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COMPOSITION OF ESSENTIAL OIL FROM *Salvia officinalis* CULTIVATED IN GEORGIA

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Essential oil (1.1%) is isolated from Salvia officinalis *cultivated in Georgia. Its properties are:* ρ_{20} *0.921,* n_D^{20} *1.463,* $[\alpha]_D^{20}$ *+24.91°, acid number 2.8, ketone content 65.4% (oxime method). GLC showed the presence of 11 terpenes, among which α-thujone (31.56%), β-thujone (17.55), camphor (16.48), and 1,8-cineol (17.53) are present in the highest amounts.*

Key words: *Salvia officinalis*, essential oil, composition.

Salvia officinalis L. is an important medicinal and oil-producing plant from the Mediterrean region. The biological properties of this plant have been studied and recommendations for its cultivation in eastern Georgia have been formulated at the Institute of Pharmacochemistry of the Georgian Academy of Sciences. A plantation was established on the Shirakskaya steppe on a 4-hectare plot of the experimental station for medicinal plants.

The medicinal raw material was collected twice per year, in June and September. The yield per hectare was 1.5 ton of air-dried material. High-quality raw material that met requirements of GF XI was prepared yearly for 10 years [1].

The chemical composition of the essential oil (EO) of *S. officinalis* cultivated on the Shirakskaya steppe is of definite interest. The air-dried leaves yielded 1.1% EO as a transparent and slightly yellow fluid liquid with a specific odor and the following properties: ρ_{20} 0.921, n_D^{20} 1.463, $[\alpha]_D^{20}$ +24.91°, acid number 2.8, and terpene ketone content 65.4% (oxime method). A preliminary investigation by TLC showed the presence of three specifically colored dominant spots corresponding to thujone, 1,8-cineol, and camphor.

The components of *S. officinalis* EO cultivated in eastern Georgia are listed below:

Peak No.	Retention time, min	Identified component	Content, %	Int. standard limit, %
1	1.24	-	0.52	-
2	1.74	-	0.04	-
3	3.48	α-Pinene	0.59	1.0-6.5
4	5.42	Camphene	4.53	1.5-7.0
5	5.86	β-Pinene	4.88	-
6	6.67		3.00	-
7	8.65	1,8-Cineol	17.53	5.5-13.0
8	12.64	α-Thujone	31.56	18.0-43.0
9	13.25	β-Thujone	17.55	3.0-8.5
10	15.20	Camphor	16.48	4.5-24.5
11	17.28	-	3.39	-

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The IR spectrum has strong absorption bands at 1745 cm^{-1} that are characteristic of ketones, 3480 (OH^-), 2900-3000 (methylene and methyl groups), 1650 cm^{-1} (double bond), and others.

GLC on a nonpolar phase detected only 11 compounds in the EO. The principal ones are bicyclic terpene ketones: α- and β-thujone, camphor, and the oxide- 1,8-cineol. The bicyclic terpenes α- and β-pinene and camphene were also identified. The total amount of these in the EO is 93.13%. Monoterpenes (peaks 6 and 11), which are present at 6.4%, were also characterized. Limonene, linalool, and linalyl acetate were not observed by GLC. Sesquiterpene hydrocarbons were not detected. It is possible that the amount of sesquiterpenes synthesized in the first stages of plant development decreased during vegetation and increased the amount of monoterpenes. In the raw material collected in June, these compounds were not observed. Therefore, we will next study the EO composition of the cultivated plant during its whole life cycle.

The data show that EO of *S. officinalis* cultivated in eastern Georgia contains a small assortment of compounds that differs in chemical composition from that reported in the literature [2-5]. The high contents of 1,8-cineol and α- and β-thujone are interesting. The ratio of these isomeric species, which exist in dynamic equilibrium in nature, is 2:1, which is consistent with the literature [2].

Such variability in the chemical composition of the EO of *S. officinalis* is in all probability due to features of the soil and climate on the Shirakskaya steppe, the large number of sunny days, and the hot summer. This is consistent with reports in the literature that the yield and EO composition depend strongly on the habitat [3-5].

The EO of *S. officinalis* is widely used in medicinal preparations, perfume, and cosmetics. Bactericidal, cytotoxic, and antiviral activities have recently been reported for the EO of *S. officinalis*, thujone, and 1,8-cineol [6]. The reliable raw material production of *S. officinalis* on commercial plantations and the good yield and chemical composition of the EO provide a basis for developing a standard commercial product and pharmacopeic description.

EXPERIMENTAL

The EO of air-dried ground leaves of *S. officinalis* collected on the experimental station for medicinal plants of the Institute of Pharmacochemistry of the Georgian Academy of Sciences on the Shikarskaya steppe was obtained by steam distillation. The yield of EO was 1.0-1.2% of the air-dried mass.

TLC was performed on L 5/40 silica gel (Czech Republic) with 10% $CaSO_4$ using the systems: 1) $CHCl_3$ and 2) ethylacetate—hexane (3:17). Spots were developed by solutions of phosphotungstic acid, antimony chloride, and conc. H_2SO_4 and HNO_3 (95:5) with subsequent heating to 110°C for 5-10 min.

The components of the EO were determined by GLC on a Perkin—Elmer F-22 chromatograph with a flame-ionization detector that was connected to a computer, a 3 m × 2 mm column, 5% silicone SE-30 on chromaton N-AW-DMCS (0.16-0.22 mm) stationary phase, 150°C injector temperature, 120°C detector temperature, and 110°C thermostat. The carrier gas was N_2 flowing at 40 ml/min. The EO components were identified using standards by comparing the retention times of their chromatographic peaks. The quantitative content was determined by normalizing the peak areas using a computer.

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