

UDC 582.678.1:547.913

## OBTAINING AND DEVELOPING SEVERAL QUALITY INDICATORS OF BAY LAUREL LEAF ETHER OIL IN ARTSAKH

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*Ether oils are fragrant, easily volatile substances contained in various parts of the plants. Esther oils are easily distilled from the plant by steam. Laurel leaves contain 0.5 - 0.6% ether oil the medicinal properties of which are determined by the content of eugenic, cineol and a number of terpenic compounds. With its antibacterial and anti-inflammatory properties, laurel oil is effectively used in aromatherapy.*

*The extraction of the bay laurel ether oil is studied by the method of complicated steam distillation with multiple distillation of water vapor, after which the physical and chemical properties such as density, refractive index, acid number and optical rotation have been determined. Determination of the density (specific gravity,  $d_{20}^4$ ) was conducted with the help of a pycnometer according to the method 1 of the GF XIII edition (OFS.1.2.1.0014.15). The determination of the refractive index was carried out using an IRF 454 B2M refract meter. Additionally, it was adjusted over purified water, for which  $n_{20}^D$  equals 1.3330.*

*Specific optical rotation ( $^{\circ} \times ml \times dm^{-1} \times g^{-1}$ ) was determined in compliance with the requirements of the GF XIII edition. Acidity number (cc) is the mass of potassium hydroxide in milligrams that was required to neutralize one gram of free acids contained in ether oil.*

**Key words:** ether oil, bay laurel, density, refractive index, acidity number, optical rotation

### Introduction

Among the diversity of flora, since the earliest times man paid attention to plants with a pleasant or acute aroma, sticky to touch. Applying them in a mixture with the plant, and later, when the man learned to extract certain aromatic substances from plants, the most valuable properties of these substances –the ether oils and aromatic resins were discovered.

The science of ether oils was highly developed in Egypt and other countries, where the ancients used them for embalming and healing purposes.

With the rapid development of chemistry, it seemed that the application of ether oils in medicine should have expanded. However, that did not happen. The industry of chemical preparations diminished the role of natural remedies, especially the ether oils. Yet only in recent years phytotherapy, aromatherapy and the undeservedly forgotten glory of ether oils were returned to mankind.

Ether oils are fragrant, easily volatile substances contained in various parts of plants, mainly in flowers, leaves, fruits, roots. Ether oils are easily distilled from the plant by steam. Since ancient times, the laurel plant was known as both food and herb.

*Laurusnobilis* is one of the most famous evergreen trees. The leaves and fruits of plants and its extracts are used for seasoning in cooking, in folk medicine and cosmetology. Ether oils, sesquiterpene lactones, phenolic compounds are found in bay laurel as the main groups of biologically active substances [1, 2].

Laurel leaves contain 0.5 - 0.6% ether oil the medicinal properties of which are determined by the content of eugenic, cineol and a number of terpenic compounds. With its antibacterial and anti-inflammatory properties, laurel oil is best used in aromatherapy. In folk remedies, the laurel leaf is

used as an external cure for itching, rheumatic pains, spasms, tumors and as an agent of strengthening the nervous system.

For these purposes ointment of the following composition is recommended: six parts of laurel leaf powder, one part of juniper leaves and twelve pieces of unsalted butter. All this should be carefully ground. This ointment is a very effective cure, acts as an analgesic and anti-spasmodic relief from rheumatic and awakening pains. Dry bay laurel leaves are widely used in culinary and canning industry.

*Laurusnobilis* is native to Mediterranean region; this plant is also spread in Georgia, the southwestern part of Krasnodar region and in small quantities on the southern coast of the Crimea.

Ether oils of plants are complex natural mixtures of substances, in which, in addition to terpenoids, there are aromatic, poly-acetylene and other compounds [3, 4]. Some of the ether oils and sesquiterpene lactones possess phytotoxic, antibacterial and other kinds of pharmacological activity and are clinically tested [5-8]. The leaves of the *laurusnobilis* are among the most studied raw materials for the extraction of ether oils.

### Conflict settings

Studies of the chemical composition of the laurel leaves, conducted by domestic and overseas researchers, showed that the content of ether oil in them varies from 0.5 to 1.5% (in cases of absolutely dry raw material) [2]. Its main components are 1,8-cineol (31,4- 56%), linalool, eugenol, methyl eugenol, sabinen compounds known for their antibacterial, antifungal, antitubercular and phytotoxic properties.

