

UDC 582.929.4: 633.81
AGRIS F60

<https://doi.org/10.33619/2414-2948/117/09>

**OBTAINING AND STUDYING THE CHEMICAL COMPOSITION
OF ESSENTIAL OIL OF *Thymus vulgaris* L., WIDESPREAD IN THE TERRITORY
OF THE NAKHCHIVAN AUTONOMOUS REPUBLIC**

©**Alibayli Kh.**, ORCID: 0000-0003-0288-2150, Institute of Dendrology Ministry of Science and Education of the Republic of Azerbaijan, Baku, Azerbaijan, xeyaleelibeyli@gmail.com

©**Sadigov T.**, ORCID: 0000-00032-0774-4521, Ph.D., Institute of Dendrology Ministry of Science and Education of the Republic of Azerbaijan, Baku, Azerbaijan, sadigovtofig@mail.ru

©**Alibayli E.**, ORCID: 0009-0004-1565-1217, Azerbaijan State Oil and Industry University, Baku, Azerbaijan, elminalibayli@gmail.com

**ПОЛУЧЕНИЕ И ИЗУЧЕНИЕ ХИМИЧЕСКОГО СОСТАВА ЭФИРНОГО МАСЛА
Thymus vulgaris L., ПРОИЗРАСТАЮЩЕГО НА ТЕРРИТОРИИ
НАХЧЫВАНСКОЙ АВТОНОМНОЙ РЕСПУБЛИКИ**

©**Алибейли Х.**, ORCID: 0000-0003-0288-2150, Институт дендрологии Министерства науки и образования Азербайджанской Республики, г. Баку, Азербайджан, xeyaleelibeyli@gmail.com

©**Садыгов Т.**, ORCID: 0000-00032-0774-4521, канд. с.-х. наук, Институт дендрологии Министерства науки и образования Азербайджанской Республики, г. Баку, Азербайджан, sadigovtofig@mail.ru

©**Алибейли Э.**, ORCID: 0009-0004-1565-1217, Азербайджанский государственный университет нефти и промышленности, г. Баку, Азербайджан, elminalibayli@gmail.com

Abstract. Extraction of essential oil of *Thymus vulgaris* L. and analysis of its chemical composition were carried out. Samples of *Thymus vulgaris* L., widespread in the mountainous regions of the Nakhchivan Autonomous Republic, were collected. After drying the obtained plant samples, the essential oil was obtained in laboratory conditions by hydrodistillation. The component composition of the obtained essential oil of *Thymus vulgaris* L. was analyzed using gas-liquid chromatography. Based on the results, it was found that the essential oil of *Thymus vulgaris* L. contains α -pinene, β -pinene, myrcene, carene, linal, caryophyllene, terpinene, citronellol, N,N-dimethylacetamide, alpha-terpineol, estragole, camphene, myrtenol, nerol, geraniol, camphor, citronellyl butyrate, alpha-terpenyl acetate, geranyl oleate, geranyl acetate, cedrol, thymol. The essential oil of *Thymus vulgaris* L. has high chemical quality. The essential oil has the potential for use in pharmacology and cosmetology due to its antibacterial and antioxidant properties.

Аннотация. Проведена экстракция эфирного масла *Thymus vulgaris* L. и анализ его химического состава. Были собраны образцы *Thymus vulgaris* L., широко распространенного в горных районах Нахчыванской Автономной Республики. После высушивания полученных образцов растений эфирное масло получали в лабораторных условиях методом гидродистилляции. Компонентный состав полученного эфирного масла *Thymus vulgaris* L. анализировали с помощью газожидкостной хроматографии. На основании результатов установлено, что эфирное масло *Thymus vulgaris* L. содержит α -пинен, β -пинен, мирцен, карен, линаол, кариофиллен, терпинен, цитронеллол, N,N-диметилацетамид, альфа-терпинеол, эстрагол, камфен, миртенол, нерол, гераниол, камфору, цитронеллилбутират, альфа-терпенилацетат, геранилолеат, геранилацетат, кедрол, тимол. Эфирное масло *Thymus vulgaris* L. имеет высокое химическое качество. Эфирное масло имеет потенциал для

использования в фармакологии и косметологии благодаря своим антибактериальным и антиоксидантным свойствам.

