Chemistry of Natural Compounds, Vol. 31, No. 4, 1995

QUALITATIVE AND QUANTITATIVE COMPOSITIONS OF THE ESSENTIAL OIL Of *Perovskia scrophulariifolia*

B. E. Abduganiev, U. A. Abdullaev, and V. N. Plugar'

UDC 549.913+543.51

The essential oil of the plant Perovskia scrophulariifolia *Bunge. has been studied by GC—MS, and the components have been identified.*

Seven species of plants of the genus *Perovskia* Kar., family Lamiaceae, are found in Central Asia. They are one of the sources of essential oil [1]. The essential oil (EO) exhibits antibacterial activity and is suitable for perfuming soap [2] and for the production of eau de Cologne and toilet water [3].

We have studied the qualitative and quantitative compositions of the EO of *Perovskia scrophulariilia* Bunge. by GC–MS using a capillary column in a MS-25RF instrument (Kratos, United Kingdom), fitted with a data-processing system and DS-90 program package.

The chromatographic peaks obtained were analyzed by comparing their mass spectra isolated from three points of the data base with library spectra and, where a comparison spectrum was unavailable, by investigating the fragmentation of the recorded compound (the mass spectra of these components are given in the Experimental part). The degree of similarity of the

TABLE 1

Name	Scan no.	MM	Empirical formula	Amount, %		
				GC—MS	GLC [5]	GLC [4]
p-Cymene	50	134	$C_{10}H_{14}$	6.1		
Cineole	68	154	$C_{10}H_{18}O$	1.7	13	Σ=25
Camphor	128	152	$C_{10}H_{16}O$	7.0	7,4	
Borneol	155	154	$C_{10}H_{18}O$	3.3		
Dihydrocarveol	165	154	$C_{10}H_{18}O$	1.2		
2,2,4-Trimethylhex-3-en-1-methanol	186	154	$C_{10}H_{18}O$	1.4	Σ=50	
Bornyl acetate	256	196	$C_{12}H_{10}O_2$	17.8		
Isobornyl acetate	279	196	$C_{12}H_{10}O_2$	0.8	Σ=13	Σ=17
Terpenyl acetate	305	196	$C_{12}H_{10}O_2$	6.0		
α-Cubebene	312	204	$C_{15}H_{24}$	1.2		
Copaene	330	204	$C_{15}H_{24}$	2.0	Σ=16	
Farnesene	334	204	$C_{15}H_{24}$	2.3		
β-Caryophyllene	358	204	$C_{15}H_{24}$	14.2		
α-Caryophyllene	408	204	$C_{15}H_{24}$	11.7		
Aromadendrene	412	204	$C_{15}H_{24}$	1.7		Σ=12
7-Isopropyl-5,10-dimethyl-bicyclo[4.4.0]-deca-3,5-diene	422	204	$C_{15}H_{24}$	1.0		
7-Isopropyl-5,10-dimethyl-bicyclo[4.4.0]-deca-5,10-diene	439	204	$C_{15}H_{24}$	2.0		
7-Isopropyl-5,10-dimethyl-bicyclo[4.4.0]-deca-1-3,4-triene	480	202	$C_{15}H_{22}$	10.1		
Farnesol	510	220	$C_{15}H_{24}O$	7.6		
Farnesal	517	220	$C_{15}H_{24}O$	0.9		

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (3712) 89 14 75. Translated from Khimiya Prirodnykh Soedinenii, No. 4, pp. 573-575, July-August, 1995. Original article submitted November 14, 1994.

