-Brazil.

## MATERIAL AND METHODS

The work was done in the experimental field of Plant Production Department-Horticulture of the Agricultural Science College of UNESP- Campus of Botucatu. Leaves of lemon-verbena were harvested from the vegetable plot of medicinal, aromatic and condimental plants. For essential oil extraction the hydrodistillation method was used in Clevenger apparatus. 100 g of leaves were placed in flat bottom flasks with distilled water covering the vegetable material. The extraction was performed at boiling heat of water over 3 following hours, and the oil content being recorded; after that, placed in 10 ml amber glasses, properly labeled and stored in freezer. The chemical composition analysis of the essential oil was held in gas chromatograph connected to a mass spectrometer (CG-EM, Shimadzu, QP-5000), running at 70 eV, equipped with fused silica DB-5 column (30 m x 0.25 mm x 0.25  $\mu$ m), helium as carrier gas (1.0 mL/min), injector at 220 C°, detector at 230 C°. The samples were solubilized in ethyl acetate and 1  $\mu$ L solution was injected, split: 1/35 in the temperature program as follows: 60 C° - 240 C°, 3 C°/min. The chemical compound identification was based on comparison of their mass spectra with data of CG-EM system (Nist 62.lib), literature reference (McLafferty & Stauffer 1989) and retention index of Kovats (Adams 1995).

## RESULTS AND DISCUSSION

Table 1 shows chemical compounds identified in essential oil of *Aloysia triphylla* leaves. The major essential oils are as follows: geranial (29.54 %), neral (27.01 %), limonene (15.93 %), geranyl acetate (4.0 %) and geraniol (3.96 %). Geraniol and neral showed the highest percentage which is not in agreement with lower values found for geranial (9.9 %) and neral (6.9 %) from studies by Bellkhdar et al. (1994) in *A. triphylla* grown in Morocco. Ozek et al. (1996) identified 69 compounds in leaves and branches of *A. triphylla* in Turkey, where the most important ones are as follows: limonene (18.6 and 14.8 % respectively), geranial (11.9 and 19.1 % respectively) and neral (6 and 8.1 % respectively). Figure 1 shows the essential oil chemical composition of *A. triphylla* obtained through Gas Chromatography connected to the Mass Spectrometer (CG-MS).

Other chemical compounds have been reported for this species by (Zygadlo et al., 1994) in leaves of *A. triphylla* where 40 of them were identified. The most important ones were myrcenone (36.5 %) and alpha-thujone (13.1 %). Myrcenone (31.0 %) and alpha-thujone (17.1 %) have also been found by (Zygadlo et al, 1995) in the flowers. Soler et al. (1986) studying the chemical composition of flowering leaves have found 1.6 % yield of essential oil in *A. gratissima* and isolated the main compounds as follows: sabinene (29.9-35.3 %), beta-pinene (7.8-9.7 %), an unknown hydrocarbon (7.4-7.9 %) , beta-bisabolene (2.1-5.8 %), copaenol (4.3 %), and copaenone (3.6-4.1 %), while in flowers of this same species, harvested over 2 following years in Uruguay, they have found other compounds as globulol, caryophyllene and caryophyllene epoxide.

The results from this work under Botucatu-SP-Brazil conditions have shown that the essential oil of *A. triphylla* has high quantity of monoterpenes and low quantity of sesquiterpenes compared to the literature.

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## Tables

Table 1. Chemical compounds identified in essential oil of *Aloysia triphylla* (L'Herit) Britton leaves in Botucatu-SP-Brazil.

Peak <sup>a</sup>	Compound	% <sup>b</sup>
1	1-Octen-3-ol	0.70
2	6-methyl-5-hepten-2-one	4.04
3	Mircene	tr <sup>c</sup>
4	Limonene	15.93
5	Trans-beta-ocimene	1.39
6	unknown	0.73
7	unknown	0.80
8	unknown	0.98
9	unknown	1.50
10	Dihydroneoisocarveol	3.70
11	Neral	27.01
12	Geraniol	3.96
13	Geranial	29.54
15	Geranyl acetate	4.0
16	Trans-caryophyllene	2.85
17	Bicyclogermacrene	1.95
18	Spatulenol	tr
19	Caryophyllene	0.84

a. Numbers in the compounds correspond to peaks in Figure 1.

b. Total percentage

c. tr, in trace amount (< 0,40%)

## Figures

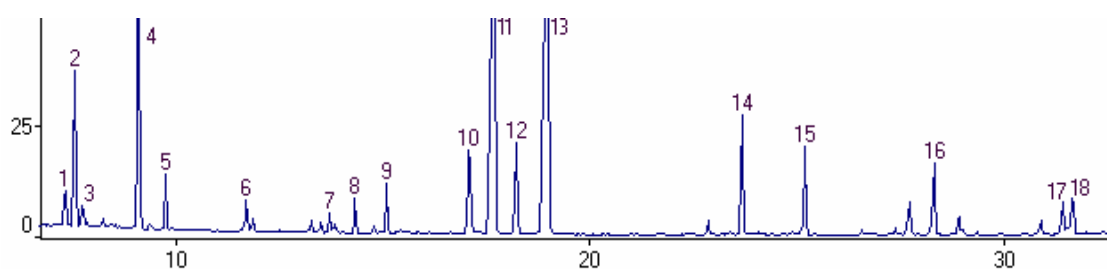


Fig. 1. Gas chromatogram of essential oil of *Aloysia triphylla* from Brazil.