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ESSENTIAL OIL CONSTITUENTS OF *Satureja boissieri* FROM TURKEY*

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Water-distilled essential oil from the aerial parts of S. boissieri *was analyzed by GC/MS. Forty – five components were characterized representing 97% of the oil. The main components were identified as carvacrol (40.8%), γ-terpinene (26.4%), and* p*-cymene (14.5%).*

Key words: Compositae, *Satureja boissieri*, essential oil, carvacrol, γ-terpinene; *p*-cymene.

The family Lamiaceae is represented in Turkey by 556 species and altogether 741 taxa [1]. Most aromatic plants belonging to the family Lamiaceae, such as *Satureja*, *Origanum*, *Thymus*, etc., are used as herbal tea in Turkey [2].

The genus *Satureja* is represented in Turkey by fifteen species, five of which are endemic. *Satureja boissieri* Hausskn. ex Boiss. is known as "Kekik or Catali" and is used as condiment in Adiyaman province.

Out of 15 *Satureja* taxa recorded in Turkey plus *S. montana* (cultivated), we have so far studied 12 taxa collected from different localities [3–9].

This paper reports the results of GC/MS analyses of the essential oil from the aerial parts of *S. boissieri.*

To the best of our knowwledge there is no previous study on the oil of this species. *S. boissieri* is used as herbal tea in the regions where it grows. The local name for *Satureja boissieri* is "Catali".

As shown in Table 1, 44 components were identified, constituting 98.5% of the *S. boissieri* oil.

The oil contained carvacrol (40.8%), γ-terpinene (26.4%), and p-cymene (14.5%) as the main constituents. *Satureja* oils containing monoterpenic phenols may contain carvacrol and/or thymol as the main constituents. Being the biosynthetic precursors of these monoterpenic phenols, γ-terpinene and *p*-cymene are always found in such oils. A list of *Satureja* species which contain carvacrol as the major compound is given in Table 2.

EXPERIMENTAL

The plant material was collected (August 2000) from Adiyaman Celikhan–Kocali village. The voucher specimen is kept at the Herbarium of the Faculty of Pharmacy, Anadolu University, Eskisehir, Turkey (ESSE: 13394).

The air dried aerial parts of the plants were subjected to hydrodistillation for 3 h using a Clevenger-type apparatus. The oil yield was 2.1%.

The oil was analyzed by GC/MS using a Shimadzu GC-MS QP5050A system. CPSil5CB column (25m × 0.25 mm i.d., 0.4 μm film thickness) was used with helium as the carrier gas. GC oven temperature was kept at 60°C and programmed to 260°C for at a rate of 5°C/min, and then kept constant at 260°C for 40 min. The split flow was adjusted at 50 mL/min. The injector temperature was at 250°C. MS were taken at 70 eV. Mass range was between *m/z* 30 to 425. A library search was carried

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TABLE 1. Composition of the Essential Oil of *Satureja boissieri*

Compound	RI*	%	Compound	RI*	%
α-Thujene	921	1.4	*trans*-*p*-Menth-2-en-1-ol	1099	Tr.
α-Pinene	928	1.0	Borneol	1141	0.1
Camphene	940	0.1	1,8-Menthadien-4-ol + *p*-Cymen-8-ol +	1154	0.8
1-Octen-3-ol	956	0.2	Terpinen-4-ol		
β-Pinene	965	0.2	α-Terpineol	1168	Tr.
Myrcene	976	2.8	Methyl carvacrol	1217	0.2
α-Phellandrene	990	0.4	Isothymol	1253	0.1
δ-3-Carene	999	0.1	Thymol + Isocarvacrol	1260	0.3
α-Terpinene	1004	4.6	**Carvacrol**	1280	**40.8**
***p*-Cymene**	1008	**14.5**	Carvacryl acetate	1337	0.2
β-Phellandrene + Limonene	1015	0.9	β-Caryophyllene	1410	0.8
(*Z*)-β-Ocimene	1019	Tr.	Aromadendrene	1430	0.2
(*E*)-β-Ocimene	1030	0.1	α-Humulene	1443	Tr.
γ-Terpinene	1047	**26.4**	Alloaromadendrene	1450	Tr.
trans-Sabinene hydrate	1048	0.2	Ledene	1483	0.2
Methyl benzoate	1061	Tr.	δ-Cadinene	1506	Tr.
trans-Linalool oxide +Cumenene	1065	0.1	Spathulenol	1555	0.2
Terpinolene + *trans*-*p*-Mentha-2,8-	1071	0.2	Caryophyllene oxide	1561	0.1
dien-1-ol			Viridiflorol	1565	Tr.
Linalool	1076	1.3	Hexadecanoic acid	1932	Tr.

RI*: Retention index on nonpolar column. Tr: trace ($\leq$ 0.1%).

TABLE 2. Essential Oils of *Satureja* Species Growing in Turkey

Species	Oil Content, %	Main Components, %
S. cuneifolia	0.6-3.6	Carvacrol (25-69)
		p-Cymene (12-31)
S. hortensis	1.3-4.8	Carvacrol (35-63)
		γ-Terpinene (24-43)
S. thymbra	1.0-4.3	Carvacrol (30-49)
		γ-Terpinene (18-27)
S. spicigera	0.5	Carvacrol (26)
		γ-Terpinene (20)
S. cilicica	0.6-0.9	Carvacrol (22-38)
		p-Cymene (15-30)
S. parnassica ssp.	1.5-2.6	Carvacrol (43-47)
sipylea		*p*-Cymene (15-20)
S. icarica	0.8-2.2	Carvacrol (38-57)
		p-Cymene ((13-18)
S. pilosa	1.1-2.7	Carvacrol (42-54)
		γ-Terpinene (12-24)
S. montana (cultivated)	1.5	Carvacrol (63)
		γ-Terpinene (10)
S. boissieri	2.1	Carvacrol (41)
		γ-Terpinene (26)

out using the Wiley GC/MS Library and in-house TBAM Library of Essential Oil Constituents. The MSs were also compared with those of reference compounds and confirmed with the aid of retention indices from published as well as our own sources.

Relative percentage amounts of the separated compounds were calculated from total ion chromatograms by a computerized integrator.

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