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Essential oil of Algerian *Saccocalyx satureioides* Coss. et Durieu

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ABSTRACT: The volatile components of the aerial parts of *Saccocalyx satureioides* Coss et Durieu, obtained by hydrodistillation, have been analysed by GC and GC-MS. Forty-one components have been fully identified and grouped into three classes, namely monoterpene hydrocarbons, oxygenated monoterpenes and sesquiterpenes. The oxygenated monoterpenes, with 76.9%, was the most represented class, α-terpineol (32.7%), thymol (22.8%), borneol (11.6%) and carvacrol (6.9%) being the main components. *p*-Cymene (5.0%), camphene (2.9%), γ-terpinene (2.8%), α-pinene (1.8%) and limonene (1.5%) were the more significant monoterpene hydrocarbons. The concentration of sesquiterpenes was lower than 3%. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS: *Saccocalyx satureioides* Coss et Durieu; Lamiaceae; essential oil; gas chromatography (GC); mass spectrometry (MS)

Introduction

Saccocalyx satureioides Coss et Durieu is a small shrub belonging to the Lamiaceae family. It grows wild in a pre-Saharan depression on the dunes of Bou-Saada, in the M'Sila region, northeastern Algeria.[1] This plant is a typical example of endemism, since its presence has been reported only in this area; it is little known and from a phytochemical point of view has only been submitted to one recent study.[2] Locally its popular name is zaâter, a common appellative for oregano and thyme in all North African regions. No particular traditional usage of this plant is reported, although it is supposed that it is treated like oregano, which is considered an essentially medicinal plant.[3]

In the course of a study aimed at phytochemical screening of the Algerian flora, we wish to report here the study of the essential oil of the aerial parts of *S. satureioides*.

Experimental

Plant material

Saccocalyx satureioides was collected in Bou-Saada in M'Sila region in May 2003. Voucher specimens were deposited in the Herbarium of the Département de Biologie, Université Mohamed Boudiaf, M'Sila, Algeria.

Isolation of the essential oil

Air-dried aerial parts of the plant (100 g) were subjected to hydrodistillation until there was no significant increase in the volume of oil collected (3 h). The oil, whose yield was 3.5% v/w, was dried over anhydrous sodium sulfate and stored under nitrogen in a sealed vial until required.

GC and GC-MS analyses

Gas chromatographic (GC) analyses were run on a Hewlett-Packard gas-chromatograph model 5890, equipped with a flame ionization detector (FID) and connected with an electronic integrator. Gas-chromatography–mass spectrometry (GC-MS) was carried out on the same gas-chromatograph connected to a Hewlett-Packard mass spectrometer model 5971A.

GC-FID was carried out with the following analytical conditions: ZB-5 capillary column (30 m × 0.25 mm i.d. × 0.25 μm film thickness); helium as carrier gas; injection in split mode (1:50); injector and detector temperatures 250 and 280 °C, respectively. The oven temperature was programmed from 40 to 300 °C at 2 °C/min. GC-MS was carried out in electron impact

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mode at 70 eV; electron multiplier, 1700 V; ion source temperature, 180 °C; mass spectra data were acquired in the scan mode in *m/z* range 40–400. GC conditions were the same as above.

Identification of components

The identity of components was based on their GC retention index,[4] computer matching of spectral MS data with those from Wiley 275 library, the comparison of the fragmentation patterns with those reported in literature and, whenever possible, co-injections with authentic samples.

Chemicals were obtained from Sigma-Aldrich Chemical Co. and Extrasynthese, France.

Table 1. Chemical composition of *Saccocalyx satureioides* Coss. et Durieu essential oil

No.[a]	KI[b]	Compound	%[c]
		Monoterpene hydrocarbons	*16.8*
1	924	Tricyclene	0.1
2	929	α-Thujene	0.6
3	936	α-Pinene	1.8
4	950	Camphene	2.9
5	975	Sabinene	t
6	977	β-Pinene	0.3
7	992	Myrcene	0.8
8	1003	α-Phellandrene	t
9	1017	α-Terpinene	0.6
10	1025	*p*-Cymene	5.0
11	1030	Limonene	1.5
12	1060	γ-Terpinene	2.8
14	1087	Terpinolene	0.4
		Oxygenated monoterpenes	*76.9*
13	1070	*cis*-Sabynene hydrate	t
15	1097	*trans*-Sabinene hydrate	t
16	1099	Linalool	0.4
17	1121	Sabinaketonedehydro	t
18	1125	α-Campholenal	t
19	1139	*trans*-Pinocarveol	t
20	1143	Camphor	0.1
21	1165	Borneol	11.6
22	1191	Terpinen-4-ol	1.2
23	1193	α-Terpineol	32.7
24	1193	*cis*-Dihydrocarvone	0.2
25	1222	Isobornyl formate	0.2
26	1289	Bornyl acetate	t
27	1291	Thymol	22.8
28	1297	Carvacrol	6.9
29	1352	Thymol acetate	0.7
30	1364	Carvacrol acetate	0.1
		Sesquiterpenes	*2.7*
31	1394	α-Gurjunene	t
32	1402	β-Caryophyllene	0.8
33	1437	α-Humulene	0.3
34	1444	Alloaromadendrene	0.2
35	1478	β-Acoradiene	0.2
36	1494	γ-Cadinene	0.1
37	1503	δ-Cadinene	0.3
38	1556	Spathulenol	0.3
39	1562	Caryophyllene oxide	0.3
40	1569	Viridiflorol	0.1
41	1663	epi-α-Muurolol	0.1

[a] The numbering refers to eluition order on ZB-5 capillary column.
[b] Retention index relative to standard mixture of *n*-alkanes on ZB-5 capillary column.
[c] Values (area%) represent averages of three determinations (t = trace, <0.05%).

Results and discussion

Table 1 lists the chemical composition of the *S. satureioides* essential oil. The 41 fully identified components have been grouped into three classes, namely monoterpene hydrocarbons, oxygenated monoterpenes and sesquiterpenes.

The oxygenated monoterpenes class is the most important both for the quantitative (76.9% total oil) and qualitative (17 components) features. In this class, α-terpineol (32.7%), thymol (22.8%), borneol (11.6%) and carvacrol (6.9%) stand out from the others, representing over 96% of oxygenated monoterpenes alone. The monoterpene hydrocarbons class follows with 16.8% total oil, spread over 13 components, among which *p*-cymene reaches 5.0%, camphene 2.9% and γ-terpinene 2.8%, then α-pinene and limonene 1.8 and 1.5%, respectively. All other components of this class are below 1%. The total concentration of sesquiterpenes is lower than 3%, comprising altogether 11 components, amongst oxygenated and hydrocarbon derivatives, none of which reaches 1%.

From a qualitative aspect, the oil obtained in this study closely resembles that obtained by Laouer *et al.*[2] from another Algerian *S. satureioides* population. In fact, whereas in this latter study borneol, thymol, α-terpineol and *p*-cymene were identified as the main components, with a large predominance of borneol (ca. 58%); in the present study we have observed the same main components with a different quantitative relationship, with the predominance of α-terpineol, and the substantial presence of carvacrol (Table 1). Different chemotypes, different collection times or different environmental concerns could be the reasons for the observed differences between the two populations of *S. satureioides*.

Furthermore, broadening the comparison in the ambit of the Lamiaceae family, it is interesting to underline some similarities of this oil with that from *Thymus satureioides*, also known as Moroccan thyme;[5–9] it is not fortuitous, in fact, that *S. satureioides* is described as 'plante à odeur de thym'.[1]

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