Available online on www.ijppr.com
International Journal of Pharmacognosy and Phytochemical Research 2016; 8(10); 1731-1734

ISSN: 0975-4873

Research Article

Chemical Composition of the Essential Oil of Aerial Parts of *Pituranthos battandieri* Maire

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Available Online: 15th October, 2016

ABSTRACT

The essential oil of the aerial parts of *Pituranthos battandieri* Maire (Apiaceae), synonym: *Deverra battandieri* (Maire) Chrtek., was obtained by steam distillation and analyzed by GC and GC-MS. 64 components were identified constituting 94.7% of the oil. Among the identified compounds, monoterpenes represented 77.4% among which 15.3% were oxygenated.The sesquiterpene fractions represented 16.5% among which 3.1% were oxygenated. The major constituents were myrcene (8.9%), α-phellandrene (17.5%), α-terpinene (14%), *o*-cymene (11.6%), β-phellandrene (3.5%), cis-linalool oxide (furanoid) (5.9%) and *trans*-β-caryophyllene (3.4%). This is the first report on the study of the chemical composition of the essential oil of this species.

Keywords : *Pituranthos battandieri* Maire, *Deverra battandieri* (Maire) Chrtek., Apiaceae, Essential oil.

INTRODUCTION

The genus *Pituranthos* Viv. (*Deverra* DC.*)* of the family Apiaceae includes more than 20 species[1] among which four are present in Algeria[2,3]. Many *Pituranthos* species are used in folk medicine[4-7] and are rich sources of bioactive compounds[1,8-13]. The essential oils of this genus are reported to possess antifungal, antimicrobial, immunomodulatory, anticancer and antioxidant activities[14-17]. Given the interest of *Pituranthos* pharmacology and phytochemistry, the present paper concentrates on a relatively rare species, *Pituranthos battandieri* Maire, Synonym: *Deverra battandieri* (Maire) Chrtek. endemic to the Algerian and Moroccan Sahara[3,18]. To the best of our knowledge, this species has not been previously investigated. In this paper as a continuation of our works on Saharan species[19-23], we report our results concerning the chemical composition of the essential oil of the aerial parts of this species collected from Bechar area in the southwest of Algeria.

MATERIALS AND METHODS

Plant material

The aerial parts of *Pituranthos battandieri* Maire[2,3] were Collected on April 2010 from the area of Bechar in the southwest of Algeria and authenticated by M. Mohamed Benabdelhakem, director of the nature preservation agency, Bechar. A Voucher specimen (PBA 54/04/10) has been deposited in the Herbarium of the research unit VARENBIOMOL, University Frères Mentouri Constantine 1.

Extraction of the essential oil

The aerial parts (300 g) of *Pituranthos battandieri* Maire, were steam distilled in a Kaiser Lang apparatus for three hours. The obtained essential oil was collected and dried over anhydrous sodium sulfate and kept at 4°C until analysis. The yield of the oil was calculated in relation of the dry weight of the plant.

GC-FID Analysis

The essential oils were analyzed on an Agilent gas chromatograph (GC-FID) Model 6890, equipped with a HP-5MS fused silica capillary column (5%-diphenyl-95%-dimethylpolysiloxane (25 m x 0.25 mm, film thickness 0.25 µm), programmed from 50 °C (5 min) to 250 °C at 3 °/min and held for 10 min. Injector and flame ionization detector temperatures were 280 and 300 °C, respectively. The essential oils were diluted in acetone (3.5%, v/v) and injected in split mode (1/60), helium was used as a carrier gas (1.0 mL/min). Solutions of standard alkanes (C_8-C_{20}) were analyzed under the same conditions to calculate retention indices (RI) with Van del Dool and Kratz equation.

GC-MS Analysis

Mass spectrometry was performed on an Agilent gas chromatograph-mass spectrometer (GC-MS) Model 7890/5975, equipped with HP-5MS capillary column (25 m x 0.25 mm, film thickness 0.25 µm) programmed with

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Table 1: Composition of the essential oil of *Pituranthos battandieri* Maire with retention times, retention indices and percentages

