© 2013 Boletín Latinoamericano y del Caribe de Plantas Medicinales y Aromáticas 12 (6): 618 - 621
ISSN 0717 7917
www.blacpma.usach.cl

Artículo Original | Original Article

Composition of the essential oil from leaves of *Capsicodendron dinisii* Schwancke from Brazil

[Composición del aceite esencial de las hojas de *Capsicodendron dinisii* Schwancke de Brasil]

Jussara MESQUITA[1], Lígia SALGUEIRO[2] & Carlos CAVALEIRO[2]

[1]Faculdade de Farmácia da UNIFENAS, Rodovia MG 179, Km 0, CEP 37.130-000, Alfenas, MG. Brazil
[2]Centro de Estudos Farmacêuticos, Faculdade de Farmácia, Universidade de Coimbra, Portugal.
Contactos | Contacts:* Carlos CAVALEIRO - *E-mail address:* *cavaleir@ff.uc.pt

Abstract
The essential oil obtained by hydrodistillation from dry leaves of *Capsicodendron dinisii* (Schwancke) was analyzed using gas chromatography (GC) and gas chromatography/mass (GC/MS) spectrometry. According to GC and GC/MS analysis, the essential oil is mostly composed of sesquiterpene hydrocarbons (69.7%) and oxygenated sesquiterpenes (22.6%). Bicyclogermacrene (30.8%), E-caryophyllene (17.2%), spathulenol (13.5%) and germacrene D (7.6%) were the principal components identified in the essential oil.

Keywords: *Capsicodendron dinisii*, essential oil, GC, GC-MS

Resumen
El aceite esencial obtenido por hidrodestilación de hojas secas de *Capsicodendron dinisii* (Schwancke) se analizó mediante cromatografía de gases y cromatografía de gases/espectrometría de masas. De acuerdo con los análisis, el aceite esencial contiene un 69,7% de sesquiterpenos hidrocarbonados y 22,6% de sesquiterpenos oxigenados. Bicyclogermacreno (30.8%), E-cariofileno (17.2%), espathulenol (13.5%) and germacreno D (7.6%) fueron los componentes principales identificados en el aceite esencial.

Palabras Clave: *Capsicodendron dinisii*, *aceite* esencial, CG, CG-EM

Recibido | Received: October 11, 2012
Aceptado en versión corregida | Accepted in revised form: April 14, 2013
Publicado en línea | Published online: November 30, 2013
Declaración de intereses | Declaration of interests: Thanks are due to Fundação para a Ciência e Tecnologia (FCT), PEst-OE/SAU/UI0177/2011 for financial support
Este artículo puede ser citado como / This article must be cited as: J Mesquita, L Salgueiro, C. Cavaleiro. 2013. Composition of the essential oil from leaves of *Capsicodendron dinisii* Schwancke from Brazil. **Bol Latinoam Caribe Plant Med Aromat 12(6): 618 – 621**

INTRODUCTION

Capsicodendron dinisii Schwancke (Canellaceae) is a 10 - 20 meters high evergreen tree with globus canopy, occurring wild in the Mixed Ombrophilous Forest and in the Campos ecosystems, from Minas Gerais to the southern states of Brazil. This species is popularly named as "*pimenteira*" or "*pau-para-tudo*", the first vernacular designation hinting the spicy taste of the stem bark, the latter - literally translated "*wood for everything*" -, alluding to its usefulness in traditional medicine.

Few publications report on metabolites of *C. dinisii:* drimane sesquiterpenoids, as cinnamodial, capsicodendrin, polygodial, isopolygodial, mukaadial or polygonone were identified in extracts from the stem bark and leaf-twig samples (Canonica *et al*., 1969; Mahmoud *et al*., 1979; Mahmoud *et al*., 1980; Bastos *et al*., 1989). Some of these compounds were recognised as chemosystematic markers of the Canellaceae family. Recently, Torres *et al.* (2010) reported the composition of an isolate of volatile compounds from the stem bark *of C. dinisii*, finding limonene (68.5%) and α-terpineol (9.9%) as the major components. Other minor constituents were identified, seventeen monoterpenes, one phenylpropanoid and three sesquiterpenes, among them, drimenol, a drimane skeleton sesquiterpenoid.

In order to contribute for the knowledge on *Capsicodendron dinisii* and for the valorisation of its biomass we report now on the composition of the essential oil isolated from the leaves. As our knowledge this is the first report on the subject.

EXPERIMENTAL

Plant material and essential oil preparation

Plant material of *Capsicodendron dinisii* Schwancke was collected at Itamarandiba, Minas Gerais, Brazil. A voucher specimen was prepared and deposited, under the accession number Jus004/12, at the herbarium of the Laboratory of Pharmacognosy, Faculty of Pharmacy, UNIFENAS. Leaves were dried at room temperature, in the dark, for 4 days, grounded to power and submitted to hydrodistillation, during **4** hours, using a Clevenger type apparatus, following the European Pharmacopoeia procedure (Council of Europe, 2010), however, without the use of any retention solvent. Distillation rendered 0.45% (v/m) of yellow pale oil with intense odour.

