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Essential Oil Composition of *Salvia heldreichiana* Boiss. Ex Bentham Described Endemic Species from Turkey

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Plant material of *Salvia heldrichiana* Boiss. Ex Bentham was collected from the locality: C4 12th km on Konya, Hadim-Kizilkaya-Karaman road. Aerial parts of plants was dried in shadow then the leaves were separated from the stems. The essential oil was extracted from the leaves by hydro distillation method. The average content of essential oil was obtained as 0.22 %. The water-distilled essential oil from dried leaves of this species was analyzed by GC-MS. Total 60 components, representing 92.7 % of the oil, were characterized. The main component of essential oil was α-pinene with 13.35%. The other important compounds were identified such as spathulenol, caryophyllene oxide, α-cadinol, linalool and α-terpineol.

Key Words: *Salvia heldreichiana*, α-pinene, Essential oil composition.

INTRODUCTION

The genus *Salvia L.* (*Lamiaceae*) has over 900 species all over the world[1,2]. The two largest centers of the genus are in America and South-West Asia[2,3]. Anatolia is major centre for *Salvia* in Asia and 46 (52%) of 89 total *Salvia* species are endemic to Turkey[4-7]. The distribution of species in neighboring countries to Turkey is follows; 75 in Flora USSR[8], 70 in Flora Iranica[9], 36 in Flora Europaea[10] and 21 in Flora Palaestina[11]. *Salvia heldrichiana* Boiss. Ex Bentham is endemic species for flora of Turkey and it is mainly native to South Anatolia[4]. Some members of *Salvia* are of economic importance since they have been used as flavouring agents in perfumery and cosmetics. Sage (*S. officinalis*) has been credited with a long list of medicinal uses as spasmodical, antiseptic and astringent[12,13]. 48 Taxa of the genus *Salvia* are researched on the chemical contents among vascular plants of known wild Turkish origin or cultivated in Turkey or

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elsewhere from material of wild Turkish origin[14]. Leaves of some *Salvia* species are used to relieve for the upper respiration channel disease. Its leaves, stalks and essential oil are used for many purposes.

EXPERIMENTAL

Aerial parts of *Salvia heldrichiana* Boiss. Ex Bentham were collected from the locality: C4 Konya: Hadim-Kizilkaya-Karaman road, on 12th km, 900m of altitude, on 20 June 2003, stone lopes, A. Duman 6232. Voucher specimens kept at the Herbarium of the Faculty of Science and Literature, of Kirikkale University in Kirikkale, Turkey (ADO). The collected plant materials were dried in shadow and leaves of plant were separated from the stems and perpetrated for the essential oil extraction.

Isolation of essential oil: The air-dried leaves of plant were divided three equal samples (50 g each). These samples were submitted for 3 h to water-distillation using a Clevenger-type apparatus. The average essential oil yield was calculated as 0.22 % v/w. The obtained essential oil samples were mixed and perpetrated for GC-MS analysis.

GC-MS analysis conditions: The analysis of the essential oil was performed using a Hewlett Packard 6890 II GC, equipped with a HP-5 MS capillary column (30 m × 0.25 i.d., 0.25 mm) and a HP 5973 mass selective detector. For GC-MS detection, electron ionization energy of 70 eV was used. Helium was the carrier gas, at flow rate of 1 mL/min. Injector and MS transfer line temperature were set at 220 and 290ºC, respectively. Column temperature was initially kept at 50ºC for 3 min, then gradually increased to 150ºC at a 3ºC/min rate. Finally, the temperature was raised 250ºC at a 10ºC/min in 10 min. Diluted samples (1/100 in hexane, v/v) of 1.0 μL were injected automatically and in splitless mode. The components were identified based on the comparison of their relative retention time and mass spectra with those of standards, NBS75K and Wiley library data of GC-MS system and literature data[15].

