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THE ESSENTIAL OIL OF A NEW *Sideritis* SPECIES: *Sideritis ozturkii* AYTAC and AKSOY*

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Water-distilled essential oils from flowering spikes of Sideritis ozturkii (Lamiaceae), *a new species, were analyzed by GC/MS. The main components were found to be* α*-pinene (31.1%, 16.0%, and 6.2%), and* β*-pinene (20.2%, 14.2%, and 7.3%) in three samples collected from the same locality at different times.*

Key words: *Sideritis ozturkii*, Lamiaceae, essential oil, pinenes.

The genus *Sideritis* (Lamiaceae) is represented in Turkey by 46 species and altogether 53 taxa, 39 taxa being endemic [1–3]. We previously reported one new record (*S. scardica* subsp. *scardica*) and five new species to science (*S. gulendami*, *S. akmani*, *S. vuralii*, *S. caesarea*, and *S. ozturkii*) from Turkey [3, 4].

The genus *Sideritis* is an important species among the other Lamiaceae genera because the ratio of endemism in *Sideritis* species is very high (78%) and several *Sideritis* species named «Dag cayi» are used as herbal tea and folk medicine in Turkey [5]. Some *Sideritis* species, *S. stricta*, *S. argyrea*, *S. congesta*, *S. condensata*, *S. vulcanica*, *S. erythrantha* var. *cedretorum*, etc., are also traded in Antalya. Local names, traditional uses, and pharmacological and antimicrobial activities of *Sideritis* species have previously been reported [5–6].

Here, we report for the first time the essential oil composition of *S. ozturkii* Aytac and Aksoy which is a recently discover endemic species of Turkey [4]. It is locally known as "Ada cayi'' in Konya, Camlik village and used as herbal tea in the region. The results of the GC/MS analysis of the essential oil are given in Table 1. The yields ranged between 0.15-0.20%. Seventy-nine, ninety-four and ninety-three compounds were identified in the oils of *S. ozturkii*, representing 95% (A), 87% (B), and 97% (C) of the oils, respectively. The main components were found to be α-pinene (31.1%, 16.0%, and 6.2%) and β-pinene (20.2%, 14.2%, and 7.3%) in three samples collected from two localities at different times. *Sideritis* species containing α- and β-pinene are mostly used as herbal tea in Turkey [5]. 57% of the *Sideritis* species existing in Turkey belongs to the «monoterpene hydrocarbon-rich» group [7]. *Sideritis ozturkii* is also included in this group.

EXPERIMENTAL

The air-dried plant materials, collection places and dates, and yield of essential oil are given in Table 2. Voucher specimens are kept at the Herbarium of the Faculty of Pharmacy of Anadolu University in Eskisehir, Turkey (ESSE).

Plants materials were hydrodistilled for 3 h using a Clevenger-type apparatus. Percentage yields of the oils were calculated on a moisture-free basis (Table 2).

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TABLE 1. The Composition of the Essential Oils of *Sideritis ozturkii*

RRI	Compound	A	B	C
1032	α-Pinene	16.6	6.2	31.1
1035	α-Thujene	0.8	0.3	1.9
1076	Camphene	Tr.	0.1	0.4
1093	Hexanal	Tr.	Tr.	Tr.
1118	β-Pinene	14.7	7.3	20.2
1132	Sabinene	2.4	1.2	3.5
1174	Myrcene	1.0	0.6	1.1
1176	α-Phellandrene	0.1	-	0.2
1188	α-Terpinene	Tr.	0.1	0.2
1203	Limonene	4.7	2.8	4.3
1213	1,8-Cineole	-	-	2.0
1218	β-Phellandrene	2.2	1.5	0.2
1225	(Z)-3-Hexenal	-	-	0.3
1255	γ-Terpinene	0.5	0.2	0.3
1280	*p*-Cvmene	0.3	0.7	0.5
1290	Terpinolene	0.3	0.2	0.4
1360	Hexanol	Tr.	0.1	0.1
1393	3-Octanol	Tr.	0.1	Tr.
1400	Nonanal	Tr.	0.1	0.1
1429	Perillen	-	0.1	-
1439	γ-Campholene aldehyde	-	0.2	Tr.
1452	α,*p*-Dimethylstyrene	Tr.	0.1	Tr.
1452	1-Octen-3-ol	0.9	0.6	0.4
1466	α-Cubebene	0.4	-	0.9
1474	*trans*-Sabinene hydrate	Tr.	0.3	0.1
1495	Bicycloelemene	-	Tr.	0.1
1497	α-Copaene	1.6	3.0	1.6
1499	α-Campholene aldehyde	Tr.	0.3	-
1507	(*E*,*E*)-2,4-Heptadienal	-	-	0.1
1522	Chrysanthenone	-	Tr.	0.1
1528	α-Bourbonene	-	-	0.1
1532	Camphor	-	0.1	-
1535	β-Bourbonene	0.3	0.1	0.1
1544	α-Gurjunene	Tr.	0.3	2.3
1549	β-Cubebene	0.2	0.5	0.5
1553	Linalool		0.5	0.1
1556	*cis*-Sabinene hydrate	-	0.1	-
1562	Octanol	Tr.	0.1	Tr.
1571	*trans*-*p*-Menth-2-en-1-o1	-	0.1	Tr.
1586	Pinocarvone	1.0	1.9	0.4
1597	Bornyl acetate	0.9	0.6	0.4
1599	(*E*,*Z*)-2,6-Nonadienal	-	-	0.1
1611	Terpinen-4-ol	2.8	1.7	0.5
1612	β-Caryophyllene	-	-	0.5
1638	β-Cyclocitral	-	-	0.1
1648	Myrtenal	1.6	2.5	0.1
1661	Alloaromadendrene	-	0.1	0.1
1663	*cis*-Verbenol	0.5	1.3	0.2