Ether oil from the *laurusnobilis* was obtained by hydrodistillation. Experimental studies have shown that the process of intensive distillation of oil from the laurel yield with the use of the Klevanger device in the Loshkarev modification ends after 4 hours given 1:30 the raw material and water. The extracted ether oil was passed through a molecular sieve A4 to remove excess water. In appearance, laurel oil is easily volatile liquid of yellowish color with a bitter taste and typical odor.

The output of ethereal oil comprises 0.4-0.5%. To increase the extraction of the main product, the water portion was extracted three times with hexane with ratio of hexane-water 5: 1. The extraction was carried out in a sharing funnel: the hexane layer is separated, all 3 portions are combined, then the hexane extract is dried over heated magnesium sulfate ( $MgSO_4$ ) for 20 hours.

The dried hexane solution of laurel ethereal oil is distilled in rotary evaporator at the temperature of 51-55 ° C. After distillation of 90-95% of hexane, the vacuum apparatus is connected to the rotary evaporator and the residuals of hexane are distilled off. After the hexane is completely stripped, 10 ml of ethyl alcohol are added to the flask, it is distilled at the temperature of 71-78 ° C and then it is put under vacuum at 30-35 mm/Ng.

The extraction of ethereal oil is 0.15-0.2% or 0.5-0.7%.

In order to achieve more extraction of laurel ethereal oil, other methods of obtaining were investigated.

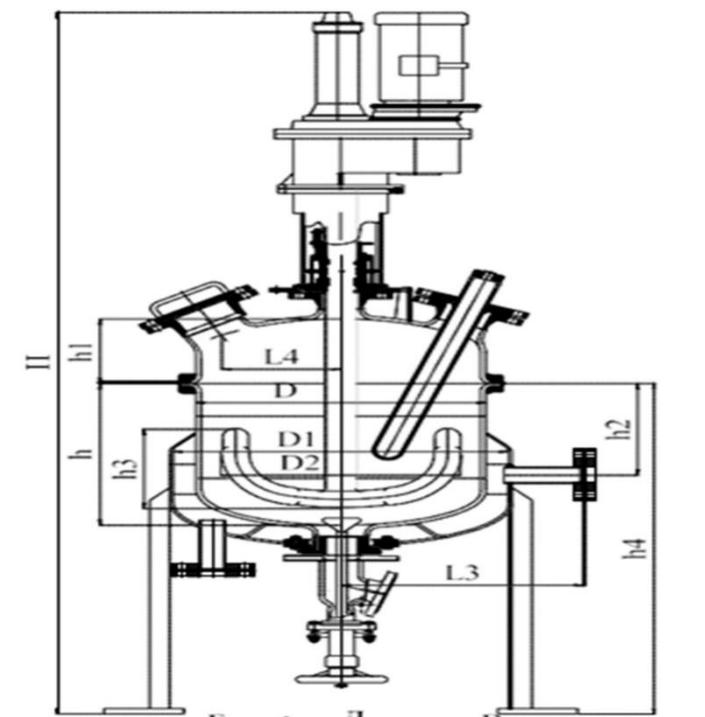
The essence of the methods is the extraction of dry leaves of the laurel bay with two easy-boiled solvents at low temperatures.

### Method 1

In a two-liter flask equipped with a hermetically sealed glycerin bolt with an anchor stirrer and a reverse spherical condenser, put 300 g of crushed dried leaves of the laurel bay, pour 1.2 L of hexane with a ratio of 1: 4, heat at 51-53 ° C, the mixture stir for 10-12 hours, then filter 2 times through the filtered paper. On a rotary evaporator, 98-99% of hexane is distilled from the filtrate. After distillation, a very viscous dark green mass is obtained which is further distilled with water vapor at 99-100 ° C and a water-ether-oil mixture is obtained which is then extracted again with hexane.

After extraction, the hexane layer is dried over heated magnesium sulfate, insisted, left for 8-10 hours, filtered with filter paper. Hexane is completely distilled off connecting the vacuum apparatus

to the rotary evaporator. After the final distillation, 10 ml of alcohol are added to the flask with ethereal oil and 30-40 ml Hg to be distilled under vacuum to remove residual hexane. The output of essential oil is up to 1-1.01% which is close to the theoretical amount.



**Fig.1.Anchor stirrer**

**Method 2**

The process of the experiment and the duration of the extraction are similar to those of Method 1. We use a more volatile solvent: methylene chloride, boiling temperature and removal is 31-32 ° C.

