Chemistry of Natural Compounds, Vol. 45, No. 1, 2009

COMPOSITION OF ESSENTIAL OILS OF *Viola tricolor* AND *V. arvensis* FROM ROMANIA

Toiu Anca,[1*] Verite Philippe,[2] Oniga Ilioara,[3] and Tamas Mircea[1]

UDC 547.913

The genus *Viola* belongs to the family Violaceae and contains about 500 species. In Romania about 30 species are growing wild, the most important medicinal plants of which are *V. tricolor*, *V. arvensis*, and *V. odorata* [1–4]. *Viola tricolor* L. (wild pansy) is widespread in Romania's spontaneous flora. In traditional medicine, the aerial parts are used for their anti-inflammatory, expectorant, and diuretic properties and to treat various skin conditions, bronchitis, cystitis, and rheumatism. Its properties are ascribed to the presence of saponins, flavonoids, mucilages, salicylic derivatives, carotenoids, and coumarins [5–7]. Closely related to *V. tricolor* L. is *V. arvensis* Murr. (field pansy), a very common species found in open and cultivated land in Europe. The aerial parts from both species can be used together for the same indications in traditional medicine, although the chemical composition of *V. arvensis* is less studied [8–10]. In the literature there is limited information on the essential oil composition of *Viola sp.*, only two of them being studied so far. Twenty-three volatile components of sweet violet (*V. odorata*) leaves were identified, most of them being aliphatics (1-dodecanol, pentadeca-5,10-dien-1-ol, 1-octadecene) or shikimic acid derivatives (2-pentyl-furan, α-ionone) [11–14]. The main component of the essential oil of *V. etrusca* Erben from Italy was methyl salicylate [15]. The variability of the essential oil of this species was also studied, methyl salicylate being the main constituent in some populations [16].

The purpose of this study was to analyze for the first time the chemical composition of the essential oils from flowering aerial parts of two *Viola species*. We isolated by steam distillation the essential oil from fresh and dried aerial parts of *V. tricolor* L. and dried aerial parts of *V. arvensis* Murr., and we determined their chemical composition. The identified compounds and their percentages in essential oils are presented in Table 1. The components are listed in order of their retention indices calculated on an apolar stationary phase.

In the essential oil obtained from fresh aerial parts of *V. tricolor* L. we identified 35 compounds representing 97.76% of the total oil, as follows: 8 sesquiterpenes, 17 aliphatics, 6 shikimic acid derivatives, and 4 monoterpenes. Sesquiterpenes were the major component (59.27%), followed by aliphatics (29.81%), shikimic acid derivatives (8.05%), and monoterpenes (0.30%). The main volatile components found were bisabolone oxide (43.25%), *trans*-β-farnesene (4.01%), and bisabolol oxide A and B (7.78% and 2.28%).

In the essential oil obtained from dried aerial parts of *V. tricolor* L. we identified 24 compounds representing 60.53% of the total oil, as follows: 14 aliphatics, 4 shikimic acid derivatives, 2 sesquiterpenes, and 4 monoterpenes. The main volatile components found were hexahydrofarnesyl acetone (4.06%), methyl salicylate (1.22%), and β-ionone (1.00%). Aliphatics were the major components (42.21%), followed by shikimic acid derivatives (11.20%), sesquiterpenes (4.79%), and monoterpenes (2.32%).

We identified 26 compounds representing 72.13% of the total essential oil obtained from dried aerial parts of *V. arvensis*, as follows: 18 aliphatics, 5 shikimic acid derivatives, 2 monoterpenes, and 1 sesquiterpene. Aliphatics were the major components (59.94%), followed by shikimic acid derivatives (8.35%), monoterpenes (2.15%), and sesquiterpenes (1.69%). The main volatile components found were 2-pentyl-furan (5.48%), β-ionone (2.09%), and hexahydrofarnesyl acetone (1.69%).

1) Department of Botany, Faculty of Pharmacy, University of Medicine and Pharmacy "Iuliu Hatieganu", 12 Ion Creanga Street, Cluj-Napoca, 400023, Romania, fax: 0040264595454, e-mail: ancamaria_toiu@yahoo.com; 2) Department of Analytical Chemistry, Faculty of Medicine and Pharmacy, 22 Boulevard Gambetta, F-76183 Rouen Cedex 1, France; 3) Department of Pharmacognosy, Faculty of Pharmacy, University of Medicine and Pharmacy „Iuliu Hatieganu", Cluj-Napoca, Romania. Published in Khimiya Prirodnykh Soedinenii, No. 1, pp. 81-82, January-February, 2009. Original article submitted May 30, 2007.

