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Composition of the Essential Oils of *Salvia vermifolia* from Turkey

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Abstract

Salvia vermifolia Hedge & Huber-Morath is an endemic species in Turkey. Essential oils of *Salvia vermifolia* were obtained by hydrodistillation. The oil content in dry flowers was 0.5%. The oil composition was determined by GC/MS. The main components in the oil were identified as spathulenol, α-pinene, β-pinene and caryophyllene oxide.

Keywords: *Salvia vermifolia*, Lamiaceae, essential oils, spathulenol.

Introduction

The genus *Salvia* of the family Lamiaceae (Labiatae) comprises nearly 900 species spread widely throughout the world. These species display marked morphological and genetic variations according to their geographical origin (Chalchat et al., 1998).

Turkey is an important gene centre for the Lamiaceae. In Turkey the family includes 546 species**.** The rate of endemism in the family is 44.2% (Baser, 1993). *Salvia, Sideritis, Thymus, Satureja, Origanum, Micromeria, Ocimum, Rosmarinus* etc. are widely used in folk medicine and herbal teas in Turkey (Tumen et al., 1998). The genus *Salvia* is represented in Turkey by 88 species and the ratio of endemism in the genus is 51%. *Salvia vermifolia* is an endemic with a narrow distribution in Turkey. The plant is perennial, with stems 25–40 cm, leaves simple, narrowly linear to linear-oblong, verticillasters 2-flowered, bracts 6 × 5 mm, calyx tubular-campanulate, 10–12 mm, yellowish-green, glandular-pubescent, corolla white with yellowish, growing on igneous and serpentine slopes (Davis, 1982).

In this paper we report the results of GC/MS analyses of the essential oils from flowering parts of *Salvia vermifolia*. To the best of our knowledge there is no previous report on the essential oil of *Salvia vermifolia*.

Experimental

Plant material

Salvia vermifolia was collected in Sivas/Gemerek, Kabaktepe Village in mid July 1996. Voucher specimens are kept at the herbarium of the Faculty of Science, University of K.S.U in K. Maras, Turkey.

Isolation of the essential oil

The air-dried flowering parts and leaves of the plants were steam distilled for 3 h using a Clevenger-type apparatus according to the standard procedure described in the *European Pharmacopoeia* (1975).

Gas chromatography – mass spectrometry

The essential oil was analysed by GC-MS using a Schimadzu QP-5000 system. The gas chromotograph was equipped with TC-1 column (GL-Science Com.HRGC) (60 m × 0.32 mm id, film thickness 0.25 µm). Oven temperature was programmed as follows: 70 °C for 5 min, up to 165 °C at 5 °C/min, up to 180 °C at 2 °C/min, up to 230 °C at 5 °C/min and then kept constant at 230 °C for 10 min. Carrier gas was helium. Split ratio was 1/14. The mass spectrometer was operating in EI mode at 70 eV. Interface temp: 230 °C. Mass range: 35–400 *m/z*, scan speed (amu/sec): 1000. The identification of constituents was based on comparison of retention indices and mass spectra using Wiley Libraries spectra.

Results and discussion

The yields of the oil from dry leaves and flowers were 0.17% and 0.5%, respectively. The stem has no remarkable oil content.

The volatile constituents in *Salvia vermifolia* oil are listed in Table 1 in order of elution from TC-1 column. 31 compo-

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Table 1. Composition of the essential oils of *Salvia vermifolia* Hedge & Hub.-Mor.

Compound	Percentage (%)	Compound	Percentage (%)
α-Pinene	9.25	Etanone	0.60
Camphene	6.69	Azulene	0.70
α-Thujene	0.61	Terpinen-4-ol	0.61
Sabinene	0.92	Verbenone	3.75
β-Pinene	8.61	Myrtenol	1.64
p-Cymene	0.35	Myrtenal	1.39
α-Terpinene	1.16	Carvone	0.35
1,8-Cineole	5.84	α-Copaene	1.38
Nonanal	0.68	β-Bourbonene	1.78
Camphor	0.67	β-Caryophyllene	1.04
Linalool	4.30	Aromadendrene	0.80
Carveol	2.55	Ledol	0.32
Eucarvone	3.88	Viridiflorol	2.08
Carveylacetate	0.39	Spathulenol	10.85
Borneol	7.13	Caryophylleneoxide	8.69
		Globulool	2.29

* Components are listed according to their elution on TC-1 column.

nents were identified, constituting 91.3% of the oil (Table 1). The oil presented high levels of spathulenol (10.95%), α-pinene (9.25%), caryophylleneoxide (8.69%), borneol (7.13%) and camphene (6.69%).

The chemical composition of the essential oil of some *Salvia* spp. has been studied earlier and several variations in the principal components of the oils have been reported; 1,8-cineole: 15.69–37.12% (Baser et al., 1995), camphor and 1,8-cineole: 30.78 and 27.28% (Baser et al., 1997), β-caryophyllene and globolol: 30% and 17% (Canigueral et al., 1990), α-thujone, β-seline and ledol: 16.2%, 8.1% and 24.2% (Mathe et al., 1998), *trans*-pinocarvyl acetate and myrtenyl acetate: 16.8% and 14.1% (Baser et al., 1998) and α-pinene and β-pinene: 29.4% and 34.8% (Rustaiyan et al., 1997), repectively.

According to our survey of the available literature on the composition of *Salvia* species there was one previous report including spathulenol as a main components in the *Salvia* oils. Our data only partially agrees with the Baser et al. (1993) report that a sample of *Salvia verticillata* ssp. Amasiaca from Turkey includes carvacrol (27%) and spathulenol (17%) as main components. Althought spathulenol was found high amount (9.54%) in one sample of *Salvia aethiopis* by Torres et al. (1997), bicyclogermacrene was the main component (29.54%) in the oil. Also this compound was obtained as a minor compound in the other Turkish *Salvia* spp. *Salvia euphratica* (1.1%) and *Salvia cryptantha* (0.17%) by Baser et al. (1998, 1995). The differences in the oil composition may be because of the collection time and geographic factors. Senatore et al. (1997) reported that the time of flowering, together with geographic and climatic factors is important in determining the composition of the oil and these factors could be in part responsible for the particular composition of the oil. Baser (1993) wrote that collection time, drying conditions, mode of distillation, geographic and climatic factors play role in the composition of the essential oils.

Our finding shows similarity to Senatore et al. (1997) findings that *Salvia* species are characterized by a significant oxygenated monoterpene content, but their data showed that *S. glutinosa* from Italy was rich in sesquiterpenes containing γ-muurolene (18.7–15.1%) as a major constituent. We can also say that *Salvia vermifolia* oil is rich in oxygenated sesquiterpene content because of spathulenol.

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