Analysis

Essential oil analysis was made by gas chromatography (GC) and by gas chromatography-mass spectroscopy (GC/MS). Analytical GC was carried out in a Hewlett-Packard 6890 (Agilent Technologies, Palo Alto, CA, USA) gas chromatograph with a HP GC ChemStation Rev. A.05.04 data handling system, equipped with a single injector and two flame ionization detection (FID) systems. A graphpak divider (Agilent Technologies, part no. 5021-7148) was used for simultaneous sampling to two Supelco (Supelco, Bellefonte, PA, USA) fused silica capillary columns with different stationary phases: SPB-1 (polydimethylsiloxane 30 m × 0.20 mm i.d., film thickness 0.20 μm), and SupelcoWax-10 (polyethyleneglycol 30 m × 0.20 mm i.d., film thickness 0.20 μm). Oven temperature program: 70 - 220 ºC (3 ºC.min^{-1}), 220 ºC (15 min); injector temperature: 250 ºC; carrier gas: helium, adjusted to a linear velocity of 30 cm.s^{-1}; splitting ratio 1:40; detectors temperature: 250 ºC. GC-MS was carried out in a Hewlett-Packard 6890 gas chromatograph fitted with a HP1 fused silica column (polydimethylsiloxane 30 m × 0.25 mm i.d., film thickness 0.25 μm), interfaced with an Hewlett-Packard mass selective detector 5973 (Agilent Technologies) operated by HP Enhanced ChemStation software, version A.03.00. GC parameters as described above; interface temperature: 250 ºC; MS source temperature: 230 ºC; MS quadrupole temperature: 150 ºC; ionization energy: 70 eV; ionization current: 60 μA; scan range: 35–350 units; scans.s^{-1}: 4.51.

Compounds were identified by their GC retention indices on both SPB-1 and SupelcoWax-10 columns and from their mass spectra. Retention indices, calculated by linear interpolation relative to retention times of C_8–C_{23} of *n*-alkanes (Van den Dool and Kratz, 1963), were compared with those of reference samples included in C.E.F. / Faculty of Pharmacy, University of Coimbra laboratory database. Acquired mass spectra were compared with reference spectra from the laboratory database, Wiley / NIST library (2007) and validated literature data (Adams 2004; Joulain and Koenig, 1998; Cavaleiro *et al*., 2004; Cavaleiro *et al*., 2006; Cavaleiro *et al*., 2011; Mesquita *et al*., 2006). Relative amounts of individual components were calculated based on GC raw data areas without FID response factor correction.

RESULTS AND DISCUSSION:

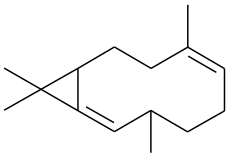
The composition of the essential oil from leaves of *C. dinisii* is abridged in Table Nº 1, where constituents are listed in order to their retention in a SPB-1 GC column.

Table Nº 1
Composition of *Capsicodendron dinisii* essential oil.

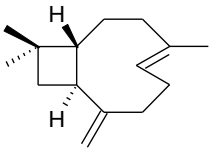
IR[a]	IR[b]	Compound	%
1329	1478	δ-Elemene	0.4
1368	1489	α-Copaene	0.3
1375	1516	β-Bourbunene	2.2
1381	1588	β-Elemene	3.1
1395	n.d.	*Z*-Caryophyllene	0.1
1409	1595	*E*-Caryophyllene	17.2
1427	1602	Aromadendrene	0.8
1440	1664	α-Humulene	4.1
1445	1634	*allo*-Aromadendrene	0.3
1466	1703	Germacrene D	7.6
1471	1711	β-Selinene	0.3
1484	1731	Bicyclogermacrene	30.8
1490	1756	Germacrene A	1.6
1497	1750	γ-Cadinene	0.4
1506	1750	δ-Cadinene	0.5
1527	2072	Elemol	0.2
1554	2115	Spathulenol	13.5
1558	1974	Caryophyllene oxide	2.7
1562	2063	Globulol	0.7
1575	2072	Viridiflorol	1.2
1580	n.d.	Humulene epoxide	0.4
1580	n.d.	Ledol	0.3
1609	n.d.	Isospathulenol	1.8
1616	2168	*t*-Muurolol	0.8
1624	2217	α-Cadinol	1.0
1829	n.d.	Hexahydrofarnesyl acetone	0.3
2102	n.d.	Phytol	0.6
		Sesquiterpene hydrocarbons	69.7
		Oxygen containing sesquiterpenes	22.6
		Other compounds	0.6
		Total identified	93.2

Compounds listed in order to their elution on the SPB-1 column.
n.d. = not determined
[a] Retention indices on the SPB-1 column relative to C8–C23 *n*-alkanes.
[b] Retention indices on the SupelcoWax-10 column relative to C8 to C23 *n*-alkanes.

