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COMPOSITION OF THE ESSENTIAL OILS OF *SALVIA ARAMIENSIS* RECH. FIL. AND *SALVIA CYANESCENS* BOISS. & BAL.

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Abstract

The chemical composition of the essential oils from flowering parts of *Salvia aramiensis* Rech. Fil. and *Salvia cyanescens* Boiss. & Bal. (endemic) from Turkey was determined by GC/MS. The main constituents of the essential oils were obtained as 1,8-cineole (60%) in *S. aramiensis and* spathulenol (32,5%) in *S. cyanescens*.

Introduction

The genus *Salvia* comprises of 89 species which are found in Turkey and the ratio of endemism in the genus is 50% (Baser, 2002). *Salvia* spp., is annually exported from Turkey in quantities exceeding in 500 tons into other countries. Cultivation of medicinal plants for the purpose of extraction of active constituents may face certain limitations such as climate, season, water availability, diseases and pests and scarcity of naturally growing plants (Arikat *et al*., 2003). *Salvia* oil is used as a flavour and food condiment, and in cosmetics, perfumes and medicine (Chalcat *et al*., 1998; Tumen *et al*., 1998). Because of heavy collecting from nature, many species belonging *Salvia* genus are becoming rare or endangered either through over collection or the reduction areas (Anon., 1988).

S. aramiensis is only known in South Anatolia, Hatay provinces that grow *Pinus brutia* woodland, rocky places and *S. cyanescens* is an endemic species and distributed in Central and North Anatolia that grow *Pinus nigra* forest, gravel river beds, fallow fields and vineyards (Davis, 1982).

Although many authors have reported analytical studies of the volatile oil of various Turkish species of *Salvia* (Bayrak & Akgul, 1987; Baser, 1993; Baser *et al*., 1997; Demirci *et al*., 2001; Demirci *et al*., 2002; Demirci *et al*., 2003; Kokdil *et al*., 1997; Sarer, 1987; Ulubelen, 1990), few studies have been carried out on *S. cyanescens* and *S. aramiensis*, including Sarer (1987), Demirci *et al*., (2001), Demirci *et al*., (2003); Bayram (2001). Therefore aim of this paper was to evaluate essential oil composition of two *Salvia* spp.; *S. cyanescens* and *S. aramiensis* growing in Turkey.

Material and Methods

Plant materials: *S. cyanescens* was collected from Sivas-Gemerek Inkisla villages in July (altitude 1100m) and *S. aramiensis* from Hatay Belen in July (altitude 600-800m). Voucher specimens are kept at the herbarium of the Science and Letter Faculty, University of KSU in K.Maras, Turkey.

Isolation of the essential oils: The air dried flowering parts and leaves of the plants were hydrodistilled for 3h using a Clevenger type apparatus according to the standart procedure described in the European Pharmacopoeie (1975).

Chemical analysis of the essential oils: The chemical composition of the essential oils was determined with a G 1800 B GCD system with an electron iozination detector (Hewlett-Packard Co, Polo All, CA) for high-resolution gas chromotography-mass spectrometry (GC-MS) analysis. Essential oils were injected into HP-5 fused silica capillary column (30mx0.25 mm) and used with helium as the carrier gas (1 ml/min). The temperature programme was 80°C for 2 min., and 80-200 °C at 4 °C/min. MS were taken at 70 eV. The scanning range was 45-450 m/z.

Result and Discussion

The essential oil yield of *S. aramiensis* was 2.2% and of *S. cyanescens* was 0.04%. Essential oil yield of *S. aramiensis* was reported as 3.0% by Sarer (1987). Our results was lower than Sarer (1987). There are reports where *Salvia* species are moderately rich in oils 0.1-1.0% (Baser, 2002). The oil components in *S. aramiensis* and *S. cyanescens* are given in Table 1 in order of elution from silica capilary column.

