Chemistry of Natural Compounds, Vol. 33, No. 3, 1997

ESSENTIAL OIL OF *Perovskia angustifolia* FROM KYRGYZYSTAN*

K. H. C. Basher,[a] T. Ozek,[a] B. Demirchakmak,[a]
B. Yo. Abduganiev,[b] Kh. R. Nuriddinov,[b] Kh. N. Aripov,[b]
A. S. Doriev,[c] and Ch. Sh. Karataeva[c]

The water distilled essential oils from leaves of Perovskia angustifolia *(Labiatae) collected from three different localities in the Arslonbob mountains of Kyrgyzystan were analyzed by GC/MS. 1,8-Cineole (12.0-27.5%), α-pinene (7.3-14.7%), epi-13-manool (3.8-12.6%), bornyl acetate (1.2-8.7%), camphene (2.5-6.8%), camphor (4.3-6.5%), β-caryophyllene (3.2-6.5%), caryophyllene oxide (1.7-5.9%), α-humulene (2.1-5.2%), humulene epoxide II (1.9-4.8%), caryophylladienol (1.4-4.3%), and borneol (3.0-3.2%) were found as major constituents.*

Perovskia angustifolia (Labiatae) is a semi-shrub with a height 50-100 cm. The plant flowers in June-July. Fruits ripen in July-August. It grows on the outskirts of the mountains in Tashkent, Fergana, Samarkand, Surhandarya regions of Uzbekistan. It is endemic in Central Asia.

Perovskia angustifolia Kudr. and *Perovskia kudrjaschevii* Pjat. are synonymous. *Perovskia botschantzevii* is the synonym or a variety of *Perovskia angustifolia*.

The following biological activities have been reported for *P. angustifolia*. Leaf extract has antihelmintic activity. Plant extract is used for skin diseases, stomach disorder, and as diuretic. An ointment prepared from the extract exhibited antibacterial activity. Flowers yield 260 kg/h nectar for honeybees. The white-flowering form of this species is esteemed for its ornamental value [1, 2].

Very few reports exist in the literature on the essential oils of *Perovskia* species. *Perovskia abrotanoides* Karel. collected from four different localities in mountains of Kyrgyzystan was reported to contain oil with 1,8-cineole (6.5-11.0%), α-pinene (5.0-6.2%), camphene (4.8-7.5%), δ-3-carene (8.5-14.5%), camphor (27.0-36.0%), β-caryophyllene (2.7-4.1%), β-selinenol (2.3-3.1%), humulene (2.4-3.3%), polustyrol (3.5-6.5%), terpinen-4-ol (1.5-3.1%), and limonene (0.9-2.3%) as major components [2]. The author of this report studied *Perovskia angustifolia* Kudr. collected from two different localities in the Chimgan mountains of Uzbekistan and from one locality along the river Aflotun in Kyrgyzystan. Major constituents found in the oils were as follows: α-pinene (13.2-15.5%), camphene (2.8-4.5%), β-pinene (5.0-6.0%), δ-3-carene (1.8-4.5%), β-myrcene (3.5-5.8%), limonene (1.7-3.1%), 1.8-cineole (21.0-23.5%), p-cymene (2.7-4.1%), linalool (4.2-10.1%), β-caryophyllene (6.0-6.5%), humulene (3.2-4.7%), and ledol (0.9-20.0%) [2]. In a separate study, 2.2% essential oil was obtained from *Perovskia abrotanoides* Karel. with 1,8-cineole (31.5%), α-pinene (13.7%), myrcene (9.5%), germacrene D (8%), and limonene (7.4%) as major constituents [3].

In this study, we have analyzed the essential oils of *Perovskia angustifolia* Kudr. from three different localities in the Arslonbob mountains of Kyrgyzystan. The essential oils were analyzed by GC/MS. Results are given in Table 1. 1,8-Cineole, α-pinene, epi-13-manool, bornyl acetate, camphene, camphor, caryophyllene oxide, α-humulene, humulene epoxide II, caryophylladienol, and borneol were found as major constituents.

---

*Materials presented at the 2nd International Conference of Natural Compounds.

[a]Centre (TBAM), 26470 Eskisehir, Turkey.
[b]Institute of the Chemistry of Plant Substances, Academy of Sciences, Tashkent, Uzbekistan.
[c]Fergana University, Fergana, Uzbekistan.

Published in Khimiya Prirodnykh Soedinenii, No. 3, pp. 386-388, May-June, 1997. Original article submitted November 4, 1996.

