CONSTITUENTS OF THE ESSENTIAL OIL OF *SIDERITIS ERYTHRANTHA* BOISS. & HELDR. VAR. *ERYTHRANTHA*

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Abstract. The chemical composition of the essential oil obtained by hydrodistillation from mountain tea (*Sideritis erythantha*) herb was determined using capillary GC and GC/MS. A total number of sixty components were identified composing 84.9% of the oil of *S.erythrantha*. *S.erythrantha* oil contained as main components: β-pinene (25.13%), eucalyptol (8.83%), linalool (7.88%), α-bisabolol (7.32%), sabinene (6.79%), β-pinene (6.17%), germacrene D (5.87%) and carvacrol (4.90%). α- Pinene was the distinctive component of *S.erythrantha*.

Keywords*: Sideritis erythrantha*, Lamiaceae, essential oil composition, α-pinene

INTRODUCTION

Sideritis erythrantha, belonging to the Lamiaceae family, is a perennial plant, which grows wild in Turkey. *Sideritis* genus is represented by 46 species and 53 taxa altogether, 39 of which endemic (Davis, 1982; Kırımer et al., 2003). It is a shrub 20-75 cm in height, widely distributed in subtropical and moderate regions (Davis, 1982). Many of the species of the Lamiaceae aromatic plants family grow wild in Mediterranean basin (Circella et al., 1995; Martins et al., 1999). *Sideritis* species are a group of plants known in Turkey as "mountain tea". Some of the species are used as tea, flavoring agents and for medicinal purposes (Kırımer et al., 1991; Özcan et al., 2001). *Sideritis* species are also used in folk medicine as tonics, carminatives, stomachic,

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antispasmodics, diuretics and digestives; they are taken for cough, as well (Ezer et al., 1991; Koedam, 1986; Villar et al., 1984; Yeşilada and Ezer, 1989; Baytop, 1984). In recent years, several studies have been performed on the chemical composition of Sideritis species oils of different origins (Başer, 1994; Başer et al., 1996; Başer et al., 1997; Tümen et al., 1995; Özek et al., 1993; Özcan et al., 2001). However, only limited studies on the Turkish plant and volatile oil were conducted so far. Therefore, the purpose of the present study was to investigate the chemical composition of *S.erythrantha* oil, which grows wild in Turkey.

MATERIAL AND METHODS

Plant material

Aerial parts of *Sideritis erythrantha* Boiss. & Heldr. var. *erythrantha* were collected from plants growing in Isparta (Eğirdir) province in early July, 2004. The aerial parts were dried in the shade at room temperature.

Recovery of the essential oils

Dried aerial parts of the plants (200 g) were ground and submitted to hydrodistillation for 4 h using a Clevenger-type apparatus. Oils obtained were dried over anhydrous sodium sulfate. The essential oils were light yellow with yield of 0.24%, v/w, on dry basis.

Identification of components

For components identification, analytical Hp 5890 gas chromatograph eguipped with FID (GC) and DELSI 121 C apparatus fitted with a flame ionization detector and a CP WAX 51 fused silica column (25 m x 0.3 mm; 0.25 µm film thickness), were used. Temperature was programmed for 50°C for first 5 min, and then programmed to reach 220°C at the rate of 3°C per min. ACP WAX 51 fused silica WCOT column (60 m x 0.3 mm) for GC/ MS was used with helium as carrier gas. For GC/MS a CPWAX 52 fused silica CB column (50m x 0.25 mm) was used with helium as carrier gas (flow rate: 1 ml/min) and coupled to a HP mass spectrometer: ionization energy 70 eV. Temperature programming was from 50 to 240°C at the rate of 3°C/ min. Samples were injected at 240°C. Components were identified by comparing linear Kovats indices (KI), their retention times (RT) and mass spectra with those obtained from the authentic samples and/or the MS library.

Essential oils percentage constituent contents were calculated from 6C peak areas without correction factors. Qualitative analysis was based on the comparison between retention times and mass spectra and the respective literature data (Adams, 2001).

RESULTS AND DISCUSSION

Percentage constituents contents of mountain tea essential oil are given in Table 1 in order of their retention time (RT) and Kovats indices (KI). Constituents are listed in order of their elution from ACP WAX 51 fused silica column.

Sixty components were identified, composing about 84.9% of *S. erythrantha* essential oil. The essential oil exhibited light yellow colour. Essential oil yield of dried mountain tea was 0.24% (v/w).

