Journal of Essential Oil Research

ISSN: 1041-2905 (Print) 2163-8152 (Online) Journal homepage: http://www.tandfonline.com/loi/tjeo20

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To cite this article: Fernando C.M. de Medeiros, Cláudio H.S. Del Menezzi, Humberto R. Bizzo & Roberto F. Vieira (2015) Scents from Brazilian Cerrado: *Psidium myrsinites* DC. (Myrtaceae) leaves and inflorescences essential oil, Journal of Essential Oil Research, 27:4, 289-292, DOI: 10.1080/10412905.2015.1037020

To link to this article: https://doi.org/10.1080/10412905.2015.1037020

Published online: 27 Apr 2015.

Journal of Essential Oil Research, 2015
Vol. 27, No. 4, 289–292, http://dx.doi.org/10.1080/10412905.2015.1037020

Scents from Brazilian Cerrado: *Psidium myrsinites* DC. (Myrtaceae) leaves and inflorescences essential oil[†]

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(*Received 22 September 2014; accepted 28 March 2015*)

The chemical profile of the essential oil obtained from leaves and inflorescences of *Psidium myrsinites* DC. (Myrtaceae) growing wildly in the Brazilian Cerrado was analyzed by GC/FID and CG/MS. The essential oil had a slimy and translucent appearance. The oil yield was 0.1% and the main components were oxygenated sesquiterpenes (68.2%) and non-oxygenated sesquiterpenes (18.3%). Caryophyllene oxide (26.1%), humulene epoxide II (8.8%), β-caryophyllene (7.4%) and α-caryophyllene (5.4%) were the major compounds. It is worth to notice that the most abundant substances have very close structures. The oil yield and composition was very similar to other species belonging to the same genus.

Keywords: *Psidium myrsinites*; Myrtaceae; essential oil; Brazilian Cerrado; sesquiterpenes; caryophyllene oxide

Introduction

The Brazilian savannah, called Cerrado, is one of the most important biomes subject to actions of conservation because of their high degree of endemism and huge land degradation, being one of the *hot spots* of biodiversity (1).

The existence of many micro-environments provides an intricate mosaic of ecosystems and allows a great number of endemic species in Cerrado (2). It has been estimated that there is more than 12,000 species of native flora from Brazilian Cerrado (3). Forty-four percentage of plant life occurring in this biome is endemic, making the Brazilian Cerrado the most biodiverse tropical savannah in the planet (4).

Among so many species, it is noteworthy that the genus *Psidium* L. is one of the most ordinary in the Cerrado. There are thirty-one different native *Psidium* species in this biome, meanwhile in the whole country there are sixty-one species from which forty-one are endemic in Brazil (5).

Species from the genus *Psidium* could be used in the production of woods and in the traditional medicine, however, their main characteristic is the presence of fruits, better known as araçás (6). Furthermore, the chemical constituents of the fruits show high content of phenolic compounds, usually responsible for the elevated antioxidant activity and other biological properties already observed (7–9). In the Brazilian Cerrado, it has already been studied the nutritional potential of the araçás, being rich in fibers and minerals (10).

The aim of this work was to analyze the essential oil extracted by hydrodistillation from the leaves and inflorescences of a *Psidium* species: *Psidium myrsinites* DC. (Myrtaceae).

Experimental

Plant material

Leaves and inflorescences of five individuals were randomly collected in June 2013, between 9 and 11 AM. The collection was performed in Cerrado micro-environment known as *stricto sensu* inside Fazenda Água Limpa (FAL), a protected area from the University of Brasília (UnB). The specimens were small trees which rose on red yellow latosol soil at 1,096 m above sea level.

Right after collection, the plant material was weighted and dried in a forced-air drier at 38°C until constant weight. A voucher specimen (CEN 84482) was deposited at the Embrapa Genetic Resources and Biotechnology herbarium, and identified by a taxonomist.

Extraction

The essential oil was extracted by hydrodistillation of the dried material (353.93 g) in a modified Clevenger-type apparatus. Entire leaves and inflorescences were

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[†]Part 4 in the series Scents from Brazilian Cerrado.

carefully separated from stems and distilled without crushing. The essential oil was collected, dried with anhydrous sodium sulfate and stored in the freezer for later analysis.

Essential oil analysis

The essential oil was analyzed in an Agilent 7890A gas chromatograph fitted with a flame ionization detector (GC-FID) and equipped with a 5%-phenyl-95%-methylpolysilixane (HP-5MS, 30 m × 032 mm × 0.25 μm) fused silica capillary column. The oven temperature was programmed from 60°C to 240°C at 3°C/min, the injector was kept at 250°C and the detector was kept at 280°C. Hydrogen was used as carrier gas at 1.5 mL/min. The oil was diluted at 1% in dichloromethane (V/V) and 1 μL of the solution was injected in split mode (1:20). The quantification of the constituents was done by normalized relative area of the peaks from a mean of three injections considering all factor responses as 1.

