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ARTÍCULO DE INVESTIGACIÓN

CHEMICAL COMPOSITION OF WOOD ESSENTIAL OIL OF *Aniba cinnamomiflora* C. K. Allen FROM VENEZUELAN ANDES

Composición química del aceite esencial de madera de *Aniba cinnamomiflora* C. K. Allen, Andes Venezolanos.

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Abstract

Aniba cinnamomiflora C. K. Allen is a tree species of Lauraceae family that produces essential oil. A study on the hydrodistillation product of wood pieces from branches of *Aniba cinnamomiflora* is presented. A 0.05% of essential oil was obtained. The essential oil was analyzed by gas chromatography and Mass spectrometry. Fifteen compounds were identified (98.55%) of the total retrieved. The major component (54.00%) corresponds to the lipid γ-palmitolactone, followed by 1-epi-cubenol (9.56%), δ-cadinene (6.05%), t-cadinol (5.00%), and chamazulene (3.53%). This is the first study on the wood essential oil of *Aniba cinnamomiflora*.

Key words: hydrodistillation, Lauraceae, γ-palmitolactone

Resumen

Aniba cinnamomiflora C. K. Allen es una especie arbórea de la familia Lauraceae que produce aceite esencial. Se presenta un estudio sobre el producto de la hidrodestilación de partículas de madera provenientes de ramas de *Aniba cinnamomiflora*. El 0,05% de aceite esencial fue obtenido. El aceite esencial fue analizado por cromatografia de gases y espectrometria de masas. Fueron identificados quince compuestos (98.55%) del total recuperado. El principal componente (54.00%) corresponde al lípido γ-palmitolactona, seguido por 1-epi-cubenol (9.56%), δ-cadineno (6.05%), t-cadinol (5.00%) y chamazuleno (3.53%) . Este es el primer reporte de estudio del aceite esencial de la madera de *Aniba cinnamomiflora*.

Palabras clave: hidrodestilación, Lauraceae, γ-palmitolactona.

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INTRODUCTION

Lauraceae family comprises species with timber, ornamental and culinary values. *Aniba* is an american genus in this family that includes shrubs or trees up to 25 m high (Marques, 2001). Several chemical components have been isolated in this genus, specially neolignans, stylpyrones, and flavones (Rossi *et al*., 2007), esters (Gottlieb & Kubitzki, 1981), phenylpropanoids (Vilegas *et al*., 1998), and sesquiterpenoids (Moreira *et al*., 2010).

Several *Aniba* species produce essential oils (EO) used as raw materials for perfume industries (Marques, 2001). Two species of the genus *Aniba* fulfill the demand for the production of cosmetics, aromatic, and health products, *A*. canelilla (Kunth) Mez and *A. rosaeodora* Ducke, commonly known as rosewood. The stems EO of *A. canelilla* are mainly composed of 1-nitro-2-phenylethane (Manhães *et al*., 2012). They have antinociceptive and hypotensive activities as well as fungistatic properties against *Candida albicans* (Oger *et al*., 1994; Lima *et al*., 2009; Bezerra *et al*., 2010). The wood EO of *A***.** *rosaeodora* are mainly composed by linalool (Moreira *et al*., 2010) which has sedative effects and has been evaluated on epidermic cancer cell lines A43 and HaCaT. The oil has showed cytotoxic activity through apoptosis. Besides, a synergistic effect with gentamicin has been demonstrated against *Acinetobacter baumannii* ATCC 19606 (Nóbrega *et al*., 2009; Rosato *et al*., 2010; Sœur *et al*., 2011).

Aniba cinnamomiflora C. K. Allen is represented by trees up to 14 m high, with alternate leaves, slightly revolute margins and brochidodromous to pseudobrochidodromous venation with terminal inflorescences in the upper branches. The stems, petioles and peduncles are covered with trichomes, usually tan colored. The flowers are yellow to green -yellow, actinodromous, with six subequal tepals, nine bilocular anthers and unicarpelar, unilocular, minutely pubescent ovary, sunk into the floral tube in a hypanthium that develops with fruit ripening forming a turbinated cupule, often 4- to 5-parted, red-colored, with floral remains in the margin. The cupules hold the fruit, which reaches up to 4 cm length. During fruit ripening, the epicarp is dark green with light lenticels and becomes dark purple to black, slightly glaucous at full maturity (Kubitzki & Renner, 1982).

A. cinnamomiflora is distributed from Costa Rica to northern South America. In Venezuela it has been reported in Amazonas, Apure, Aragua, Mérida, Miranda, Táchira and Trujillo states, ranging from 600 to 2400 m of altitude. Usually it represents the tallest trees in the Andean and coastal cloud forests, and rainforests of the Orinoco (Hokche *et al*., 2008). The aim of this paper is to determine the chemical composition of the essential oil obtained from the wood of *A. cinnamomiflora*, not previously reported.

MATERIALS AND METHODS

A. cinnamomiflora branches were collected in the vicinity of the School of Forestry, Faculty of Forestry and Environmental Sciences (FCFA) at the Universidad de Los Andes (ULA), Mérida, Venezuela. The geographical coordinates at this location are 08°37’19.6’’ north latitude and 71°08’23.3’’ west longitude, at 1765 m of altitude. A voucher # 054 432 was deposited at the “Carlos Liscano” MER Herbarium, FCFA. The wood essential oil of *A. cinnamomiflora* was obtained by hydrodistillation using a Clevenger trap.

