



## NOTE

### Study of the Essential Oil Composition of *Lallemantia iberica* (M. Bieb.) Fisch. and C.A. Mey. (Lamiaceae) from Turkey

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The essential oil of wild-growing *Lallemantia iberica* (Lamiaceae) from Turkey was obtained by hydrodistillation and analyzed by GC and GC-MS. In the oil of the *Lallemantia iberica*, 40 components were characterized representing 90.1 % of the total oil, with germacrene-D (36.0 %),  $\beta$ -caryophyllene (18.3 %) and bicyclogermacrene (9.7 %) as the main constituents. The results showed that the analysis of essential oil composition will add some contributions on the usability of this plant as a crop and renewable resources and chemotaxonomy of the genus patterns.

**Key Words:** *Lallemantia iberica*, GC-MS, Essential oil, Germacrene D.

The *Lallemantia* (Lamiaceae) genus plants were locally cultivated from the Bronze age and oil from the seeds of *Lallemantia* can be used for a variety of purposes, including food, lighting and medicine<sup>1</sup>. *Lallemantia* genus is a member of Lamiaceae family and this family is well represented in Turkey by 46 genera and ca. 760 taxa with species, subsp., varieties and hybrids of which 44.2 % are endemic. The *Lallemantia* genus is represented with 3 different species (*L. canescens* (L) Fisch and Mey, *L. peltata* (L) Fisch and Mey and *L. iberica* (M. Bieb.) Fisch.), which are distributed in different localities of Turkey<sup>2</sup>.

*Lallemantia iberica* originates in the Caucasian region and may be locally naturalized in East and Central East Europe. This taxon is cultivated for its seeds from which oil is extracted. The seed contains up to 30 % of a drying oil. It is used for lighting, as a varnish, in paints and as a lubricant. The oil may also be used for oil-foods and as a tanning agent<sup>3</sup>. The leaves are used as a potherb in modern Iran<sup>4</sup>.

According to the available literature, the chemical composition of oils of *L. peltata*<sup>5</sup>, *L. royleana*<sup>6</sup> and *L. iberica* from Iran<sup>7</sup> have already been studied. As a part of our studies on the plant products and biotechnology research laboratory on the some genus patterns *Thymus*<sup>8</sup>, *Tanacetum*<sup>9</sup>, *Hypericum*<sup>10</sup> and *Achillea*<sup>11</sup> have been reported.

Although, there are some studies on the *Lallemantia* species essential oils from different countries and the chemical composition of *Lallemantia iberica* oil has not been reported

from Turkey. In this study, we have isolated the volatiles by water distillation from the aerial part of *Lallemantia iberica*. The essential oil was then analyzed by GC and GC/MS. The aim of this work was to elucidate the composition of the essential oil of *Lallemantia iberica* and compare them with the data available in the literature for the oil composition of other species of *Lallemantia* genus.

**Plant source:** The specimens of *Lallemantia iberica* was collected from Elazig, Eastern Anatolian region of Turkey in 2009. Voucher specimen (FUH-9875) is kept at the Firat University Herbarium (FUH), Elazig, Turkey.

**Isolation of the essential oils:** Air-dried aerial parts of the plant materials (100 g) were subjected to hydrodistillation using a Clevenger-type apparatus for 3 h to yield, explained in different studies.

**Gas chromatographic analysis:** The essential oils were analyzed using HP 6890 GC equipped with and FID detector and an HP-5 MS column (30 m  $\times$  0.25 mm i.d., film thickness 0.25  $\mu$ m) capillary column was used. The column and analysis conditions were the same as in GC-MS. The percentage composition of the essential oils was computed from GC-FID peak areas without correction factors.

**Gas chromatography/mass spectrometry analysis:** The oils were analyzed by GC-MS, using a Hewlett Packard system. HP-Agilent 5973 N GC-MS system with 6890 GC in Plant Products and Biotechnology Res. Lab. (BUBAL) in Firat University. HP-5 MS column (30 m  $\times$  0.25 mm i.d., film thickness

0.25  $\mu\text{m}$ ) was used with helium as the carrier gas. Injector temperature was 250  $^{\circ}\text{C}$ , split flow was 1 mL/min. The GC oven temperature was kept at 70  $^{\circ}\text{C}$  for 2 min and programmed to 150  $^{\circ}\text{C}$  at a rate of 10  $^{\circ}\text{C}/\text{min}$  and then kept constant at 150  $^{\circ}\text{C}$  for 15 min to 240  $^{\circ}\text{C}$  at a rate of 5  $^{\circ}\text{C}/\text{min}$ . Alkanes were used as reference points in the calculation of relative retention indices (RRI). MS were taken at 70 eV and a mass range of 35-425. Component identification was carried out using spectrometric electronic libraries (WILEY, NIST). The identified constituents of the essential oils are listed in Table-1.

