

**NOTE****Composition of Essential Oils from  
*Sideritis montana* of Iran**

MOHAMMAD HADI MESHKATALSADAT\*, REZA SADEGHI SARABI,  
NASSER AKBARI† and MARZIH PIREAI  
Department of Chemistry, Lorestan University  
P.O. Box 465, Khoramabad, Lorestan, Iran  
Fax: (98)(661)4600092  
E-mail: meshkatsadat@lu.ac.ir; mhmeshkatsadat@yahoo.com

Hydro-distilled essential oil from the flowering spikes of the plant was analyzed by GC/MS. Major components characterized in the oil of *S. montana* were geraniol (42.05 %), and germacrene D (6.25%), *p*-cymene (2.05%) and  $\alpha$ -bisabolol (2.43 %).

**Key Words:** *Sideritis montana*, Lamiaceae, Geraniol, Germacrene D.

The genus *Sideritis* (Lamiaceae) is represented in Iran contain 65 species and being endemic<sup>1-5</sup>. Several *Sideritis* species are used in folk medicine. Pharmacological and antimicrobial activities of *Sideritis* species have been reported<sup>6</sup>. The oil of *S. argyrea* was reported to exhibit antimicrobial activity<sup>7</sup>. The extracts of some *Sideritis* species of Turkey, including *S. argyrea*, have been shown to have antibacterial activity<sup>8</sup>. 6 *Sideritis* species, including *S. argyrea*, have been reported to have antiinflammatory activity against carrageenan-induced oedema in mice<sup>9</sup>. We report on the oil composition of *S. montana*, which are endemic species in Iran and this is the first report on the oil compositions of *S. montana*.

60 g of plant material (aerial parts) of the plant was collected from Aligoudarz west of Iran. Voucher specimens are kept at the Herbarium of the Faculty of Agriculture College, Lorestan University, Iran. Plant materials was hydro-distilled for 8 h using a Clevenger-type apparatus. Percentage yields of the oil calculated on moisture-free basis was as % 1.02 GC analyses was carried out on a Shimutzu 17A gas chromatograph and a BP-5 (non-polar and 95 % dimethyl polysiloxane) capillary column (30 m  $\times$  0.25 mm 0.25  $\mu$ m film thickness). The oven temperature was held at 60°C

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†Department of Agronomy, Agriculture Faculty, Lorestan University, Khoramabad, Iran.

for 3 min then programmed at 5°C /min to 300°C. Other operating conditions were as follows: carrier gas He, with a flow rate of 5 mL/min; injector temperature 230°C; detector temperature 300°C; split ratio, 1:8. GC/MS analyses was performed on a Shimutsu 17A GC coupled with Shimutsu QGD5050 Mass system. The operating conditions were the same conditions as described above but the carrier gas was helium. Mass spectra were taken at 70 eV. Mass range was from m/z 50-450 amu. Quantitative data were obtained from the electronic integration of the peak areas. Retention indices were calculated using co-chromatographed standard hydrocarbons (Table-1).

TABLE-1  
CHEMICAL COMPOSITION OF *S. montana*

No.	Compounds	Tn	RI	Area (%)
1	<i>p</i> -Cymene	7.90	1022	2.05
2	Linalool	10.20	1100	1.45
3	Terpinen-4-ol	12.47	1172	2.04
4	$\alpha$ -Terpineol	12.90	1188	2.03
5	<i>cis</i> -Myrtanol	14.00	1224	2.07
6	Neral	14.20	1240	0.20
7	Geraniol	15.10	1262	42.05
8	Geranial	15.40	1272	0.46
9	$\alpha$ -Copaene	18.20	1371	3.12
10	Geranyl acetate	18.25	1384	2.19
11	<i>trans</i> -Caryophyllene	19.45	1416	0.12
12	Germacrene D	21.12	1482	6.23
13	$\alpha$ -Humulene	21.50	1491	3.12
14	$\alpha$ -bisabolol	16.20	1682	2.43
15	Phytol	25.50	2110	2.14

Tn = Retention time; RI = Retention indices.

Sideritis is an important genus in Turkey, because of the high percentage of endemism and the wide use of its members as herbal tea. Those Sideritis species used as herbal tea generally contain  $\alpha$ - and  $\beta$ -pinene in their oils<sup>10</sup>. Although Sideritis species are poor in essential oil, dried Sideritis flowers impart a pleasant characteristic aroma to infusions which are consumed especially in Western Iran. The results of GC/MS analyses of the oils are given Table-1. 15 Compounds were characterized in the oil of *S. montana* making up 94.2 % of the oil. Geraniol 42.05 %, germacrene D 6.25 %, *p*-cymene 2.05 %  $\alpha$ -bisabolol 2.43 % as major constituents. In other study on the oil of *S. argyrea*,  $\beta$ -pinene (24 %),  $\alpha$ -pinene (17 %) and

limonene (18 %) were found as main constituents<sup>10</sup>. It was, however, interesting to find oxygenated caryophyllene derivatives such as *trans*-caryophyllene (0.12 %), terpinen-4-ol (2.03 %),  $\alpha$ -terpineol (2.04 %) in oil. As Table-1 indicates,  $\alpha$ -bisabolol (2.43 %), an oxygenated sesquiterpene, was found as a major constituent in the oil of *S. montana*. The above results clearly show the wide chemodiversity among the genus *Sideritis* and necessitates the need to study the oils of *Sideritis* species not only based on their main constituents, but also the minor components which may be considered as markers characterizing a species.

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