After removal of methylene chloride, 10 ml of water are added to the flask containing the ethereal oil, the water is distilled off in a vacuum, then it is freed from chloride compounds and then the alcohol is distilled off. Pure ether oil is obtained in an output of 1.2-1.25 ml.

**Table 1**

**Qualitative composition and meaning of the constant of ethereal oil of laurel bay (n=3)**

Nº	Method of extraction	Output of ethereal oil %	Density g\cm	Indicator of refraction n20	Optical rotation of density
1	Distillation with water vapor	0.8	0.9200	1.4698	10.02198
2	Extraction with hexane with water	0.2-0.25	0.9190	1.4697	10.9950
3	Extraction of dry laurel bay with hexane and distillation with water vapor	1-1.01	0.9192	1.4700	11.1200
4	Extraction of dry leaves with chlorine methanol and hydro distillation	1.2-1.25	0.9200	1.4698	11.1150

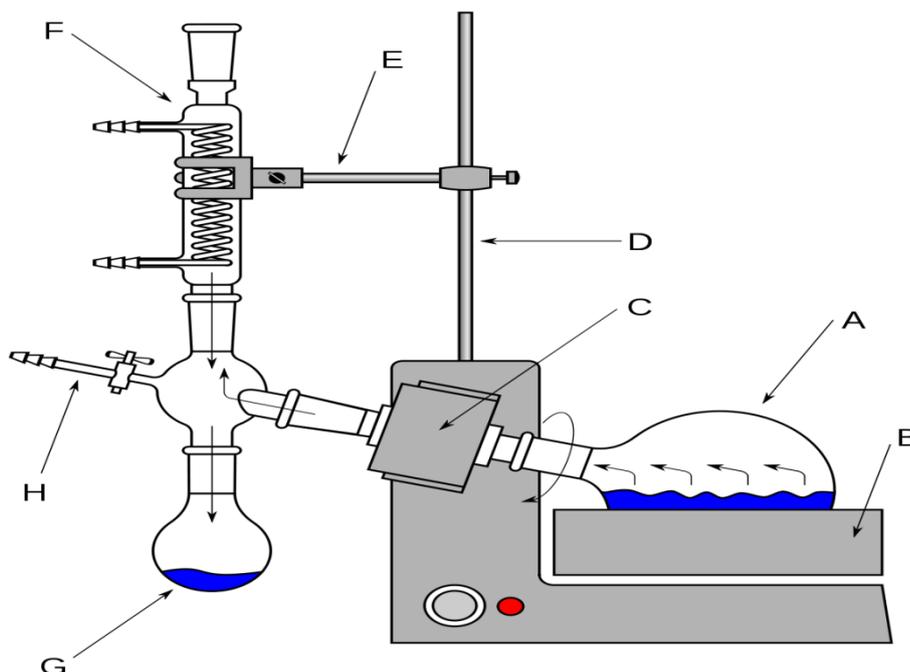


Fig. 2. Rotary evaporator

### Research results

To study the constants of ether oil of laurel leaves and their variability, raw materials were harvested in the main phases of the plant development (budding, flowering and fruiting). The yield was dried in the shade, in open air: the samples were evaluated after two months since their collection. The analysis of the samples was carried out in two stages: 1) extracting the ether oil and 2) the subsequent determination of the constants.

Determination of the density (specific gravity,  $d_{20}^4$ ) was carried out with the help of a pycnometer according to the method 1 of the GF XIII edition (OFS.1.2.1.0014.15).

The refractive index (refraction,  $n_{20}^D$ ) was determined in accordance with the requirements of the GF XIII edition (OFS.1.2.1.0017.15). High refraction and high density usually characterize the richness of the studied ether oil with oxygen compounds, which indicates, in particular, the timely collection of the yield. The determination of the refractive index was carried out using an IRF 454 B2M refract meter. Additionally, it was adjusted over purified water, for which  $n_{20}^D$  is equal to 1.3330.

Specific optical rotation ( $^{\circ} \times \text{ml} \times \text{dm}^{-1} \times \text{g}^{-1}$ ) was determined in compliance with the requirements of the GF XIII edition (OFS.1.2.1.0018.15).

Acidity number (cc) is the mass of potassium hydroxide in milligrams that was required to neutralize one gram of free acids contained in ether oil [GF XIII, (OFS.1.2.1.0004.15)]. This is an important constant, since the content of free acids usually varies within certain limits for each ether oil. As a rule, it is small (0.5-5), but when stored, it increases as a result of the decomposition of compound ethers.