The mass spectra analyses were made in an Agilent 5973N gas chromatograph operating in the same conditions than above. The carrier gas was helium (1.0 mL/min) and the mass detector was operated in electronic ionization mode (70 eV) at 3.12 scans/s with a mass range from 40 to 450 u.

The linear retention indices (LRI) were obtained by the injection of a homologous serious of n-alkanes (C_9-C_{28}) in the same conditions and column as above. The indices were calculated by the Van Den Dool and Kratz equation (11).

The identification of the compounds was made by comparison of their mass spectra with the NIST MS database and the linear retention indices found in the literature (12, 13).

Table 1. Chemical constituents of the essential oil from leaves and flowers of *P. myrsinites*.

Peak #	Constituents	LRI^{a}_{exp}	LRI^{b}_{lit}	Concentration (%)[c]
1	tricyclene	921	919	0.6
2	α-pinene	932	932	0.8
3	β-pinene	974	975	0.3
4	myrcene	988	990	5.4
5	*p*-cymene	1020	1023	0.2
6	limonene	1024	1026	1.5
7	linalool	1095	1099	2.5
8	β-pinene oxide	1154	1154	0.5
9	4-terpineol	1174	1174	0.2
10	α-terpineol	1186	1188	0.3
11	α-copaene	1374	1371	0.4
12	β-caryophyllene	1417	1413	7.4
13	aromadendrene	1439	1432	1.0
14	α-caryophyllene	1452	1447	5.4
15	allo-aromadendrene	1458	1454	0.2
16	γ-muurolene	1478	1471	0.7
17	β-selinene	1489	1479	1.3
18	(*E*)-methyl isoeugenol	1491	1481	0.7
19	α-selinene	1498	1488	1.0
20	γ-cadinene	1513	1508	0.4
21	caryophyllenyl alcohol	1570	1562	0.4
22	caryophyllene oxide	1582	1577	26.1
23	globulol	1590	1584	4.3
24	humulene epoxide II	1608	1602	8.8
25	caria-4(12),8(13)-dien-5-ol	1639	1629	4.7
26	α-muurolol	1644	1635	2.5
27	β-eudesmol	1649	1644	1.5
28	α-cadinol	1652	1647	1.7
	Total identified			80.9
	Monoterpenes			9.0
	Oxygenated monoterpenes			4.0
	Sesquiterpenes			18.3
	Oxygenated sesquiterpenes			68.2
	Others			0.7

Notes: [a]On a HP5-MS column, [b]Adams (2007), [c]Average of 3 injections.

Results and discussion

Leaves of *P. myrsinites* presented 48.4% humidity. The essential oil had a slimy and translucent appearance and the yield was 0.1% (w/w, dry weight).

The chemical profile of the essential oil and the total ion chromatogram (TIC) are presented in Table 1 and Figure 1, respectively. The chromatogram contained forty-four peaks, but only twenty-eight of them were identified corresponding to 80.9% of the total essential oil composition. It is believed that the large amount of sesquiterpenes (86.5% of the oil) has disrupted greatly the identification process. In these conditions, the main components in the oil of *P. myrsinites* were both oxygenated and non-oxygenated sesquiterpenes such as caryophyllene oxide (26.1%), humulene epoxide II (8.8%), β-caryophyllene (7.4%) and α-caryophyllene (5.4%). Castelo et al. (2012) previously reported for *P. myrsinites* the presence caryophyllene oxide, β-caryophyllene, β-guaiane α-humulene and viridiflorol as the major constituents, results quite similar with those observed in the present work. However, the essential oil composition was not completely elucidated and authors did not describe quantitatively each compound, since no quantification by GC-FID was performed in their study (14). Therefore, this is the first study to report the qualitative and quantitative composition of the essential oil of *P. myrsinites*.

Although the essential oil yield was not very high, it is possible to note that the amount of oil obtained is consistent with the genus production. For example, the oil from four species from the Amazon rainforest (*Psidium acutangulum* DC., *P. striatulum* DC., *P. guineense* Sw. and *P. guajava* L.) showed yields between 0.1% and 0.8% (15). In the Cerrado, the species *Psidium myrsinoides* O. Berg, a close related species of *P. myrsinites* presented an yield of 0.4% (16).

