Chemistry of Natural Compounds, Vol. 43, No. 5, 2007

ESSENTIAL OIL COMPOSITION OF *Micromeria fruticosa* DRUCE FROM TURKEY

Isa Telci[1*] and Mustafa Ceylan[2]

UDC 547.913

The genus *Micromeria* belonging to Lamiaceae comprises 14 species and 22 taxa in the flora of Turkey [1], 12 of which are endemic. *Micromeria* species are generally consumed as herbal tea and for folk medicinal purposes in colds. They are also used against heart disorders, headache, wounds, and skin infections [2–4]. As a result of recent studies, it has been shown that the essential oil of *Micromeria* species has biological activity such as antimicrobial [4, 5], antibacterial, antifungal [6], and antioxidant [5].

Micromeria fruticosa (L.) Druce has the smell of peppermint and consists of four subspecies, spp. *giresunica* P. H. Davis, spp. *brachycalyx* P. H. Davis, spp. *serpyllifolia* P. H. Davis, and spp. *barbata* Boiss&Kotschy in Turkey. Subsp. s*erpyllifolia* is grown naturally in Northeast Anatolia and is used as spice and flavoring agent and as a herbal tea in the region, with names such as "tas nanesi," while subsp *brachycalyx* grows naturally in South Anatolia [1]. In this paper, we study the essential oil composition of two subspecies (spp. *serpyllifolia* P. H. Davis from Erzurum and spp. *brachycalyx* P. H. Davis from Adana) in *Micromeria fruticosa.*

Plants were collected at the flowering stage in 2004 and dried under room conditions. A voucher specimen has been deposited in the Medicinal and Aromatic Plants Herbarium in the Agriculture Faculty of Gaziosmanpasa University. Oil was extracted from air-dried parts by hydrodistillation. Distilled water was used and 20 g samples were diluted with 200 mL distillate water (1:10 w/v). Distillation was continued for approximately 2 hours. The essential oils were stored in dark glass bottles at 4°C until analysis [7].

The essential oil components were analyzed using an 6890 Agilent gas chromatograph equipped with an HP-Innowax fused silica capillary column (30 m × 0.25 mm, film thickness 0.25 μm). Oven temperature was held at 50°C for 5 min and then increased from 50°C to 220°C at a rate of 8°C/min. Injector and detector (FID) temperatures were 250°C and 250°C, respectively. Helium was used as the carrier gas at a flow rate of 1.3 mL/min. Diluted samples (1/100 in chloroform, v/v) of 2.0 μL were injected in the split/splitless (5:1 split) mode. Quantitative data were obtained electronically from FID area percent data. GC-MS analyses were performed using Agilent system model 6890 with 5973 mass selective detector equipped with an HP-Innowax fused silica capillary column (30 m × 0.25 mm, film thickness 0.25 μm). For GC/MS detection, an electron ionization system with an ionization energy of 70 eV was used. Helium was the carrier gas, with flow rate 1.3 mL/min. The oven temperature programming was the same with GC analysis. Injector and MS transfer line temperatures were set at 220°C and 250°C, respectively. Diluted samples (1/100 in chloroform, v/v) of 2.0 μL were injected in the split/splitless (5:1 split) mode. Identification of oil components was accomplished based on their retention indices (determined with reference to a homologous series of normal alkenes), and by comparison of their mass spectral fermentation patterns (Wiley and NIST database/ChemStation data system) and, whenever possible, by co-injection with authentic compounds.

The essential oil contents of subsp. *serpyllifolia* and *brachycalyx* were 2.4 and 2.6%, respectively. The essential oil of s*erpyllifolia* contained linalool (30.29%), pulegone (16.65%), and *p*-menthone (10.27%), while the essential oil of *brachycalyx* contained linalool (39.92%) and piperitenone (31.93%) as the main components. S*erpyllifolia* was found to contain lower amounts of piperitenone (2.79%), whereas *brachycalyx* was found to contain higher amounts piperitonene following linalool (Table 1). Pulegone [8] was the most encountered component in *Micromeria* species, especially in *Micromeria fruticosa*. In this study, it was the second major component following linalool in s*erpyllifolia,* and the third component after linalool and piperitenone in *brachycalyx.*

1) Department of Field Crops (Medicinal and Aromatic Plants), Agricultural Faculty, Gaziosmanpasa University, 60245, Tokat, Turkey, fax: +90 356 252 1488, e-mail: itelci@gop.edu.tr; 2) Department of Chemistry, Faculty of Arts and Sciences, Gaziosmanpasa University, 60245, Tokat, Turkey. Published in Khimiya Prirodnykh Soedinenii, No. 5, pp. 519-520, September-October, 2007. Original article submitted July 13, 2006.

0009-3130/07/4305-0629

TABLE 1. Essential Oil Composition of *Micromeria fruticosa* subspecies

Component*	RT	*serpyllifolia*, %	*brachycalyx*, %	Identificatioon method
β-Pinene	3.91	0.34		a,b
1,8-Cineole	5.22	6.72	7.09	a,b
Fenchome	8.08	-	1.00	b
2-Hexanal	8.85	0.27	-	b
Menthone	9.13	7.83	-	ab
iso-Menthone	9.55	4.20	2.02	ab
Camphor	9.91	0.74	-	a,b
Linalool	**10.37**	**30.29**	**39.92**	a,b
Borneol	10.95	0.42	-	a,b
Terpinen-4-ol	11.20	0.41	-	a,b
Pulegone	**11.87**	**16.65**	**9.47**	a,b
2-Cyclohexan-1-one	12.29	0.86	-	b
Pentadecane	12.56	0.56	-	b
3-Methylcyclohexanone	12.79	0.44	-	b
4-Undecene	12.90	0.61	-	b
Piperitone	12.98	1.40	1.47	ab
Piperitone oxide	13.05	3.11	-	ab
2-Furaldehyde	14.27	1.37	-	b
p-Menthone	15.33	10.27	1.51	b
2-Methyl-2-phenyl	15.48	1.73	-	b
Piperitenone	**15.60**	**2.79**	**31.93**	ab
Piperitenone oxide	16.07	1.80	-	ab
Phytol	16.24	0.43	-	b
2,5-Furandione	16.43	0.83	-	b
Undecane	16.57	-	1.02	b
Spathulenol	18.10	1.24	2.61	b
1-Heptadecane	18.63	0.18	-	b
Dodecane	20.18	0.22	-	b
7-Hexadecane	20.37	1.05	-	b
Total		96.7	98.07	
Oil yield (mL/100 g)		2.4	2.6	

*Components are listed in order of elusion on an HP-Innowax fused silica capillary column.

a: Retention time according to authentic standards.

b: Mass spectrum.

Piperitenone and related components are rarely found as the main component in the aromatic plants, except *Micromeria* species such as *M. congesta* [9] and *M. dalmatica* [6]. In this study, *brachycalyx* contained essential oil with a high piperitenone content after linalool.

In conclusion, we can report that the investigated essential oils in two subspecies of *Micromeria fruticosa* belong to two different chemotypes, as follows: a) linalool, pulegone, and *p*-menthone type and b) linalool and piperitenone type. These chemotypes have not been reported in the *Micromeria* genus up to now.

ACKNOWLEDGMENT

The authors thank taxonomist Dr. Lutfu Bekat from Aegean University for botanical identification.

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