TABLE 1. (Continued)

RRI	Compound	A	B	C
1664	*trans*-Pinocarveol	1.5	2.6	0.5
1674	*p*-Mentha-1,5-dien-8-ol	0.2	0.4	-
1677	*epi*-Zonarene	0.4	0.4	0.5
1678	*cis*-*p*-Mentha-2,8-dien-1-ol	-	Tr.	-
1683	*trans*-Verbenol	2.3	5.6	0.8
1700	*p*-Mentha-1,8-dien-4-ol- (=Limonen-4-ol)	0.3	-	Tr.
1706	α-Terpineol	2.9	1.2	0.6
1708	Ledene	-	-	0.2
1719	Borneol	0.4	-	-
1725	Verbenone	0.9	1.2	-
1726	Germacrane D	0.5	-	0.9
1740	α-Muurolene	Tr.	0.2	0.1
1755	Bicyclogermacrene	9.2	2.5	2.6
1763	Naphthalene	0.5	0.9	0.1
1765	Geranyl acetate	0.6	-	0.1
1773	δ-Cadinene	3.2	4.2	2.6
1799	Cadina-1,4-diene (=Cubinene)	2.3	1.0	2.4
1804	Myrtenol	1.4	1.7	0.3
1828	9-Decen-1-ol	-	0.3	-
1830	2,6-Dimethyl-3(*E*),5(*E*),7-octatriene-2-ol	-	0.1	-
1838	(*E*)-β-Damascenone	Tr.	0.1	0.1
1845	*trans*-Carveol	0.4	0.7	0.1
1853	*cis*-Calamenene	1.8	3.8	1.5
1864	*p*-Cymen-8-ol	0.2	0.4	0.1
1868	(*E*)-geranyl acetone	0.2	0.2	Tr.
1882	Aplotaxene	0.3	0.4	0.2
1882	*cis*-Carveol	-	0.1	-
1900	*epi*-Cubebol	0.9	2.2	1.0
1941	α-Calacorene	0.2	0.4	0.2
1957	Cubebol	1.7	4.6	1.9
1984	β-Calacorene	Tr.	0.1	0.1
2008	Caryophyllene oxide	Tr.	0.8	0.2
2051	Gleenol	0.1	0.3	0.2
2069	1,6-Germacradien-5 β-ol (=Germacrene D-4 β-ol)	-	-	0.1
2080	Cubenol	0.5	0.8	0.5
2084	Octanoic acid	0.4	0.4	-
2088	1-*epi*-Cubenol	0.9	1.5	0.8
2098	Globulol	0.1	0.2	0.1
2104	Viridiflorol	0.2	0.2	0.1
2131	Hexahydrofarnesyl acetone	0.2	0.3	0.1
2144	Spathulenol	4.6	4.3	0.1
2179	3,4-Dimethyl-5-pentylidene-2(5H)-furanone	-	0.1	-
2192	Nonanoic acid	0.5	0.3	-
2198	Thymol	Tr.	0.2	Tr.
2209	T-Muurolol	0.4	0.6	0.3
2219	δ-Cadinol	0.2	0.2	0.1
2239	Carvacrol	0.4	0.1	0.1
2247	*trans*-α-Bergamotol	0.4	0.3	0.1
2256	Cadalene	-	0.6	0.2

TABLE 1. (Continued)

RRI	Compound	A	B	C
2264	4,7-Dimethyl-1-tetralone	-	0.5	0.1
2289	Oxo-α-Ylangene	-	0.4	0.1
2300	Decanoic acid	-	0.1	Tr.
2300	Tricosane	0.3	0.1	Tr.
2396	13-*epi*-Manoyl oxide (=8 α-13-oxy-14-en-epilabdane)	0.6	0.5	0.1
2419	4-Isopropyl-6-methyl-1,2,3,4-tetrahydronaphthalen-1-one	-	0.1	-
2500	Pentacosane	-	0.1	-
2503	Dodecanoic acid	Tr.	0.1	0.1
2622	Phytol	-	-	0.1
2700	Heptacosane	-	0.3	
2713	Tetradecanoic acid		0.2	Tr.
2900	Nonacosane	Tr.	0.4	0.1
2931	Hexadecanoic acid	0.2	1.6	0.3
	Total	95.5	86.9	96.4

RRI: Relative retention indices calculated against n-alkanes, Tr.: <0.1%.

TABLE 2. Collection Place, Date, Yield, and Voucher Number of *Sideritis ozturkii*

Code	Collection Place	Collection Date	Yield (%)	ESSE
A	Konya: Derebucak, Kizildag, Camlik town	31.7.2000	0.18	13278
B	Antalya: 4 km of Camlik-Akseki road, 1450-1700m	17.7.1997	0.15	12526
C	Konya: Derebucak, Kizildag, Camlik town	27.6.2000	0.20	13254

The essential oils were analyzed by gas chromatography/mass spectrometry. GC/MS analysis was carried out using a Hewlett-Packard GCD system. Innowax FSC column (60 m × 0.25 mm; 0.25 mm film thickness) was used with helium as a carrier gas (1 mL/min). GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min and then kept constant at 220°C for 10 min, to 240°C at a rate of 1°C/min. Alkanes were used as reference points in the calculation of relative retention indices (RRI). The split ratio was adjusted at 50:1. The injector temperature was at 250°C. MS were taken at 70 eV. Mass range was from *m/z* 35 to 425. Library search was carried out using the Wiley GC/MS Library and the TBAM Library of Essential Oil Constituents. Relative percentage amounts of the separated compounds were calculated from total ion chromatograms by a computerized integrator.

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