Keywords: *Thymus vulgaris* L., essential oil, chromatography, antibacterial, industry, medicine, cosmetology

Ключевые слова: *Thymus vulgaris* L., эфирное масло, хроматография, антибактериальное, промышленность, медицина, косметология

The flora of the Nakhchivan Autonomous Republic has rich plant resources. Essential oil plants also occupy a special place in this wealth. Currently, up to 2000 essential oil plants are known to science. Essential oil is found in all organs of plants in small or large quantities. Due to the richness of its chemical composition and the prospects for use, one of the most widely used genera of the Dalmatomiaceae family is thyme. 7 species of the genus are distributed in the Nakhchivan Autonomous Republic. Thyme is one of the most widely used plants in the medical and food industries worldwide due to the chemical compounds it contains. The biologically active substances of this plant are concentrated in its aboveground green parts and show the highest amount in the flowering phase. The aboveground green parts of thyme species growing in Azerbaijan contain from 0.12% to 1.75% essential oil. In the dry and hot climate of the Nakhchivan Autonomous Republic, the essential oil yield of thyme species varies from 1.45% to 1.75% (1.80%). Thyme plant, which is rich in essential oil, has been studied by many Azerbaijani scientists from time to time, and its industrial importance and areas of application in medicine have been investigated [1-3, 6, 7].

The main objective of the research work is to study the chemical composition and uses of essential oil obtained from *Thymus vulgaris* L. species.

Materials and methods

For the implementation of the research work, samples of the *Thymus vulgaris* L. species, which are widespread in the mountainous areas of the Nakhchivan Autonomous Republic, were collected. The collection process was carried out in the morning hours, during the flowering stage of the plant. The collected material was dried in the shade. Essential oil was obtained from the dried *Thymus vulgaris* L. species in the “Industrially Important Plants” laboratory of the Institute of Dendrology by the hydrodistillation method (Ginzberg) (Figure 1).



Figure 1. Extraction of essential oil from *Thymus vulgaris* L.

The component composition of the essential oil was analyzed using a “Kristal” 2000 M gas-liquid chromatography [4, 5].

Based on the results of the analysis, *Thymus vulgaris* L. essential oil contains α -Pinen — 24,320%, β -Pinen — 0,097%, Myrcene — 0,081%, Carene-3 — 0,148%, Linaool — 1,979%, Cariophyllene — 6,750%, Terpinen-4-ol — 1,719%, Citronellol — 7,691%, N,N dimethyl acetamide — 0.022%, alpha-terpineol — 0.401%, Estragole — 0.398%, camphene — 0.169%, myrtenol — 0.998%, Nerol — 3.985%, geraniol — 487%, camphor — 1.204%, Citronelly butyrate — 30.234%, alpha-Terpenylacetate — 0.085%, Geranyl Oleate — 6.759%, Geranylacetate — 0.121%, Cedrol — 0.760%, Thymol — 0.148% were determined.

Conclusion and discussion

Common thyme (*Thymus vulgaris* L.) is a perennial herbaceous plant belonging to the Lamiaceae family (Lamiaceae Lindl.). There are different opinions in the literature regarding the distribution of thyme on Earth. Some sources indicate that there are 400 species of thyme in the temperate zone of Eurasia and North America. It is reported that there are 38 species of thyme on Earth (excluding tropical countries) [9].

The homeland of thyme is considered to be the Mediterranean coast. All species of the genus Thyme are essential oil plants. The roots and leaves are usually covered with hairs that carry essential oil. Thyme, a wild semi-shrub, is collected when it is in bloom as a high-quality raw material and medicinal plant. The collected herb should be dried in a shady place or in a drying cabinet [8, 10].

During the conducted research, the hydrodistillation method was applied to obtain essential oil from *Thymus vulgaris* L. species collected from the mountainous areas of the Nakhchivan Autonomous Republic. During the hydrodistillation process, 200 grams of dried thyme plant were used (Figure 2).



Figure 2. *Thymus vulgaris* L. species

During the experiment, 2.2 ml of essential oil was obtained. The yield percentage of the obtained essential oil was calculated using the following formula.

$$Y (\%) = \left(\frac{m_y}{m_b} \right) \times 100$$

$$\text{Essential oil yield (\%)} = (\text{Amount of essential oil obtained} / \text{mass of dried plant}) \times 100$$

$$\text{Yield (\%)} = (2.2 / 200) \times 100 = 1.1\%$$

The quality of the essential oil obtained depends on the dynamic development phase of the plant. Productivity can vary depending on the geographical region where the plant is grown, as well as climatic conditions. Thyme can be found on sandy slopes, grassy areas, and low-humidity areas [11]. The composition of the essential oil obtained from *Thymus vulgaris* L. was studied using a “Kristall” 2000 M gas-liquid chromatography. The results are shown in Table.