S. aramiensis oil has 20 components constituting 98.9% in oil and presented high levels of 1.8-cineol (60%), β-pinene (9%), myrcene (3.7%), α-pinene (3.4%) and germacrene-D (2.9%). The result was confirmed by Demirci *et al*., (2002) that 1.8-cineol was identified as the main component in all *S. aramiensis* oil collected in three different seasons in Hatay regions. But our result about 1.8-cineol content (60%) was higher than Demirci *et al*., (2002) results (13-49% 1,8-cineol). In contrast to our result Sarer (1987) reported that *S. aramiensis* oil had high camphor 16.5%, α-terpinol 10.8% and borneol 9.6%.

Baser (2002) reported that some Turkish *Salvia* species (*S. recognita, S. aytachii, S. aucheri, S. multicaulis, S. fruticosa, S. cryptantha, S. cyanescens, S. cadmica and S. myrnaea*) contain camphor and 1.8-cineol as major constituents.

In *S. cyanescens*, 18 components constituing 93.6% in oil were identified and the oil presented high levels of spathulenol (32.5%), myrtenal (7.8%), α-pinene and β-pinene (6.9%) and para-cymene (5.7%). Baser (1993) reported that *S. cyanescens* has borneol and isoborneol as main component. Also the data *S. cyanescens* is not in agreemeent with the reports of Baser (1993, 2002). The differences may be due to different type of GC, different period of collecting time and different geographic area of collecting (Bisio *et al*., 1998).

According to our survey of the available literature on the composition of *Salvia* species, our data partially agrees with previous studies. Baser *et al*., (1997) reported that *S. crypthanta* includes 1-8 cineole (15.69-37.12%) and *S. aytachii* includes camphor (30.78%) and 1,8-cineole (27.28%) as main component from Turkey. There are also some results about spathulenol as a main component in the *Salvia* spp. For instance Baser *et al*., (1993) reported that carvacrol (27%) and spathulenol (17%) were main component in *S. verticillata spp.* Amasiaca; as a similar spathulenol was found as a main component (10.85%) in *S. vermifolia* from Turkey (Karaman & Ilcim, 2002) also Torres *et al*., (1997) found high amounts of bicyclogermacrene (29.54%) and spathulenol (9.54%) in one sample content of *S. aethiopsis*.

Table 1. Percentage composition of the oils of *Salvia aramiensis* and *S. cyanescens.*

Compound	***S. aramiensis* (%)**	***S. cyanescens* (%)**
α-pinene	3,4	6,90
Camphene	1,3	1,10
Sabinene	2,4	-
β-pinene	9,0	6,90
Myrcene	3,7	-
Para-cymeme	-	5,70
Limonene	1,1	-
1.8-cineole	60,0	4,60
γ-terpinene	-	0,80
Cis-sabinene-hydrate	0,9	-
α-campholene aldehyde	-	2,20
Trans-pinocarveol	-	5,60
Camphor	2,1	-
Pinocarvone	-	3,90
Borneol	1,0	-
Terpinen-4-ol	-	3,90
α-terpineol	1,7	-
Myrtenal	-	7,8
Bornyl acetate	0,7	2
α-copaene	-	1
β-bourbonene	0,5	1,6
β-caryophyllene	1,5	2,00
α-humulene	1,9	-
Germacrene-D	2,9	-
Bicylogermacrene	0,7	-
Spathulenol	2,2	32,50
1.5-epoxisalvial-4(14)ene	-	2,4
Guaiol	0,9	-
Salvial-4(14)en-1-one	-	2,7
Bulnesol	1	-
Total	**98,9**	**93,6**

The variability composition and ratio in the oil of *S. cyanescens* and *S. aramiensis* could be induced by environmental, physiological and morphological factors and defined modifications in the environment can induce changes in biosynthesis, accumulation or metabolism in of given compounds of the essential oil (Senatore & Fusco, 1997; Mathe *et al*., 1992).

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