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COMPOSITION OF ESSENTIAL OILS FROM TURKISH *SALVIA* SPECIES

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Key Word Index –*Salvia candidissima*; *S. cryptantha*; *S. fruticosa*; *S. officinalis*; *S. tomentosa*; Labiatae; essential oils.

Abstract The chemical composition of the essential oils from five *Salvia* species from Turkey was determined by GC. The species were *S. candidissima*, *S. cryptantha*, *S. fruticosa*, *S. officinalis* and *S. tomentosa*. 24, 22, 20, 19, and 22 components were identified, respectively, the major ones being β-pinene (*candidissima*), borneol (*cryptantha*), 1,8-cineole (*fruticosa*), camphor (*officinalis*) and β-pinene (*tomentosa*). α-Pinene in *candidissima*, camphor in *cryptantha*, α-thujone in *officinalis* and 1,8-cineole in *tomentosa* were the other important components.

INTRODUCTION

The sage plant, *Salvia*, belongs to the family Labiatae, which also includes the mints. Many species and varieties grow wild or are cultivated in many parts of the world. The herbs and/or their essential oils are used commonly in the food, drug and perfumery industries [1]. *S. officinalis* L. (common sage) and *S. sclarea* L. are cultivated [2] while *S. fruticosa* Mill. (Greek sage) and *S. lavandulaefolia* Vahl. (Spanish sage), the other important species, are wild growing plants [3, 4]. *S. triloba* leaves which are exported mainly from Greece and Turkey constitute the commercial sage together with *S. officinalis* [5]. In the flora of Turkey more than 70 species and varieties of *Salvia* can be found [6, 7]. In this paper, we report our findings on the chemical constituents of the essential oils from five *Salvia* species growing in Turkey.

RESULTS AND DISCUSSION

A total of 24, 22, 20, 19, and 22 components, respectively, representing *ca* 96–98% of the essential oils were identified (Table 1). Oxygenated components constituted the major components in *S. cryptantha*, *S. fruticosa*, and *S. officinalis* essential oils.

In the oil of *S. candidissima* the main component was β-pinene (34.39%). α-Pinene (22.6%) and 1,8-cineole (8.4%) were the other important components. The chemical composition of this oil has not been reported previously.

Borneol (24.8%) was the major component of *S. cryptantha* essential oil. The same oil also contained considerable amounts of camphor (17.5%) and 1,8-cineole (10.4%). Doğan [8] stated that a Turkish sample of this oil from Konya contained 27.9% 1,8-cineole, 17.07% bornyl acetate and 15.64% camphor as major components. According to our results, the borneol content is much higher than that of bornyl acetate.

S. fruticosa essential oil was found to contain 1,8-cineole (55.5%) as the major component. It was reported that 1,8-cineol or α-thujone could be the main component in *S. fruticosa* oils [9, 10]. A Turkish sample of the same oil from Muğla was found to contain 42.4% 1,8-cineole, 9.1% camphor and 1% thujone [11]. Our sample contains much higher quantities of 1,8-cineole, but also α- and β-thujone.

S. officinalis essential oil contained camphor (22.9%) as the main component. α-Thujone (20.6%) and β-thujone (15.1%) were also important components. Previously reported contents of α- and β-thujone (13.6–66.8%), 1,8-cineole (5.2–14.0%), and camphor (0–33.3%) in different samples of *S. officinalis* oils [12, 13] are similar to our findings. β-Pinene (19.2%), 1,8-cineole (15.0%) and α-pinene (11.4%) were the major components in *S. tomentosa* essential oil. The chemical composition of this oil has been not investigated previously.

EXPERIMENTAL

Plant material. The four wild growing species were collected in June from different parts of Anatolia and identified as *S. candidissima* Mill. (Erzurum), *S. cryptantha* Montbr. et Aucher ex Benth. (Gümüşhane), *S. fruticosa* Mill. (Muğla) and *S. tomentosa* Mill. (Kars). *S. officinalis* L. which does not occur wild in Turkey was cultivated in Izmir.

Isolation of essential oils. Steam distillation of fresh whole plant materials gave yellowish coloured oils. The oil yields were 0.6, 0.6, 2.8, 0.3 and 1.6% (v/w), respectively.

Chromatographic analysis. Constituents were identified by comparing their R_ts with those of authentic samples which were identified during previous studies by IR and MS [14]. The following analysis conditions were the same for all essential oils: stationary phase: 10% Carbowax on Chromosorb W/AW (80–100 mesh); column: stainless steel, 4 m × 1/8 inch; temps: column 80–195° (2°/min) 15 min, injector and detector 200°; flow rates: N_2 15 ml/min, H_2 40 ml/min, dry air 300 ml/min; detector: FID; injected sample: 0.2 μl.

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Table 1. Constituents of the essential oils from five Turkish *Salvia* species (% of oil)

No.	Component	*S. candidissima*	*S. cryptantha*	*S. fruticosa*	*S. officinalis*	*S. tomentosa*
1	α-Pinene	22.6	5.8	3.2	3.5	11.4
2	Camphene	1.7	2.8	0.7	4.7	1.8
3	β-Pinene	34.4	–	4.3	1.8	19.2
4	Myrcene	1.8	3.2	3.1	0.8	0.7
5	α-Phellandrene	3.6	2.9			3.0
6	α-Terpinene	0.2		0.4	0.1	—
7	Limonene	1.5	1.4	tr	1.4	0.8
8	1,8-Cineole	8.4	10.4	55.5	5.0	15.0
9	γ-Terpinene	tr	tr	1.7	0.4	0.7
10	*p*-Cymene	2.0			1.1	–
11	Terpinolene		0.8	0.9		
12	α-Thujone	0.5	0.6	2.0	20.6	0.1
13	β-Thujone	tr	0.3	2.0	15.1	0.2
14	Camphor	0.6	17.5	8.4	22.9	1.2
15	Linalool	0.2	4.0	1.6	1.1	1.6
16	Linalyl acetate	1.1	5.1	0.5	1.0	6.2
17	Isobornyl acetate		2.1		–	0.4
18	Bornyl acetate	3.5	3.1	1.7	2.6	7.8
19	Borneol	3.1	24.8	4.6	7.9	3.2
20	Isoborneol	2.2	3.4	—		
21	Terpinen-4-ol	1.5	tr	1.1	—	5.1
22	β-Caryophyllene	4.2	4.2	5.2	4.1	4.9
23	α-Humulene	0.5		0.3	2.1	5.9
24	α-Terpinyl acetate	tr	3.3	1.1	0.9	3.1
25	Geranyl acetate	2.0	0.5	—	–	2.3
26	Geraniol	2.6	tr		—	2.0

tr = trace.

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