Table

CHEMICAL COMPOSITION OF *Thymus vulgaris* L. ESSENTIAL OIL

Время, мин	Компонент	Группа	Площадь	Высота	Площадь, %	Концентрация	Ед. концентрации	Детектор
8.464	alfa-pinen		13893.082	2204.768	24.320			ПИД-1
9.011			161.658	80.259	0.283			ПИД-1
9.217			24.519	13.022	0.043			ПИД-1
9.429	beta-Pinen		55.621	19.315	0.097			ПИД-1
9.593	Mircen		46.007	20.488	0.081			ПИД-1
9.979	Carene-3		84.566	40.187	0.148			ПИД-1
10.098			40.570	18.711	0.071			ПИД-1
10.241			832.403	340.373	1.457			ПИД-1
10.661			4.904	3.431	0.009			ПИД-1
12.758			53.847	16.352	0.094			ПИД-1
13.243			14.208	5.458	0.025			ПИД-1
13.461			103.288	34.896	0.181			ПИД-1
13.723			35.036	11.577	0.061			ПИД-1
14.182	linalool		1130.462	313.863	1.979			ПИД-1
14.481	Cariophyllene		3855.678	1093.080	6.750			ПИД-1
14.689			32.838	10.529	0.057			ПИД-1
14.788			145.891	35.253	0.255			ПИД-1
15.125	Terpinen-4-ol		982.241	257.985	1.719			ПИД-1
15.335	Citronellol		4393.240	1196.665	7.691			ПИД-1
15.463			38.459	14.233	0.067			ПИД-1
15.665	N,N di methyl acetamid		12.321	5.373	0.022			ПИД-1
15.815			256.463	52.541	0.449			ПИД-1
16.133	alfa-terpineol		228.992	65.950	0.401			ПИД-1
16.193	Estragole		227.351	57.462	0.398			ПИД-1
16.334	kamfen		96.465	27.410	0.169			ПИД-1
16.445	mirtenol		570.044	144.419	0.998			ПИД-1
16.625	Nerol		2276.534	489.250	3.985			ПИД-1
16.755	geraniol		278.393	62.182	0.487			ПИД-1
17.077	camphor		687.706	141.219	1.204			ПИД-1
17.231	Citronelly butyrate		17271.469	3700.318	30.234			ПИД-1
17.463			150.239	48.445	0.263			ПИД-1
17.598	alfa-Terpenilacetat		48.772	18.638	0.085			ПИД-1
17.672			179.589	59.416	0.314			ПИД-1
17.725			271.648	78.166	0.476			ПИД-1
18.151	Geranyl Oleate		3860.911	1024.699	6.759			ПИД-1
18.610			260.649	72.057	0.456			ПИД-1
18.872			16.861	6.637	0.030			ПИД-1
19.180			43.857	14.581	0.077			ПИД-1
19.755			41.942	13.590	0.073			ПИД-1
20.053			235.549	67.630	0.412			ПИД-1
20.193	geranilacetat		69.359	19.976	0.121			ПИД-1
20.327			52.766	17.073	0.092			ПИД-1
20.401			38.697	11.712	0.068			ПИД-1
20.930			915.402	150.577	1.602			ПИД-1
21.101			81.818	19.748	0.143			ПИД-1
21.232			847.058	214.652	1.483			ПИД-1
21.371	Cedrol		434.200	109.609	0.760			ПИД-1
22.167			14.045	5.674	0.025			ПИД-1
22.275			221.218	36.744	0.387			ПИД-1
22.551			384.939	76.115	0.674			ПИД-1
22.658			618.924	126.144	1.083			ПИД-1
23.123			417.734	95.981	0.731			ПИД-1
24.133	Thymol		84.793	18.952	0.148			ПИД-1

The quality of essential oil extracted from plants depends on the dynamic phase of development. Yields can vary depending on the geographical region and climatic conditions where the plant is grown.

Thymus L. — thyme plant is rich in essential oil, so it is widely used in folk medicine, medicine, pharmacology, cosmetics, perfumery industry, and household as a spice. Essential oils obtained from all species of the genus *Thymus* (*Thymus* L.) have antiviral and antibacterial effects. *Thymus* plant is also rich in vitamins A and C, calcium, sodium and potassium. Tea made from thyme is also widely used in folk medicine. *Thymus vulgaris* L., which belongs to the genus *Thymus* (*Thymus* L.), was used in the research work.

Studies have shown that thyme essential oil is rich in naturally occurring bioactive substances and has wide application potential in medicine, pharmacy, and cosmetology. To obtain high-quality essential oil, it is important to apply proper distillation methods and take into account the growing conditions of the plant.