RESULTS AND DISCUSSION

60 Compounds were identified in the essential oil of *Salvia heldrichiana* Boiss. Ex Bentham, having the total area of 92.69 %. The main compounds found in essential oil of this species were α-pinene (13.35 %), spathulenol (4.17 %), caryophyllene oxide (4.14 %), α-cadinol (3.94 %), linalool (3.57 %) and α-terpineol (3.56 %) (Table-1). The average content of essential oil was 0.22 % in this endemic species.

In previous investigations on *Salvia* spp of Turkey, different compounds were identified as major components. The main compound was identified 1,8-cineole (55.5 %) in *S. fruticosa* oil[14]. From *S. cryptantha* oil; borneol (24.8 %), camphor (17.5 %) and 1,8-cineole (10.4 %) have been the major

constituents[16]. *S. pomifera* essential oil was found to contain β-thujone (50-67 %)[17]. β-pinene (34.4 %) and α-pinene (22.6 %) were identified as major compound of the essential oil of *S. tomentosa*. In the oil of *S. officinalis* the main component was camphor (22.9 %) with α-thujone (20.6 %)[16]. *Salvia aucheri* Benham var. *canescens* Boiss. & Heldr. growing endemic, were collected two different location in Turkey and analyzed by GC-MS. according to result, 1,8-cineol (32.3 %, 28.6 %), camphor (18.9 %, 22.8 %) borneol (8.2 %, 8.9 %), α-pinene (6.3 %, 9.0 %) and β-pinene (5.3 %, 6.2 %) were identified as main constituents of the essential oil of *Salvia aucheri* Benham var. *canescens*[18]. The volatile compounds of *Salvia heldreichiana* differ from many *Salvia* spp. growing in Turkey in the variety of its compounds and their relative quantity. The differences of essential oil components can be attributed to genetic differences, climatic factors, different locations and plant parts analyzed[18].

TABLE-1
ESSENTIAL OIL COMPOSITION OF *SALVIA HELDREICHIANA* BOISS. EX BENTHAM

	Compounds	RT	Compound ratio (%)
1	α-Thujene	8.35	0.14
2	α-Pinene	8.59	13.35
3	Camphene	9.16	0.59
4	Verbenene	9.39	0.18
5	Sabinene	10.21	1.03
6	β-Pinene	10.32	1.68
7	Myrcene	11.02	2.42
8	α-Terpinene	12.09	0.34
9	*p*-Cymene	12.45	2.84
10	Limonene	12.63	2.06
11	Cineole	12.72	3.37
12	Ocimene	13.60	0.18
13	γ-Terpinene	14.03	0.97
14	Linalool oxide	14.66	0.32
15	Terpinolene	15.40	0.29
16	Linalool	15.98	3.57
17	α-Campholenal	17.14	2.01
18	Pinocarveol	17.68	0.74
19	*cis*-Verbenol	17.82	2.79
20	Borneol	18.95	1.75
21	4-Terpineol	19.52	2.03
22	Crypton	19.91	3.33
23	α-Terpineol	20.16	3.56
24	Myrtenol	20.40	0.95

	Compounds	RT	Compound ratio (%)
25	Berbenone	20.98	0.55
26	*trans*-Carveol	21.46	0.71
27	Phenol	21.89	0.73
28	Propanal	22.39	2.74
29	Carvone	22.59	0.32
30	Geraniol	23.15	0.32
31	Bergamol	23.26	3.21
32	2-Caren-10-ol	24.37	0.17
33	Cuminol	24.72	0.48
34	Thymol	24.86	1.53
35	Carvacrol	25.26	0.99
36	Terpinolene	27.34	0.77
37	Nerylacetate	28.04	0.27
38	β-Bourbonene	28.82	1.78
39	β-Caryophyllene	30.25	1.19
40	Guaiene	30.62	0.23
41	Calarene	30.78	2.86
42	Aromadendrene	30.94	0.96
43	β-Cubebene	32.80	0.74
44	Curcumene	32.92	0.17
45	Bicyclogermacrene	33.44	0.33
46	Naphthalene	34.15	1.45
47	Cadinene	34.54	0.49
48	α-Selinene	36.18	1.10
49	Spathulenol	36.62	4.17
50	Caryophyllene oxide	36.84	4.14
51	Alloaromadendrene	37.17	0.15
52	Cubenol	38.09	0.52
53	α-Cadinol	38.92	3.94
54	Guaiene	39.07	0.30
55	β-Eudesmol	39.16	0.66
56	*t*-Muurolol	39.30	1.47
57	Vulgarol	39.71	0.99
58	Murolan	39.81	0.17
59	Calamenene	40.74	1.07
60	Cadina-4	41.31	0.53
	Total		92.69