TABLE 1. Composition of the Essential Oils of *Perovskia angustifolia*

Compounds	A	B	C	Compounds	A	B	C
	amounts, %				amounts, %		
tricyclene	0.27	–	0.25	2-methyl-6-methylene-3,7-octadien-2-ol	0.22	–	–
α-pinene	11.3	7.25	14.7	myrtenal	0.01	–	–
α-thujene	0.15	–	0.29	aromadendrene	2.14	1.77	2.85
camphene	6.82	2.54	6.37	trans-pinocarveol	0.32	0.64	0.14
β-pinene	3.60	1.65	4.55	δ-terpineol	0.68	0.57	0.65
sabinene	0.05	–	0.12	α-humulene	2.27	5.24	2.16
δ-3-carene	–	1.36	0.40	trans-verbenol	0.09	0.15	–
myrcene	4.04	0.30	2.54	γ-muurolene	–	0.12	–
α-phellandrene	–	0.30	–	α-terpineol	1.95	2.13	2.11
α-terpinene	0.18	–	0.28	α-terpinyl acetate	0.30	–	–
limonene	2.33	3.57	1.94	borneol	3.20	3.04	3.20
1,8-cineole	**24.9**	**12.0**	**27.5**	carvone	–	0.12	–
β-phellandrene	0.30	0.39	1.03	δ-cadinene	–	0.01	0.07
γ-terpinene	0.38	0.16	0.62	myrtenol	0.14	0.17	–
5-methyl-3-heptanone	–	–	0.07	p-cymen-8-ol	0.05	–	–
p-cymene	2.18	1.61	2.86	trans-jasmone	0.07	–	–
terpinolene	0.06	–	0.10	cis-jasmone	0.06	0.13	–
α-thujone	0.12	–	–	caryophyllene oxide	2.22	5.92	1.67
1-octen-3-ol	0.08	–	0.18	methyl eugenol	–	0.01	–
trans-sabinenehydrate	0.01	–	0.08	humulene epoxide I	0.29	0.75	–
α-campholene aldehyde	0.07	–	–	ledol	0.42	–	0.78
camphor	4.51	6.47	4.31	humulene epoxide II	1.88	4.76	–
linalool	0.52	0.48	0.32	elemenal*	0.09	0.22	–
cis-sabinenehydrate	0.05	–	0.08	spathulenol	0.08	–	–
trans-p-menth-2-en-1-ol	–	–	0.06	eugenol	0.17	0.88	0.11
pinocarvone	0.12	0.27	–	carvacrol	0.06	–	–
bornyl acetate	8.72	1.22	4.47	caryophylladienol*	0.14	0.50	–
β-caryophyllene	3.17	6.50	3.17	caryophyllenol I*	1.38	4.32	–
terpinen-4-ol	0.20	0.01	–	caryophyllenol II	0.78	2.28	0.51
alloaromadendrene	0.12	–	0.16	epi-13-manool	3.81	12.6	4.01

*Tentative identification by GC/MS data alone.

EXPERIMENTAL

The water distilled essential oils from leaves of *Perovskia angustifolia* collected from three different localities (**A, B,** and **C**) in the Arslonbob mountains of Kyrgyzystan in October, 1994 were analyzed by GC/MS. The leaves were subjected to hydrodistillation for 3 h using a Clevenger-type apparatus to produce essential oils in 1.1%, 0.82%, and 0.75% yields, respectively. The percentage yields of the oils were based on a moisture free basis.

The essential oils were analyzed by GC/MS using a Hewlett-Packard GCD system. An Innowax FSC column (60 m × 0.25 mm ∅) was used with helium as carrier gas. GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min and then kept constant at 220°C for 10 min. Split ratio was adjusted at 50:1. The injector temperature was 250°C. MS were taken at 70 eV. Mass range was from m/z 10 to 425. A library search was carried out using the Wiley GC/MS Library and the TBAM Library of Essential Oil Constituents [4-9]. Relative percentage amounts of the separated compounds were calculated from total ion chromatograms by the computerized integrator.

REFERENCES

1. B. K. Shishkin, Flora of the USSR (Flora SSSR) XXI, AN SSSR, Moscow–Leningrad (1954); Israel Program for Scientific Translation, Jerusalem, Israel (1977), p. 267.
2. A. D. Dembitski, Izv. AN Kaz. SSR, Ser. Khim., **4**, 4-10 (1984).
3. B. M. Lawrence, in: Labiate Oils — Mother Natures Chemical Factory in Essential Oils 1988-1991, Allured Publ. Co., II (1993), p. 201.
4. A. A. Swigar and R. M. Silverstein, Monoterpenes: Infrared, Mass, ^{1}H-NMR and ^{13}C-NMR Spectra and Kovats Indices, Aldrich Chemical Co., Milwaukee, WI (1981).

5. W. Jennings and T. Shibamoto, Qualitative Analysis of Flavor and Fragrance Volatiles by Glass Capillary Gas Chromatography, Academic Press, London (1980).
6. Eight Pear Index of Mass Spectra, 3rd Edition, The Royal Society of Chemistry, London (1986), Vols. 1-7.
7. F. W. McLafferty and D. B. Stauffer, The Wiley/NBS Registry of Mass Spectral Data, John Wiley and Sons, New York (1988), Vols. 1-7.
8. R. P. Adams, Identification of Essential Oils by Ion Trap Mass Spectroscopy, Academic Press (1989).
9. R. P. Adams, Identification of Essential Oils Components by Gas Chromatography/Mass Spectroscopy, Allured (1995).