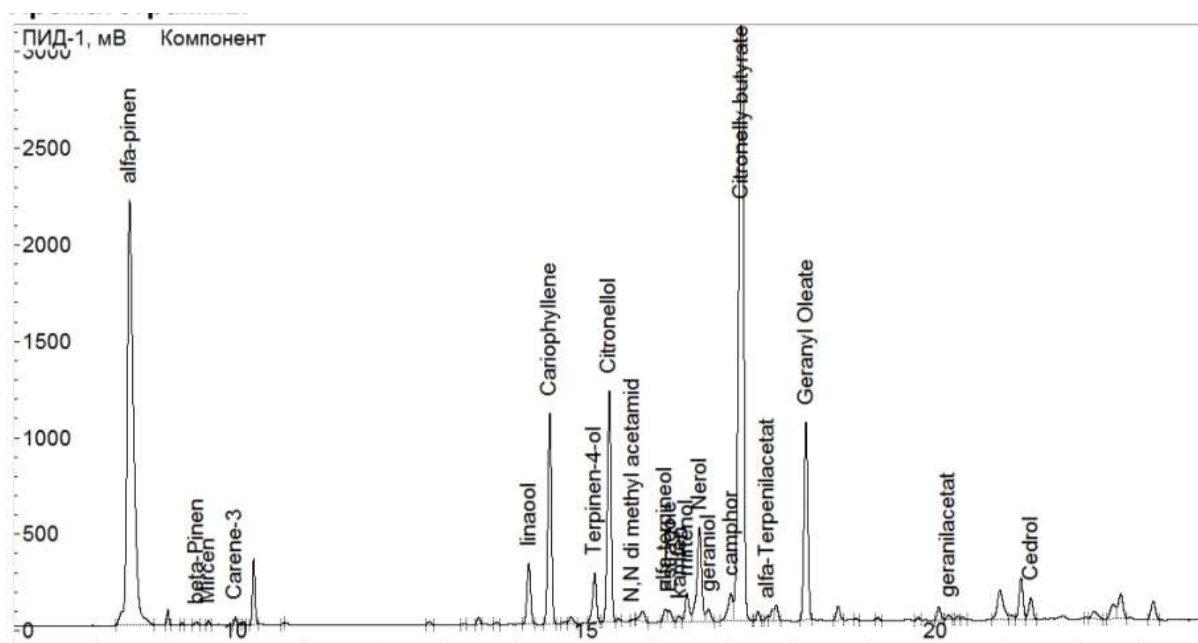


Figure 3. Chromatography of the chemical composition of *Thymus vulgaris* L essential oil

Conclusion

As a result of the conducted scientific research, high-quality essential oil was obtained from the *Thymus vulgaris* L. plant and its component composition was studied using a "Kristal" 2000 M gas-liquid chromatography. Based on the results of the analysis, *Thymus vulgaris* L. essential oil contains: α -Pinen — 24,320%, β -Pinen — 0,097%, Myrcene — 0,081%, Carene-3 — 0,148%, Linaool-1,979%, Cariophyllene- 6,750%, Terpinen-4-ol-1,719%, Citronellol-7,691%, N,N dimethyl acetamide — 0.022%, alpha-terpineol — 0.401%, Estragole — 0.398%, camphene — 0.169%, myrtenol — 0.998%, Nerol — 3.985%, geraniol — 0.487%, camphor — 1.204%, Citronelly butyrate — 30.234%, alpha-Terpenylacetate — 0.085%, Geranyl Oleate — 6.759%, geranylacetate — 0.121%, Cedrol — 0.760%, Thymol — 0.148% were determined. These components indicate that the essential oil has high biological activity. *Thymus vulgaris* L. essential oil can be considered promising for pharmacology and cosmetology due to its antibacterial and antioxidant properties. Also, its use in perfumery and cooking is undeniable due to its beautiful aroma. *Thymus vulgaris* L. essential oil, which has a multifaceted importance, is suitable for widespread use in various fields of industry.

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Работа поступила
в редакцию 27.05.2025 г.

Принята к публикации
08.06.2025 г.

Ссылка для цитирования:

Alibayli Kh., Sadigov T., Alibayli E. Obtaining and Studying the Chemical Composition of Essential oil of *Thymus vulgaris* L., Widespread in the Territory of the Nakhchivan Autonomous Republic // Бюллетень науки и практики. 2025. Т. 11. №8. С. 66-72.
<https://doi.org/10.33619/2414-2948/117/09>

Cite as (APA):

Alibayli, Kh., Sadigov, T., & Alibayli, E. (2025). Obtaining and Studying the Chemical Composition of Essential oil of *Thymus vulgaris* L., Widespread in the Territory of the Nakhchivan Autonomous Republic. *Bulletin of Science and Practice*, 11(8), 66-72.
<https://doi.org/10.33619/2414-2948/117/09>