REFERENCES

1. J.B. Walker and W.J. Elisens, *Sida*, **19**, 571 (2001).
2. I.C. Hedge, A Global Survey of the Biogeography of the Lamiaceae, in eds.: R.M. Harley and T. Raynolds, Advances in Lamiaceae Science, Kew: Royal Botanic Gardens, pp. 7-17 (1992).

3. I.C. Hedge, *J. Royal Horticult. Soc.*, **85**, 451 (1960).
4. I.C. Hedge and L. Salvia, in ed.: P.H. Davis, Flora of Turkey and the East Aegean Islands, Edinburgh University Press, Vol. 7, pp. 400-461 (1982).
5. P.H. Davis, R.R. Mill, K. Tan and L. Salvia, Flora of Turkey and the East Aegean Islands, Edinburgh University Press, Vol. 10, p. 210 (1988).
6. A.A. Dönmez, *Bot. J. Linn. Soc.*, **137**, 413 (2001).
7. H. Duman and L. Salvia, in eds.: A. Güner, N. Özhatay, T. Ekim and K.H.C. Baser, Flora of Turkey and the East Aegean Islands, Edinburgh University Press, Vol. 11, pp. 209-210 (2000).
8. E.G. Pobedimova and L. Salvia, in ed.: B.K. Schischkin, Flora of the USSR, Moskova-Leningrad, Vol. 21, pp. 178-260 (1954).
9. I.C. Hedge and L. Salvia, in ed.: K.H. Rechinger, Flora Iranica, Graz: Austria, Vol. 150, pp. 403-476 (1982).
10. I.C. Hedge and L. Salvia, in eds.: T.G. Tutin, V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb, Flora Europaea, Cambridge University Press, Vol. 3, pp. 188-192 (1972).
11. M. Zohary and L. Salvia, in ed.: M. Zohary, Flora Palaestina, Jerusalem: Israel Academy of Sciences and Humanities, Vol. 1, pp. 296-297 (1966).
12. C.A. Newall, L.A. Anderson and J.D. Philipson, Herbal medicines: A Guide for Health-Care Professionals, The Pharmamaceutical Press, London, p. 23 (1996).
13. B. Tepe, D. Daferera, A. Sokmen, M. Sokmen and M. Polissiou, *Food Chem.*, **90**, 333 (2005).
14. K.H.C. Baser, in eds.: A. Güner, N. Özhatay, T. Ekim and K.H.C. Baser, Index to Turkish Plant Chemical Contents, Flora of Turkey and the East Aegean Islands, Edinburgh University Press, Vol. 11, pp. 513-616 (2000).
15. R.P. Adams, Identification of Essential Oils Components by Gas Chromatography/ Quadrupole Mass Spectroscopy, Carol Stream, IL, USA: Allured Publishing Corporation (2001).
16. A. Bayrak and A. Akgül, *Phytochemistry*, **26**, 846 (1987).
17. K.H.C. Baser, T. Özek, N. Kirimer and G. Tümen, *J. Essent. Oil Res.*, **5**, 347 (1993).
18. M. Özcan, O. Tzakou and M. Couladis, *Flavour Fragr. J.*, **18**, 325 (2003).

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