Peak N°	RT	[b]RI	[a]Components	%
1.	5.765	924	α-thujene	tr
2.	5.900	932	α-Pinene	1.8
3.	6.405	957	Camphene	0.3
4.	6.680	971	Sabinene	tr
5.	6.773	976	β-Pinene	1.5
6.	7.018	988	β-Myrcene	8.9
7.	7.262	1001	Mentha-1(7).8-diene	0.7
8.	7.335	1005	α-Phellandrene	17.5
9.	7.543	1016	α -Terpinene	14.0
10.	7.674	1024	*o*-Cymene	11.6
11.	7.745	1028	Limonene	1.9
12.	7.775	1029	β -Phellandrene	3.5
13.	7.853	1034	(Z)-β-Ocimene	tr
14.	8.495	1070	*cis*-Linalool oxide (furanoid)	5.9
15.	8.761	1085	*trans*-Linalool oxide (furanoid)	2.6
16.	8.806	1088	*p*-Cymenene	0.4
17.	8.968	1097	Linalool	0.2
18.	9.384	1124	(Z)-*p*-Menth-2-en-1-ol	0.4
19.	9.671	1143	(E)-*p*-Menth-2-en-1-ol	0.3
20.	10.091	1171	Terpinen-4-ol	0.6
21.	10.358	1188	*p*-cymen-8-ol	0.6
22.	10.487	1197	α-Terpineol	0.5
23.	10.543	1198	*cis*-Piperitol	tr
24.	10.609	1205	α -phellandrene epoxyde	1.3
25.	10.684	1211	*trans*-Piperitol	tr
26.	11.178	1245	Cuminaldehyde	0.4
27.	11.262	1252	Carvotanacetone	tr
28.	11.365	1259	*cis*-Chrysanthenyl acetate	1.1
29.	11.472	1266	Nonanoic acid	tr
30.	11.655	1279	Bornyl acetate	0.9
31.	11.826	1291	Dihydroedulane-I	tr
32.	11.925	1298	Carvacrol	0.5
33.	12.087	1311	*p*-Vinylguaiacol	tr
34.	12.772	1363	Decanoic acid	tr
35.	12.983	1379	α-Copaene	0.3
36.	13.002	1381	Daucene	tr
37.	13.093	1387	ß-bourbonene	0.4
38.	13.149	1391	ß-Elemene	0.6
39.	13.561	1424	*trans*- β -Caryophyllene	3.4
40.	13.645	1431	γ-elemene	0.5
41.	13.729	1438	α-Guaiene	0.7
42.	13.809	1444	6,9-Guaiadiene	0.3
43.	13.903	1453	ß-sesquifenchene	tr
44.	14.004	1460	α- Humulene	0.5
45.	14.226	1478	α- Neocallitropsene	0.9
46.	14.310	1485	Germacrene D	0.7
47.	14.412	1493	ß- Selinene	0.2
48.	14.486	1499	Bicyclogermacrene	0.5
49.	14.548	1504	α-Bulnesene	1.9
50.	14.732	1520	δ-Cadinene	2.1
51.	15.014	1545	α-Calacorene	tr
52.	15.082	1551	Elemol	tr
53.	15.174	1559	Dodecanoic acid	tr
54.	15.371	1563	Germacrene B	0.4
55.	15.440	1581	Spathulenol	1.0
56.	15.515	1587	Caryophyllene oxide	1.1

57.	15.871	1620	Elema-1,11-dien-15-al	tr
58.	15.981	1629	*trans*-Muurulol	0.3
59.	16.052	1636	Cyclomyltaylane	tr
60.	16.328	1660	ß-Eudesmol	0.3
61.	16.676	1691	Acorenone	0.4
62.	16.923	1694	β -sinensal	tr
63.	17.340	1763	Unidentified	0.2
64.	17.779	1797	Unidentified	0.5
65.	18.206	1840	2-Pentadecanone-6,10,14-trimethyl	0.7
66.	19.171	1956	Hexadecanoic acid	0.1
Total identified				94,7
Grouped compounds				
Monoterpene hydrocarbons				62.1
Oxygenated monoterpenes				15.3
Sesquiterpene hydrocarbons				13.4
Oxygenated sesquiterpenes				3.1
Others				0.8
Unidentified				0.7

tr: trace < 0.1%

[a]Compounds are listed in order of their RI

[b]RI (retention index) measured relative to *n*-alkanes (C_8-C_{20}) using HP-5MS

the same conditions as for GC-FID. The mass spectrometer (MS) ionization was set in positive electron impact mode at 70 eV and electron multiplier was set at 2200 V. Ion source and MS quadrupole temperatures were 230 °C and 180 °C, respectively. Mass spectral data were acquired in the scan mode in the *m/z* range 33-450. The essential oil constituents were identified by matching their mass spectra and retention indices (RI) with those of reference compounds from libraries such as Adams[24] and Mc Lafferty & Stauffer[25]. The proportions of the identified compounds were calculated by internal normalization.

RESULTS AND DISCUSSION

The yield of steam distillation was 0.95% (w/w) in relation to the dry weight of the plant. A total of 64 constituents were determined which account for about 94.7% of the essential oil of *Pituranthos battandieri* Maire. The identified components (Table 1) are listed in order of their experimental retention times and retention indices.

The major constituents of the oil were myrcene (8.9%), α-phellandrene (17.5%), α-terpinene (14%), *o*-cymene (11.6%), β-phellandrene (3.5%), cis-linalool oxide (furanoid) (5.9%) and *trans*-β-caryophyllene (3.4%). At less extent the other main constituents were α-pinene (1.8%), β-pinene (1.5%), limonene (1.9%), *trans*-linalool oxide (furanoid) (2.6%), α-phellandrene epoxyde (1.3%), *cis*-chrysanthenyl acetate (1.1%), α-bulnesene (1.9%), δ-cadinene (2.1%), spathulenol (1.0%) and caryophyllene oxide (1.1%).

The sesquiterpenic components were present at moderate proportion (16.5%) while the monoterpenic components represented the major fraction 77.4% of the total oil composition. As other plant of the genus *Pituranthos*[15,26], this species is rich in monoterpenic compounds: in our case α-phellandrene (17.5%), α-terpinene (14%), *o*-cymene (11.6%) and myrcene (8.9%), are the major constituents. To the best of our knowledge this is the first report on the chemical composition of the essential oil of *Pituranthos battandieri* Maire.

CONCLUSION

The chemical composition of the essential oil of *Pituranthos battandieri* Maire was described for the first time. Sixty four components were determined. The oil was characterized by a high level of the monoterpenic components and a moderate yield of the sesquiterpenic fraction. The major compounds were myrcene (8.9%), α-phellandrene (17.5%), α-terpinene (14%), *o*-cymene (11.6%), β-phellandrene (3.5%), cis-linalool oxide (furanoid) (5.9%) and *trans*-β-caryophyllene (3.4%).

ACKNOWLEDGEMENTS

We are grateful to Dr. Mohamed Benabdelhakem, director of the nature preservation agency, Bechar, for the identification of the plant material and MESRS (DGRSDT) for financial support.

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