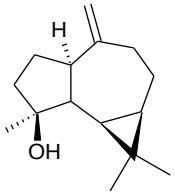
More than 93% percent of the composition of the oil was elucidated through the identification of 15 sesquiterpene hydrocarbons (69.7%), 11 oxygen containing sesquiterpenes (22.6%) and one diterpenoid. Bicyclogermacrene **[1]** (30.8%), *E*-caryophyllene **[2]** (17.2%) spathulenol **[3]** (13.5%) and germacrene D **[3]** (7.6%) are the most representative constituents.



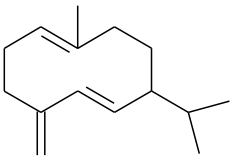
[1]



[2]



[3]



[4]

Monoterpenic hydrocarbons and oxygen containing monoterpenes were not detected. Similarly no drimane derivatives, pointed as chemosystematic markers of the Canellaceae (Bastos *et al*., 1999), were found in the essential oil from leaves. In fact, leaves oil is noteworthy different from the volatile extract from the stem bark, studied by Torres *et al.* (2010), in which monoterpenes (86.8%) are predominant and drimenol testifies the phylogeny. Spathulenol is the unique constituent common of both compositions, even so, at very different relative amounts, 0.7% in the stem bark extract, 13.5% in the leaves oil.

CONCLUSION

The composition of volatile oil isolated from leaves of *C. dinisii* was determined for the first time, resulting identified 27 compounds, mainly sesquiterpenoids. Remarkable differences, concerning the biosynthesis and accumulation of volatile metabolites in the stem bark and in the leaves *of C. dinisii*, were evidenced.

ACKNOWLEDGMENTS

Thanks are due to Fundação para a Ciência e Tecnologia (FCT), PEst-OE/SAU/UI0177/2011 for financial support.

REFERENCES

Adams RP. 2004. **Identification of Essential Oils Componentes by Gas Chromatography/ Quadrupole Mass Spectroscopy.** Allured Publishing Corporation, Carol Stream, Ilinois, USA.

Bastos JK, Kaplan MAC, Gottlieb OR. 1999. Drimane-type sesquiterpenoids as chemosystematic markers of Canellaceae. **J Brazil Chem Soc** 10: 136 - 139.

Canonica L, Corbella A, Gariboldi P, Jommi. G, Krepinski J. 1969. Drimane sesquiterpenoids, Capsicodendrin. **Tetrahedron** 25: 3903 - 3908.

Cavaleiro C, Salgueiro LR, Miguel MG, Proença da Cunha A. 2004. Analysis by gas chromatography–mass spectrometry of the volatile components of *Teucrium lusitanicum* and *Teucrium algarbiensis*. **J Chromatogr A** 1033: 187 - 190.

Cavaleiro C, Pinto E, Gonçalves MJ, Salgueiro L. 2006. Antifungal activity of *Juniperus* essential oils against dermatophytes, *Aspergillus* and *Candida* strains. **J Appl Microbiol** 100: 1333 - 1338.

Cavaleiro C, Gonçalves MJ, Serra D, Santoro G, Tomi F, Bighelli A, Salgueiro L, Casanova J. 2011. Composition of a volatile extract of *Eryngium duriaei* subsp. *juresianum* (M. Laínz) M. Laínz, signalised by the antifungal activity. **J Pharm Biomed Anal** 54: 619 - 622.

Council of Europe. 2010. **European Pharmacopoeia.** 7th ed. Council of Europe, Strasbourg, Switzerland.

Joulain D, Koenig W. 1998. **The atlas of spectral data of sesquiterpene hydrocarbons.** Hamburg Verlag, Hamburg, Germany.

Van den Dool H, Kratz PD. 1963. A generalization of the retention index system including linear temperature programmed gas liquid partition chromatography. **J Chromatogr** 11: 463 - 471.

Mahmoud II, Kinghorn AD, Cordell GA, Farnsworth NR. 1979. Cyto-toxic drimane sesquiterpenoids from *Capsicodendron-dinisii*. **J Nat Prod** 42: 681 - 681.

Mahmoud II, Kinghorn AD, Cordell GA, Farnsworth NR. 1980. Potential anti-cancer agents.14. Isolation of bicyclofarnesane sesquiterpenoids from *Capsicodendron-dinisii*. **J Nat Prod** 43: 365 - 371.

Mesquita J, Oliveira AB, Lombardi J, Castro Braga F, Proença da Cunha, Salgueiro L, Cavaleiro C. 2006. Essential oil constituents of *Piper vicosanum* from the Brazilian Atlantic Forest. **J Essent Oil Res** 18: 392 - 395.

Torres E, Wisniewski Jr A. 2010. Composição química dos componentes voláteis de *Capsicodendron dinisii* Schwancke (Canellaceae). **Quim Nova** 33: 130 - 132.

Wiley Registry 8th Edition with NIST 05 **MS Spectra,** Revision 2005 D.06.00, 2007. Agilent Technologies.