Psidium myrsinoides presented an essential oil very similar to that obtained from *P. myrsinites* in which β-caryophyllene and caryophyllene oxide were the main compounds (16).

The guava tree (*Psidium guajava*), native from Central America, is the best known species of this genus. Many articles on its essential oil were published. β-caryophyllene is the most common substance, however, there are others like α-pinene, 1,8-cineol and limonene in significant amounts (17). It needs to be considered that guava is a cultivated and domesticated species, and some changes in the methabolic pathways could have happened during this process.

In the Amazon some essential oil from *Psidium* were previously described. The chemical composition of the oils from *P. acutangulum* DC., *P. striatulum* Mart. ex DC., *and P. guineense* and *P. guajava* indicated, as main components, α-pinene, 1,8-cineole

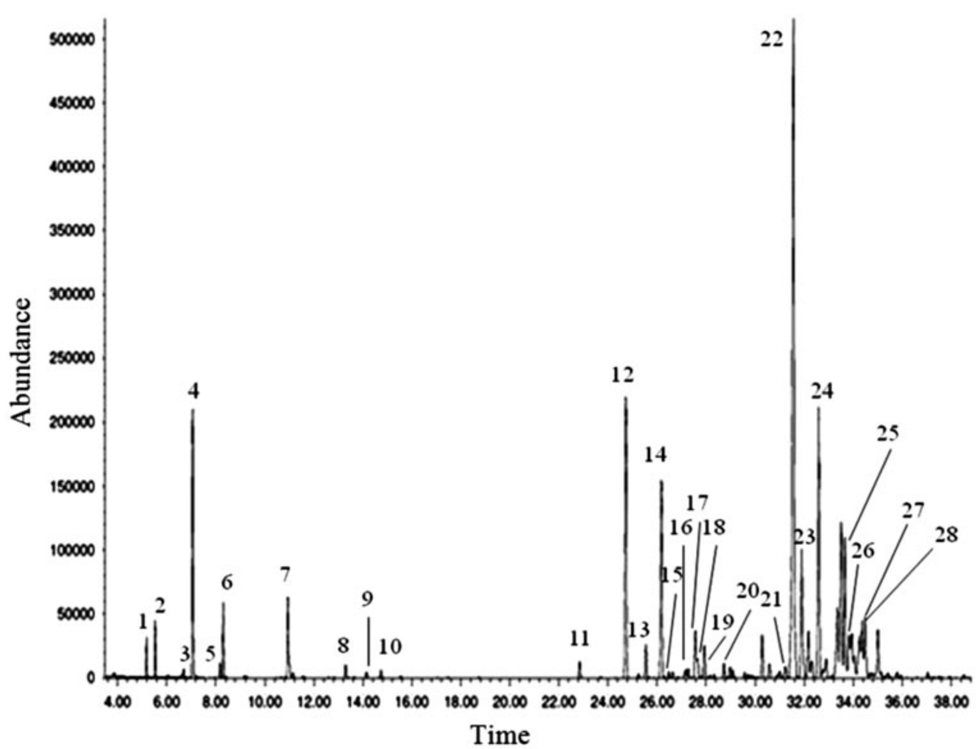

Figure 1. Total ion chromatogram of the essential oil from *P. myrsinites.*

(*P. acutangulum, P. guajava*); β-caryophyllene, α-selinene (*P. striatulum*); β-bisabolol, and limonene (*P. guineense*) (15).

The essential oils from *Psidium pohlianum* Berg and *Psidium guyanensis* Pers., both from the biome Caatinga, a Brazilian semiarid vegetation, were reported (18). It was observed a very close oil composition between these two species with 1,8-cineole being the main constituent in both plants, followed by the occurrence of α-pinene, β-eudesmol and γ-eudesmol.

In the Atlantic rainforest, it was found out α-thujene, 1,8-cineole and β-caryophyllene as major compounds in the oil from *Psidium cattleianum* Sabine (19).

The genus *Psidium* is largely distributed in all Brazilian territory and presented a predominance of mono and sesquiterpenes, with great variability, as reported above. The species of *Psidium* observed in the Cerrado biome showed a predominance of sesquiterpenes, mostly caryophyllene derivatives, which could be associated to the environmental conditions. However, there are still many other *Psidium* species to be chemically exploited to have a better understanding of this genus.

Acknowledgements

The authors are grateful to CAPES, CNPq, FAPERJ, UnB and EMBRAPA for financial support. The authors also would like to thank Sebastião for guidance in field works and Prof. Carolyn Proença (UnB) for the specimen identification.

Disclosure statement

No potential conflict of interest was reported by the authors.

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