0009-3130/09/4501-0091

TABLE 1. The Compounds Identified and Their Percentages in Essential Oils of *Viola tricolor* and *V. arvensis*, %

Compound	RI_{obs}	*V. tricolor* a.p.		*V. arvensis* dried a.p.	Compound	RI_{obs}	*V. tricolor* a.p.		*V. arvensis* dried a.p.
		fresh	dried				fresh	dried	
Limonene	1032.8	0.12	-	-	Caryophyllene	1589.9	0.18	-	-
2-Pentyl-furan	1035.9	-	0.71	5.48	Bisabolol oxide B	1660.5	2.28	-	-
Eucalyptol	1036.6	Tr.	-	-	Bisabolone oxide	1698.0	43.25	-	-
α-Methyl-benzene ethanol	1089.2	0.15	-	-	Bisabolol oxide A	1756.1	7.78	-	-
n-Nonanal	1105.2	0.33	1.99	2.62	Myristic acid	1773.5	0.30	1.72	3.72
2-Methyl benzyl alcohol	1147	5.64	-	-	Hexahydrofarnesyl acetone	1858.0	1.00	4.06	1.69
Menthone	1171.2	-	0.43	-	Benzyl salicylate	1876.1	0.63	-	0.53
neo-Menthol	1180.2	-	0.38	-	Farnesyl acetone C	1933.6	-	0.73	-
Methyl salicylate	1199.6	1.47	1.22	0.22	Palmitic acid	1972.7	12.57	21.62	28.19
β-Cyclocitral	1231.1	Tr.	0.51	1.22	Phytol	2119.4	6.46	7.27	11.40
Thymol	1290.8	Tr.	-	-	Linoleic acid	2156.5	1.50	0.29	3.19
Geranyl acetone	1449.7	-	0.98	0.93	*n*-Tricosane	2301.5	2.37	3.05	1.71
trans-β-Farnesene	1455.4	4.01	-	-	*n*-Pentacosane	2504.0	4.51	1.56	2.30
β-Ionone	1487.9	0.13	1.00	2.09	Sesquiterpenes		59.27	4.79	1.69
β-Bisabolene	1508.1	Tr.	-	-	Monoterpenes		0.30	2.32	2.15
Lauric acid	1579.2	-	0.47	0.76	Shikimic acid derivatives		8.05	11.20	8.35
Spathulenol	1584	0.76	-	-	Aliphatics		29.81	42.21	59.94

Tr.: trace (conc<0.1%), a.p. - aerial parts, RI_{obs}: retention indice observed.

The results obtained showed highly significant differences in the composition of essential oils obtained from fresh and dried aerial parts of *V. tricolor* and slight differences in essential oils from dried aerial parts of *V. tricolor* and *V. arvensis*. This analysis also showed significant differences in yield and composition of essential oils from the two new studied species (*V. tricolor, V. arvensis*) and the other two already studied (*V. odorata*, *V. etrusca*). Methyl salicylate, the main component of the essential oil of *V. etrusca* (96%), was also found in *V. tricolor* and *V. arvensis*, but only in small amounts (less then 2%).

REFERENCES

1. *Flora R. P. Romane*, Vol. III, Ed. Acad. Bucuresti, 1955, p. 553–625.
2. T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters, and D. A. Webb, *Flora Europaea*, vol. **2**, University Press, Cambridge, 1968, p. 270–282.
3. M. Tamas, *Botanica farmaceutica*, Vol. III. Sistematica-Cormobionta, Ed. Medicala Universitara "Iuliu Hatieganu", Cluj-Napoca, 1999, p. 137–138.
4. V. Ciocarlan, *Flora ilustrata a Romaniei. Pteridophyta et Spermatophyta*, Ed. Ceres, Bucuresti, 2000.
5. A. Chevallier, *The Encyclopedia of Medicinal Plants*, Dorling Kindersley Limited, New York, 1996, p. 280.
6. M. Wichtl, *Herbal Drugs and Phytopharmaceuticals*, Medpharm, Stuttgart, 1994, p. 527–529.
7. H. Schilcher, *Phytotherapy in Paediatrics. Handbook for Physicians and Pharmacists*, Medpharm Scientific Publ., Stuttgart, 1997, p. 499–500.
8. D. Fraisse, A. Carnat, A. P. Carnat, O. Texier, R. Elias, and G. Balansard, et al., *Ann. Pharm. Fr*., **59**, No. 2, 119 (2001).
9. A. P. Carnat, A. Carnat, D. Fraisse, and J. L. Lamaison, *J. Nat. Prod*., **61**, No. 2, 272 (1998).
10. S. Rimkiene, O. Ragazinsiene, and N. Savickiene, *Medicina*, **39**, No. 4, 411 (2003).
11. J. Q. Cu, F. Perineau, and A. Gaset, *Phytochemistry*, **31**, No. 2, 571 (1992).
12. H. Walbaum and A. Rosenthal, *J. Prakt. Chem. (Leipzig*), No. 124, 55 (1930).
13. L. Ruzicka and H. Schinz, *Helv. Chim. Acta*, No. 17, 1592 (1934).
14. L. Ruzicka and H. Schinz, *Helv. Chim. Acta*, No. 25, 760 (1942).
15. G. Flamini, P. L. Cioni, and I. Morelli, *Flavour Fragr. J*., **17**, No. 2, 147 (2002).
16. G. Flamini, P. L. Cioni, and I. Morelli, *Ann. Bot*., No. 91, 493 (2003).