0009-3130/95/3104-0475$12.50

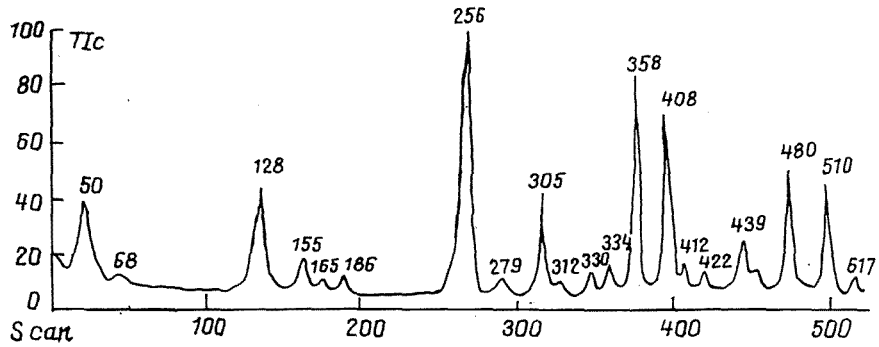

Fig. 1

spectra compared amounted to 93-97%, the difference being mainly located in the low-mass region of the spectra (40-60 *m/z*), where the background ions of the instrument have an appreciable influence on the total ionic current. The analysis of the chromatogram carried out in this way showed the presence in the EO of components of monoterpenoid and sesquiterpenoid nature.

So far as concerns literature information on the composition of the EOs of plants of the genus *Perovskia*, we must mention work by B. N. Rutovskii [1], who first characterized the EOs, and a review [4] in which all information up to 1991 was generalized.

The composition of the EO of *P. scrophulariifolia* with respect to its individual components and vegetation phases has been investigated by Ramazanova using the GLC method. Table 1 gives the GC—MS results that we have obtained in comparison with those in the literature [1, 5].

In the essential oil of *P. scrophulariifolia* we succeeded in identifying farnesene and the products of its oxidation, and some modifications of sesquiterpene hydrocarbons with a naphthalene nucleus. Thus, in this oil we detected and identified a total of 20 components, six of which predominated (Fig. 1). Of the monoterpenoids, bornyl acetate predominated and, of the sesquiterpenoids, α- and β-caryophyllenes.

EXPERIMENTAL

Programming conditions of the chromatograph: from 40 to 150°C and 150 to 250°C at rates of 5 to 10 deg/min. The EO was isolated by steam distillation [6], and the quantitative level of the EO was determined by a standard method [7].

Details of the mass spectra of the EO components identified from their key ions *m/z* (%):

Scan No. 334. Farnesene: M^+204(6%), 136(17%), 121(16%), 105(10%), 93(25%), 69(100%), 43(95), 41(97%).

Scan No. 422. 7-Isopropyl-5,10-dimethylbicyclo[4.4.0]deca-3,5-diene: M^+204(37%), 161(90%), 133(35%), 119(62%), 105(75%), 91(100%), 79(77%), 67(36%), 57(62%), 43(93%).

Scan No. 439. 7-Isopropyl-5,10-dimethylbicyclo[4.4.0]deca-5,10-diene: M^+204(27%), 161(100%), 133(26%), 119(35%), 105(50%), 91(50%), 79(37%), 41(39%).

Scan No. 480. 7-Isopropyl-5,10-dimethylbicyclo[4.4.0]deca-1,3,4-triene: M^+202(7%), 159(66%), 128(19%), 115(15%), 105(27%), 91(39%), 79(30%), 41(100%).

REFERENCES

1. M. I. Goryaev, Essential Oils of the Flora of the USSR [in Russian], Izd-vo KazSSR, Alma-Ata (1952).
2. M. S. Shalyt, Useful Wild Plants of the Turkmen SSR (in Russian), Moscow (1951), p. 222.
3. V. Isaev, Tr. Tadzh. Botan. Sada, Moscow, No. 1, 7 (1932).
4. Plant Resources of the USSR [in Russian], Nauka, Moscow, Vol. 6 (1991), p. 64.
5. N. Kh. Ramazanova, Dissertation ... Candidate of Biological Sciences [in Russian], Tashkent (1975), pp. 40 and 156.

6. M. I. Goraev and I. Pliva, Methods for the Investigation of Essential Oils [in Russian], Izd-vo Akad. Nauk KazSSR, Alma-Ata (1962), p. 5.
7. State Pharmacopoeia of the USSR, Methods for the Analysis of Medicinal Plant Raw Material [in Russian], Moscow, No. 1 (1987), p. 292.