

Chemical Composition of the Leaf Oil of *Mentha rotundifolia* (L.) from Algeria

M. Brada*

Centre Universitaire de Khemis-Miliana, W. Ain-Defla, 44225, Algeria

M. Bezzina

Laboratoire d'Analyse Fonctionnelle des Procédés Chimiques, Université Saad Dahleb,
Route de Soumaa W. Blida, 09000, Algeria

M. Marlier

Unité de Chimie Organique et Chimie Générale, Faculté Universitaire des Sciences Agronomiques de Gembloux

G.C. Lognay

Unité de Chimie Analytique, Faculté Universitaire des Sciences Agronomiques de Gembloux, 2;
Passage des Déportés, B-5030 Gembloux, Belgique

Abstract

Two Algerian origin oils of *Mentha rotundifolia* (L.) Hud. were analyzed by means of GC and GC/MS. Piperitenone oxide (23.5–38.6%) and *cis*-piperitone oxide (28.1–30.5%) were the two main constituents of the oils analyzed.

Key Word Index

Mentha rotundifolia, Lamiaceae, essential oil composition, piperitenone oxide, *cis*-piperitone oxide.

Introduction

Mentha rotundifolia (L.) Huds., Lamiaceae is a wild-growing, perennial, herbaceous, aromatic plant species, widespread in the nature. In Algeria and northern Africa, this endemic plant is well known such as "timarssat." In Algerian traditional medicine, it is popular and appreciated.

Mentha rotundifolia (L.) Huds. is a hybrid between *M. longifolia* (L.) and *M. suaveolens* Ehrh. (1-2). Some authors have considered *M. rotundifolia* (L.) Huds. as a synonym of *M. suaveolens* Ehrh. (3). Several studies dealing with the composition of *M. rotundifolia* oil from different parts of the world (1-11) have been reported and related chemotypes have been defined. One of them is particularly rich in piperitenone oxide, an oxygenated monoterpene whose biological effects (cardiovascular effects, CNS activity, antibacterial and antifungal properties, toxic, repellent and reproduction retardant toward malarial vector *Anopheles stephensi*) have been investigated (12-17). Moreover, this molecule is an interesting building-block for the chemical synthesis of heterocyclic compounds (18). The present article deals on the original GC/MS and GC characterization of the oils isolated from *M. rotundifolia* growing wild in two sites in Algeria.

Materials and Methods

Plant material and isolation of volatile constituents:

Mentha rotundifolia leaves were collected in the second week of November 2004 in two localities of Algeria (Rouina: altitude 250 m, Miliana: altitude 780 m) within the region of Ain-Defla located in northern Algeria. Voucher specimens were deposited in the Herbarium of the Agronomic Institute of the Hassiba Ben Bouali University of Chlef.

Air-dried leaves (10 g) of the two *M. rotundifolia* samples were finely ground and separately subjected to hydrodistillation for 1 h using a Likens-Nickerson apparatus. The solvent used was diethyl ether.

Gas chromatographic analysis: The analysis of the oil was carried out by HP GC 6890A with FID, using a capillary column coated with 5% phenyl methyl siloxane (30 m x 0.25 mm x 0.25 µm film thickness); column temperature, 40°C (1 min) to 200°C at 6°C/min, 200–280°C at 30°C/min, 280°C (2 min). Injector temperature 280°C; detector temperature 300°C, injection mode, split; volume injected, 1 µL of the oil. Carrier gas was He, 1 mL/min.

Gas chromatography/mass spectrometry: GC/MS was conducted using an Agilent 5973 GC/MS coupled to an

*Address for correspondence

Table I. Chemical composition of the leaf oil of *Mentha rotundifolia* from two localities of Algeria (mean of triplicates)