The results of the determined quantitative content and physicochemical constants (average values) of the laurel ether oil are featured in the table.

**Quantitative content and values of the constants of ether oil of laurel leaves (n = 3)**

The phases of plant development	Ether oil extraction Per %	Density g/cm	Index of refraction n <sub>20 D</sub>	Specific optic rotation (°)×ml×dm <sup>-1</sup> ×g <sup>-1</sup>	Acidity number
Artsakh					
Budding	0,76	0,9200	1,4698	10,2198	2,22
Flowering	1,21	0,9218	1,4715	12,1543	2,13
Fruiting	0,96	0,9236	1,4729	13,2458	2,16

### Conclusion

1. Depending on the phase of the plant's vegetation the quantitative content, physical and chemical constants of the bay laurel growing in Artsakh have various characteristics, namely quantitative outcome of the ether oil, its density, refractive index and optical rotation.
2. The obtained product is used to support digestion, stimulate appetite and boost the secretion of stomach juice, hence increasing the functional activity of the stomach. It can be an excellent relief for cleansing the kidneys, liver and urogenital system of the human body. Its stimulating and toning properties can significantly improve well-being and contribute to early recovery after ailments. Also, this oil can be used for all ailments, which are accompanied by temperature, as the laurel oil possesses good antipyretic properties.
3. The use of laurel oil is recommended for the alleviation of various kinds of chronic and aching disorders, namely arthritic or rheumatic pains in the joints, pains and discomfort in the stomach, muscle pains and spasms, etc. It has antiseptic properties, which can help with diseases such as bronchitis or various ear infections. Moreover, laurel oil positively influences the reproductive function, helps to deal with infertility. Women are recommended this oil to regulate the menstrual flow. Bay laurel oil can trigger and accelerate childbirth, as well as reduce the likelihood of various complications during labour.

### References

1. Коновалов Д.А., Насухова Н.М. Сесквитерпеновые лактоны листьев и плодов *Laurusnobilis L.* (лавра благородного) // Фармация и фармакология. 2014. № 2 (3). С. 23-33.
2. Насухова Н.М., Коновалов Д.А. Динамика накопления эфирного масла в листьях лавра благородного // Вестник Волгоградского государственного медицинского университета. 2014. № 5. С. 94-95. 45
3. Коновалов Д.А. Полиацетиленовые соединения растений семейства Asteraceae (обзор) // Химико-фармацевтический журнал. – 2014. –Т. 48, № 9.– С. 36-53.
4. Коновалов Д.А. Природные полиацетиленовые соединения // Фармация и фармакология.– 2014.– № 4 (5).– С. 23-48.
5. Коновалов Д.А., Старых В.В. Фитотоксическая активность некоторых сесквитерпеновых лактонов, выделенных из представителей сем. Asteraceae // Растительные ресурсы. 1997. Т. 33, № 4. С. 17-27.
6. Коновалов Д.А., Старых В.В., Шхануков Ю.Ж. Фитотоксическая и ан-тифунгальная активность суммы лактонов *Artemisiataurica Willd.* // Растительные ресурсы. 2002. Т. 38, № 3. С. 77-81.

7. Петров В.И., Седова Н.Н., Аджиенко В.Л. Социальный институт клинических исследований // Социология медицины. 2004. № 2. С. 18.
8. Коновалов Д.А., Челомбитко В.А. Сесквитерпеновые лактоны из Achilleamillefolium L. // Химия природных соединений. 1991. № 5. С. 724-725.
9. Konovalov D.A., Konovalova O.A., Chelombit'ko V.A. Chemical composition of the essential oil of Artemisia scoparia // Chemistry of Natural Compounds. 1992. Vol. 28, № 1. P. 121-122.
10. Коновалова О.А., Коновалов Д.А., Кабанов В.С., Рыбалко К.С., Шейченко В.И. Состав эфирного масла Artemisia scoparia Waldst. et Kit. // Растительные ресурсы. 1989. Т. 25. Вып. 3. С. 404-410.