GC analyses were performed using a Perkin-Elmer AutoSystem gas chromatograph equipped with a FID. A 5% phenylmethyl polysiloxane fused-silica capillary column (AT-5, Alltech Associates Inc., Deerfield, IL), 60 m x 0.25 mm, film thickness 0.25 µm, was used. The initial oven temperature was 60 °C; it was heated at 4 °C/min to 260 °C, and maintained for 20 min.

The injector and detector temperatures were 200 °C and 250 °C, respectively. The carrier gas was helium at 1.0 mL/min. The sample was injected using a split ratio of 50:1. Retention indexes were calculated relative to C_8-C_{24} *n*-alkanes, and compared to values reported in the literature (Adams, 2007).

The GC-MS analyses were carried out on a Hewlett-Packard GC-MS system, Model 5973, fitted with a HP-5MS fused silica capillary column (30 m x 0.25 mm i.d., film thickness 0.25 µm, Hewlett-Packard). The oven temperature program was the same as that used for the HP-5 column for GC analysis; the transfer line temperature was programmed from 150 ºC to 280 ºC; source temperature 230 ºC; quadrupole temperature 150 ºC; carrier gas, helium, adjusted to a linear velocity of 34 cm/s; scan range, 40:500 amu; 3.9 scans/s; ionization energy, 70 eV. The sample was diluted with diethyl ether (20µL in 1 mL) and 1µL was injected using a Hewlett-Packard ALS injector with a split ratio of 50:1. The identification of the oil components was based on a Wiley MS data library (6th ed.), followed by comparisons of ms data with published literature (Sandra & Bicchi, 1987; Davies, 1990; Adams, 2007).

RESULTS

The wood essential oil of *A. cinnamomiflora* was obtained by hydrodistillation using a Clevenger trap obtaining a 0.05% yield. The chemical composition was determined by gas chromatography / mass spectrometry (Table 1). Fifteen components of the oil were identified corresponding to a 98.55%, the major ones are γ-palmitolactone (54.0%), 1-epi-cubenol (9.6%), δ-cadinene (6.1%), *t*-cadinol (5.0%) and chamazulene (3.5%).

Table 1. Chemical composition of the essential oil of *Aniba cinnamomiflora*.

Compound	Peak Area (%)	KI	KI Literature (Adams, 2007)
Linalool	1.0	1101	1098
α-Bisabolene	1.2	1520	1506
δ-Cadinene	6.1	1535	1524
trans-Nerolidol	1.9	1570	1564
Spathulenol	1.4	1584	1577
Gleenol	3.0	1590	1586
Guaiol	3.3	1600	1600
1-*epi*-Cubenol	9.6	1617	1627
t-Cadinol	5.0	1624	1633
α-Cadinol	1.9	1630	1652
1,3,5-Trimethoxi-2- propenyl-benzene	2.6	1707	-
Chamazulene	3.5	1723	1725
Benzyl benzoate	1.3	1756	1759
Phenyl ethyl benzoate	2.7	1850	1815
γ-Palmitolactone	54.0	2097	2081
Total	98.5		

KI: Kovats index

DISCUSSION

The oil obtained from *A. cinnamomiflora* wood was not predominantly composed of terpenoids, but a type of lipid component. The major component identified, γ-palmitolactone, in the essential oil of *Aniba cinnamomiflora* wood has been evaluated and applied in cosmetics. This compound, also known as γ-hexadecalactone, is used as fragrance component (Panten *et al*., 2011). Although the total content of components of *A. cinnamomiflora* oil is not very similar to the composition of *Aniba* essential oils previously reported, several of them are common. For example, benzyl benzoate (1.3%) is also present in *A. riparia* (R. Luz *et al*., 2002) and *A. hostamanniana* (De Lima *et al*., 2015) essential oils. This compound is considered a characteristic feature of the genus *Aniba* (Gottlieb & Kubitzki, 1981), and is commercially used as a topical medication against several parasitoses (Silva *et al.,* 2009). Although a minor component of this species (0.9%), the monoterpene linalool, usually present in high proportion in rosewood *A. rosaeodora* (Moreira *et al*., 2010; Almeida *et al*., 2013), has anti-inflammatory, antioxidant, and inhibitory activities, as well as bactericidal effects (Peana *et al*., 2002; Liu, *et al*., 2012). The t-cadinol, a common component in the oil of *A. hostmanniana* (De Lima *et al*., 2015), has shown bactericidal effect on *Staphylococcus aureus* (Claeson *et al*., 1992); the δ-cadinene, also a main component of *A. hostmanniana* (De Lima *et al*., 2015), is anti-inflammatory and sedative (Dogna, 2009).

The chamazulene possesses anti-inflammatory and antioxidant activity (Safayhi *et al*., 1994). The 1-nitro-2-phenylethane, a vasorelaxant major component in *Aniba canelilla* (Leal *et al*., 2013), was not found in *A. Cinnamomiflora*.

CONCLUSIONS

This is the first study on the essential oil of *Aniba cinnamomiflora* wood obtained with 0.05% yield. The main components of the oil were identified as γ-palmitolactone (54.0%), 1-epi-cubenol (9.6%), δ-cadinene (6.1%), *t*-cadinol (5.0%), and chamazulene (3.5%). The high concentration of the lipid γ-palmitolactone allows the use of this oil as a fragrance component in perfume industry.

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