Compound	RI	Area (%)		Compound	RI	Area (%)	
		Rouina	Milliana			Rouina	Milliana
α -pinene	930	0.3	0.5	piperitenone	1347	0.2	1.6
camphene	945	t	t	piperitenone oxide	1376	38.6	23.5
sabinene	970	t	t	(Z)-jasnone	1400	0.4	0.7
β -pinene	973	0.3	t	unknown 2	1405	8.5	17.4
1-octen-3-ol	976	0.2	0.7	unknown 3	1420	8	-
myrcene	988	0.3	t	β -caryophyllene	1424	4.4	1
α -phellandrene	1002	-	t	aromadendrene	1450	0.3	-
α -terpinene	1014	t	t	(E)- β -farnesene	1456	0.3	0.8
p-cymene	1023	-	0.5	α -humulene	1458	0.4	-
limonene	1026	0.4	-	1,2-epoxy menthyl acetate	1466	-	1.8
(Z)- β -ocimene	1035	t	-	bicyclosesquiphellandrene	1467	0.6	-
(E)- β -ocimene	1046	0.2	-	germacrene D	1485	2.4	4.7
γ -terpinene	1057	t	1.2	δ -selinene	1494	-	t
cis-sabinene hydrate	1065	0.6	-	cadina-1,4-diene	1497	-	t
terpinolene	1087	t	-	bicyclogermacrene	1500	0.2	-
p-cymenene	1088	-	0.4	γ -cadinene	1517	-	t
trans-sabinene hydrate	1098	t	-	cis-calamenene	1526	0.3	0.7
nonanal	1102	t	-	α -cadinene	1540	t	t
1-octen-3-yl acetate	1110	0.4	0.6	α -calacorene	1545	-	t
3-octyl acetate	1122	t	-	α -caryophyllenyl alcohol	1572	-	t
allo-ocimene*	1128	t	-	1,6-germacradien-5-ol	1579	t	-
borneol	1166	1	2.4	caryophyllene oxide	1580	-	1.8
terpinen-4-ol	1178	0.3	2.8	viridiflorol	1597	t	-
α -terpineol	1191	0.7	t	unknown 4	1613	-	0.4
pulegone	1231	-	t	T-muurolof	1648	0.3	0.6
carvotanacetone	1249	-	t	α -cadinol	1655	t	-
cis-piperitone oxide	1261	28.1	30.5	neophytadiene	1836	-	0.6
unknown 1	1264	0.5	-				
bornyl acetate	1286	1	1.4	Monoterpene hydrocarbons:		1.3	2.6
2-undecanone	1293	-	0.4	Oxygen-containing monoterpenes:		71.6	65.5
2-hydroxypiperitone	1302	-	0.4	Sesquiterpene hydrocarbons:		4.2	7.2
4-hydroxypiperitone	1307	-	0.5	Oxygen-containing sesquiterpenes:		0.3	2.4

t = trace (< 0.1); *correct isomer not identified; MS m-z: unknown 1 = 96 (35), 68 (66), 67 (100), 43 (34), 41 (33), 39 (39); unknown 2 = 154 (30), 127 (37), 112 (81), 109 (24), 81 (50), 43 (100); unknown 3 = 154(26), 127(31), 112(69), 109(28), 81(44), 43(100); unknown 4 = 179(59), 161(93), 119(100), 109(24), 105(54), 41(42)

Agilent 6890 gas chromatograph fitted with a split-splitless injector at 250°C (splitless mode). Analytical conditions have been fixed as follows: Agilent HP-5MS capillary column (30 m x 0.25 mm, 0.25 μ m film thickness), temperature program: from 40°–250°C at 6°C/min, mobile phase: He at 1 mL/min. The mass spectra have been recorded in EI mode (70 eV), scanned mass range: 35 to 500 amu. Source and quadrupole temperatures were fixed at 230°C and 150°C, respectively. The identification of the components was performed on the basis of chromatographic retention indices and by comparison of the recorded spectra with computed data libraries (Wiley 275.L, Adams 2001). For sesquiterpene hydrocarbons, further confirmations were obtained by comparing the mass spectra with data from the literature (19,20).

Results and Discussion

Table I lists the compounds identified in the oils (yield: 0.2%), obtained by hydrodistillation, of wild *M. rotundifolia*. Thirty-nine compounds were identified in leaf oil of sample 1, the main one being cis-piperitone oxide. Piperitone oxide

has been previously reported as the main constituent of the essential oils of *M. rotundifolia* (1,6,24).

Thirty-nine compounds were identified in leaf oil of sample 2. The main one being piperitenone oxide. This oxygenated monoterpene has been reported to characterize the oils of some chemotypes of *Mentha spicata* (8), *M. longifolia* (21, 22), *M. villosa* (23) and *M. rotundifolia* (2,5,24–26). Previous studies on the oil of *M. rotundifolia* revealed the existence of chemotypes with different major components, as menthyl acetate (1), dihydrocarvone (3), p-mentha-2,4(8),6-triene (8) and pulegone (10).

The present original study demonstrated that the oils composition of *M. rotundifolia* from Algeria is similar to those quoted in the literature.

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