The main compounds of *S.erythrantha* oil were: α-pinene (25.13%), eucalyptol (8.83%), linalool (7.88%), α-bisabolol (7.32%), sabinene (6.79%), β-pinene (6.17%), germacrene D (5.87%), and carvacrol (4.90%). The major oil constituent is α-pinene. Among the monoterpenic hydrocarbons in *S.erythrantha* oil, α-thujene, α-pinene, camphene, sabinene, β-pinene, myrcene and p-cymene, were the most important. The amount of oxygenated compounds such as linalool, terpinene-4-ol, α-terpineol and eucalyptol (1,8-cineole) was found. *Sideritis bilgerama* is very rich in β-pinene, *S.tmolea* - in β-caryophyllene and α-cadinol, and *S.congesta* - in geranyl acetone (Özcan et al., 2001). Başer et al. (1997) established the presence of β-pinene, carvacrol and α-pinene in *Sideritis scardica* oil. The main components of *S.germanicopolitana* are myrcene, sabinene and β-pinene (Kırımer et al., 1992). The oil of *Sideritis dichotoma* from Turkey consists mainly of б-pinene and β-pinene (Kırımer et al., 1992). A Greece oil (*S.cladestina* and *S.sipylea*) contains mainly α-pinene, β-pinene, myrcene and limonene (Gergis et al., 1989). Özcan et al. (2001) reported that *S.congesta* contained muurol-5-en-4-β -ol (33.02%), muurol-5-en-4-α -ol (11.65%), α-cadinol (6.63%) and linalool (2.64%). α-Pinene (19.31%), β-pinene (18.01%), β-bisabolene + γ-elemene (7.19%), α-bisabolol (3.94%) and β-caryophyllene (3.01%) were found to be the major components in the *S.dichotoma* oil (Kırımer et al., 1992). B-pinene (34-35%) and α-pinene (24-25%) have been reported to be the basic components of *Sideritis congesta,* collected from two different areas (Kırımer et al., 2001).When results from literature were compared to those in Table 1, oils contents showed differences and similarities. Differences observed could be due to the different environmental and genetic factors, chemotypes and nutritional status of the plants, and to other factors, which can influence the oil composition, as well.

Table 1. Chemical composition of *Sideritis erythrantha* oil

RT	KI	Constituents	%
8.45	924	α -thujene	0.92
8.73	932	α -pinene	25.13
9.24	949	Camphene	0.77
10.10	969	Sabinene	6.79
10.25	973	β-pinene	6.17
10.38		Oct-3-en-1-ol	Tr*
10.71	986	Myrcene	2.56
11.24	1005	α -phellandrene	Tr
11.34	1007	Δ3-carene	Tr
11.62	1018	α -terpinene	Tr
11.89	1020	p-cymene	1.69
12.02	1024	Limonene	Tr
12.08		β-phellandrene	Tr
12.12	1027	Eucalyptol	8.83
12.82		2-methyl-6-methylene oct-2-ene	Tr
13.04	1054	γ-terpinene	Tr
13.41	1066	Cis-sabinene hydrate	Tr
13.51	1068	Octanol	Tr
13.94	1088	Terpinolene	Tr
14.45	1096	Linalool	7.88
14.58	1102	Nonanal	Tr
15.27	1125	α -campholene aldehyde	Tr
15.72	1136	E pinocarveol	Tr
15.88	1144	E verbenol	Tr
16.07		Citronellal	Tr
16.39	1158	Pinocarvone	Tr
16.64	1166	δ-terpineol	Tr
16.71	1168	Borneol	Tr
16.95	1175	Terpinene-4-ol	2.23
17.41	1190	α -terpineol	0.99
18.12	1214	E carveol	Tr
18.36	1223	Citronellol	Tr
18.79	1239	Cuminaldehyde	Tr
18.85	1243	Carvone	Tr
19.23	1252	Carvenone	Tr
19.52	1270	Geranial	Tr
19.60		Benzoate de propyle	Tr
19.99	1282	Bornyl acetate	Tr
20.25	1290	Thymol	1.26
20.49	1300	Carvacrol	4.90
21.22	1326	Benzoic acid 2-methylpropyl ester	Tr
21.77	1347	Citronellyle acetate	Tr

22.44	1371	α -patchoulene	Tr
22.73	1382	β-bourbonene	Tr
23.37	1406	Cis-α-bergamotene	Tr
23.72	1420	β-caryophyllene	1.57
23.92	1428	β-copaene	Tr
24.13	1436	1-butanol-3-methyl benzoate	Tr
24.35	1445	Geranyl acetone	Tr
24.57	1453	α -humulene	Tr
24.92	1467	9-epi (E)-caryophyllenene	Tr
25.29	1482	Germacrenene D	5.87
25.60	1505	β-bisabolene	Tr
26.12	1516	δ-cadinene	Tr
26.24	1521	Cis-calamenene	Tr
27.15	1559	Nerolidol	Tr
27.43	1571	Cis-3-hexenyl benzoate	Tr
27.73	1584	Caryophyllene oxide	Tr
27.93	1592	Salvial-4(14)-en-1-one	Tr
30.11	1688	α-bisabolol	7.32

*Tr<0.01

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