No	Compounds	RRI	Concentration (%)
1	$\alpha$ -Pinene	1021	0.1
2	<i>cis</i> -Ocimene	1099	0.1
3	1,3,6 octatriene	1107	0.1
4	Undecane	1147	0.2
5	$\alpha$ -Terpineol	1215	0.1
6	<i>trans</i> -Carveole	1234	0.1
7	Carvacrol	1253	0.1
8	Camphene	1324	0.3
9	$\delta$ -Elemene	1327	1.8
10	$\alpha$ -Cubebene	1336	0.1
11	$\alpha$ -Copaene	1360	0.4
12	$\beta$ -Damascenone	1362	0.1
13	$\alpha$ -ourbonene	1366	2.7
14	$\beta$ -Elemene	1370	1.2
15	Aromadendrene	1384	0.1
16	$\beta$ -Caryophyllene	1393	18.3
17	$\beta$ -cubebene	1400	0.6
18	Azulene	1412	0.1
19	$\beta$ -Farnesene	1415	2.5
20	$\alpha$ -Humulene	1418	1.9
21	Alloaromadendrene	1421	0.3
22	Germacrene D	1437	36.0
23	Valencene	1440	0.8
24	Bicyclogermacrene	1445	9.7
25	$\alpha$ -Amorphene	1457	1.2
26	$\delta$ -Cadinene	1458	0.5
27	Spathulenol	1495	2.5
28	Caryophyllene oxide	1498	4.6
29	Azulene	1526	0.3
30	$\alpha$ -Muurolol	1532	0.5
31	$\alpha$ -Cadinol	1539	0.8
32	$\beta$ -Bisabolene	1555	0.2
33	Cyclanonasiloxane	1583	0.1
34	2-Pentadecanone	1631	0.2
35	1,2-Benzenedicarboxylic acid	1639	0.1
36	Nonadecane	1660	0.1
37	<i>n</i> -Hexadecanoic acid	1692	0.1
38	Heneicosane	1789	0.1
39	Phytol	1794	1.0
40	Tricosane	1902	0.1
	Monoterpenes		0.9
	Sesquiterpenes		87.9
	Nonterpenes		1.3
	Total		90.1

RRI: Relative retention times

Essential oil was obtained by hydrodistillation from air dried aerial parts of *Lallemantia iberica*. Oil was subsequently analyzed by GC and GC/MS and the individual identified components with its relative percentage is given in Table-1.

In the oil of *Lallemantia iberica*, 40 components were characterized representing 90.1 % of the total oil, with germacrene-D (36.0 %),  $\beta$ -caryophyllene (18.3 %) and bicyclogermacrene (9.7 %) as the main constituents (Table-1). The essential oil is mainly composed of sesquiterpene derivatives. The identified sesquiterpenes compounds constituted approximately 87.9 % of the total oil, which mainly included germacrene D and  $\beta$ -caryophyllene. Monoterpenes and nonterpenes were found in low amounts in the essential oil. Previously reported results about the essential oil analysis of *L. iberica* from Iran have revealed that sesquiterpenes (51.3 %) constituted the major components of the oil<sup>12</sup>.

In previous work on this plant oil, collected from north of Iran, Larijan suburb, was isolated by hydrodistillation and analyzed by means of GC and GC/MS. Among the 26 components identified in this oil, *p*-cymene (22.1 %), isophytol (19.8%), T-cadinol (11.1 %), 3-octanol (8.1 %), caryophyllene oxide (7.4 %) and terpinen-4-ol (5.7 %) were the major constituents<sup>7</sup>. On the other hand, Nori-Shargh *et al.* found that the oil of *L. iberica* consisted mainly of germacrene-D (33.7 %),  $\delta$ -3-carene (19.0 %), iso-caryophyllene (12.8 %), sabinene (11.1 %),  $\alpha$ -terpinene acetate (6.5 %) and limonene (4.4 %). Baser *et al.* reported that the germacrene D (27.4 %), (E)- $\beta$ -ocimene (20.1 %) and geijerene (12.0 %) as major constituents in the oil of species of *Lallemantia peltata*.

This reports on the *Lallemantia* essential oils revealed that germacrene D is the first major constituent of *L. iberica*<sup>12</sup> and *L. peltata*<sup>5</sup> and in this sample studied.  $\beta$ -Caryophyllene, the second major compound of the essential oils of *L. iberica* was not detected in the *L. iberica*<sup>12</sup>. The third major compound-bicyclogermacrene (9.7 %)- was determined in the *L. iberica*, it is not reported in the *L. iberica*, collected from Iran<sup>12</sup>.  $\delta$ -Cadinene also was found in both *L. iberica* oil from Iran and Turkey<sup>12</sup>.

The results showed that the Germacrene D was the abundant component in *Lallemantia* genus essential oils in here and the others. It is possible to say that the essential oils of this genus patterns were mainly composed of sesquiterpene derivatives than monoterpenes.

This study demonstrates the occurrence of germacrene D/ $\beta$ -caryophyllene chemotype of *Lallemantia iberica* collected from Turkey. The result was also supplied some contributions on the renewable resources of *Lallemantia* genus and its chemotaxonomy.

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