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Research Paper

Chemical composition and seasonal variation of the essential oil of *Micromeria fruticosa*

Mohammad Al-Hamwi[1], Youssef Bakkour[2*], Maha Abou-Ela[1], Abdolla El-Lakany[1], Mohammad Tabcheh[2], Fawaz El-Omar[2]

[1]Department of Pharmacognosy and Medicinal plants, Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon

[2]Laboratory of Applied Chemistry, Faculty of Science III, Lebanese University, P.O.Box 826, Tripoli, Lebanon

* Corresponding Author

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ABSTRACT

The chemical composition of the essential oil from the aerial parts of *Micromeria fruticosa* (*Lamiaceae*) growing wild in Lebanon was analyzed. A number of samples were collected in the months of July (full flowering stage) and October. Thereafter, the essential oil was extracted by hydrodistillation and analyzed by GC-MS. A total of nineteen and seventeen compounds were identified in each sample respectively, representing 92.41% and 87.8% of the total compounds of the essential oil (EO) in each sample respectively. A significant seasonal variation in the composition of the essential oil and their concentrations was observed.

Keywords: *Micromeria fruticosa*; Essential oil composition; GC-MS, Pulegone.

INTRODUCTION

Micromeria fruticosa (*Lamiaceae*) is an aromatic plant and has the smell of peppermint. This plant is found in the eastern Mediterranean region (Lebanon, Syria, Turkey) (Dudai, et al., 2001; Marinkovic, et al., 2002)). The aerial parts of *M. fruticosa* are widely used in this region as medicinal teas and infusions to treat many ailments including abdominal pains, diarrhea, colds, wounds and skin infections (Dudai, et al., 2001; Baser, et al., 1996). Also, it shows medicinal value against heart diseases, antimicrobials, antifungals, antibacterials and antioxidants (Telci, et al., 2007; Formisano, et al., 2007). There is a considerable research interest towards assaying the composition of *Micromeria fruticosa* essential oil (Stojanovic, et al., 2006). Pulegone was the most encountered component in *M.fruticosa* (Dudai, et al., 2001; Marinkovic, et al., 2002; Telci, et al., 2007; Formisano, et al., 2007). In addition, D-Limonene, Piperitone, Mentalactone, Guaiacol, Menthol, and Mentone are the main other components of this essential oil (Marinkovic, et al., 2002). In this paper, we describe the yield, the chemical composition and the seasonal variation of the essential oil of *M. fruticosa.*

MATERIALS AND METHODS

Plant material: The aerial parts of the two samples of *Micromeria fruticosa* were collected from the Lebanese Bekaa valley at 1300 m above sea level and authenticated by Dr. Ali Chakas, Botanist, Lebanese University, faculty of science III, one at the full flowering stage in July and the other in a later stage in October. The samples were dried at room temperature.

Essential oil extraction: The samples were air dried and crushed. The essential oils were then extracted from both harvestings. They were individually isolated by hydro-distillation for (2-3h) using a Clevenger-type apparatus yielding yellowish oil with a fragrant smell. Its percent composition was calculated on moisture free basis to be 2.8% and 2.5% for the samples collected in June and October respectively. The oil obtained was collected in dark glass vessels and stored at temperatures below 4^{o}C until they reach a point of chromatographic determination.

Gas Chromatography/Mass spectrometry: A Shimadzu QP 2010 plus gas chromatography system interfaced to a 2010 mass spectrometer was used for analysis of the samples. The separation was performed on a 30m (length) x 0.25 mm (diameter) fused silica capillary column coated with 0.25μm film Rtx-5MS. The injector and the detector temperatures were respectively 250 and 280°C. The oven temperature was held at 40°C for 5 min, and programmed from 40 to 100°C at 7°C/ min then to 280°C at 19°C/min and finally maintained at 280°C for 5 min. Split injection was conducted with a split ratio of 5:10. Helium was used as carrier gas, and flow-rate was 1.62mL/min. The mass spectra were recorded over a range of 30-1000 amu at 0.5s/scan. Solvent cut time was 3 min. Ionization energy was 70 eV. The inlet and ionization source temperature were 280°C. The chemical composition of the oil was identified by comparing their spectra with those of a NIST library and confirmed by comparing their retention indices with data published in various literatures.

RESULTS AND DISCUSSION

A limited number of publications have shown the effect of seasonal variation on the chemical composition of essential oil of *M. fruticosa* (Dudai, et al., 2001).

The composition of *Micromeria fruticosa* essential oil is summarized in table 1. 92.41% and 87.8% of the total essential oil extracted from the aerial parts of both samples of *M. fruticosa* obtained in July (full flowering stage) and in October have been identified respectively.

Various compounds found in the two samples were isolated and compared (Table 2). The proportions of Pulegone, D-Limonene, Menthone and menthol dropped significantly from the July sample to the October sample. Conversely, the proportions of Menthalactone, Piperitone and Guaiacol noticeably increased from the July sample to the October sample.

In addition, some other compounds like Sabinene and Neomenthol were detected in the July sample only. The concentrations of various other compounds such as α-pinene, β-pinene, β-myrcene, 3-octanol and Eucalyptol show mild variations in their concentrations when comparing the two samples as shown in the table 1.

The significant seasonal variations in the chemical composition and concentration of the main constituents of the essential oils of *M. fruticosa* can be used as a tool to choose the oil with a chemical composition suitable for use in traditional medicine.

Table -1: Chemical composition of the essential oil of *Micromeria fruticosa.*

No.	Compound	RT	RI	% Area (July 2010)	% Area (October 2010)
1.	α-Pinene	9.708	933	0.63	0.12
2.	Sabinene	10.892	972	0.38	-
3.	β-Pinene	10.958	978	1.02	0.21
4.	β-Myrcene	11.408	991	0.68	0.11
5.	3-Octanol	11.575	999	2.42	1.54
6.	D-Limonene	12.45	1030	15.64	2.88
7.	Eucalyptol	12.508	1032	0.17	0.26
8.	Menth-2-en-1-ol	15.758	1124	3.51	3.7
9.	Menthone	16.208	1158	7.39	5.13
10.	Neomenthol	16.65	1170	2.18	-
11.	Menthol	16.808	1184	5.27	2.12
12.	Pulegone	17.742	1241	30.41	13.35
13.	Piperitone	17.892	1267	4.24	10.82
14.	Menthyl acetate	18.392	1290	2.43	1.88
15.	Isomenthol acetate	18.567	1305	0.9	0.5
16.	Guaiacol	18.996	1309	3.72	9.97
17.	Menthalactone	19.283	1501	10.28	33.89
18.	Spathulenol	21.067	1576	0.69	1.32
19.	Caryophyllene oxide	21.117	1587	0.45	0.16
	Total	-	-	92.41	87.8

RT: Retention time; RI: Retention indices.

Table-2: Percentage of main compounds found in July and October samples.

Sample	Compounds Isolated						
	Pulegone	D-Limonene	Menthone	Menthol	Menthalactone	Piperitone	Guaiacol
July	30.41%	15.64 %	7.39 %	5.27 %	10.28 %	4.42 %	3.72 %
October	13.35 %	2.88 %	5.13 %	2.12 %	33.89 %	10.82 %	9.97 %

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