### References

1. Konovalov D.A., Chelombitsko V.A, Sesquiterpene lactones from Achilleamillefolium L. // Chemistry of natural compounds. 1991. № 5. p. 724-725.
2. Konovalov D.A., Naskhova N.M., Sesquiterpene lactones of leaves and fruits of Laurusnobilis L. // Pharmacy and pharmacology. 2014. No. 2 (3). p. 23-33.
3. Konovalov D.A., Natural polyacetylene compounds // Pharmacy and Pharmacology .- 2014.- No. 4 (5) p. 23-48.
4. Konovalov D.A., Starikh V.V., Phytotoxic activity of some sesquiterpene lactones isolated from the representatives of the family. Asteraceae // Plant resources. 1997. V. 33, No. 4. p. 17-27.
5. Konovalov D.A., Starikh V.V., Shkhanukov Yu.Z., Phytotoxic and antifungal activity of the sum of lactones Artemisia taurica Willd. // Plant// Phytoresources. 2002. p. 38, No. 3. p. 77-81.
6. Konovalov D.A. Polyacetylene compounds of plants of the Asteraceae family (review) // Chemical-pharmaceutical journal. 2014. -V. 48, No. 9. p. 36-53.
7. Konovalov D.A., Konovalova O.A., Chelombit'ko V.A., Chemical composition of the ether oil of Artemisia scoparia // Chemistry of Natural Compounds. 1992. Vol. 28, No. 1. p. 121-122.
8. Konovalova O.A., Konovalov D.A., Kabanov V.S., Rybalko K.C., Sheychenko V.I., Composition of the ether oil of Artemisia scoparia Waldst. et Kit. // Plant resources. 1989. Vol. 25, 3<sup>rd</sup> release, p. 404-410.
9. Naskhova N.M., Konovalov D.A., Dynamics of the accumulation of ether oil in the leaves of the laurusnobilis / Bulletin of the Volgograd State Medical University. 2014. No. S 94-95, p. 45.
10. Petrov V.I., Sedova N.N., Adzhienko V.L., Social Institute of Clinical Research // Sociology of Medicine. 2004. № 2. p. 18.

### ԱՐՑԱՆՈՒՄ ԴԱՓՆՈՒ ԵԹԵՐԱՅԻՆՅՈՒՂԻ ՍՏԱՅՈՒՄՆ ՈՒ ՈՐԱԿԱԿԱՆ ՑՈՒՑԱՆԻՇՆԵՐԻ ՈՐՈՇՈՒՄԸ

**Գ.Գ. Ներսիսյան, Ռ.Ս. Հակոբյան, Ն.Վ. Ֆարսիյան, Լ.Կ. Պողոսյան, Ս.Ա. Աղամյան**  
Շուշիի պեղնոլոգիական համալսարան

Եթերային յուղերը բուրավետ, հեշտ թռչող նյութեր են, որոնք պարունակվում են բույսերի տարբեր հատվածներում:

Եթերային յուղերը հեշտությամբ տարանջատվում են բուսական հումքից՝ ջրի գոլորշիների միջոցով:

Դափնու տերևները պարունակում են 0,5-0,6% եթերային յուղեր, որոնց բուժիչ հատկությունները պայմանավորված են էվգենոլի, ցինեոլի և մի շարք միացությունների պարունակությամբ: Դրանով են բացատրվում դրանց հակաբիոտիկ և հակաբորբոքային հատկությունները, ինչը թույլ է տալիս օգտագործել դափնու յուղը արոմաթերապիայում: Դափնու եթերային յուղը ստացվել է բարդացված ջրային թորման մեթոդով՝ ջրային գոլորշու բազմիցս գտմամբ, ինչից հետո որոշվում են ֆիզիկաքիմիական

## CHEMISTRY

հաստատունները՝ խտությունը, բեկման ցուցիչը, թթվային թիվը, օպտիկական հատկությունները: Խտության որոշումը (հատուկ ուժգնությունը՝  $d_{20}^4$ ) իրականացվել է պիկնոմետրի օգնությամբ: Քայքայիչ ցուցանիշը (ռեֆրակցիա,  $n_{20}^D$ ) որոշվել է ГФ XIII հրատարակության պահանջներին համապատասխան: Ռեֆրեկցիան դեքսիորոշումը կատարվել է ռեֆրակտոմետրի օգնությամբ (ИРФ 454 Б2М). Նախապես կարգավորել են մաքրված ջրի մակերևույթին, որի համար  $n_{20}^D$  հավասար է 1,3330: Տեսակարար օպտիկական ռոտացիան ( $[\alpha]_{D}^{20}$ ) որոշված է ГФ XIII հրատարակման պահանջներին համապատասխան: Թթվային թիվը՝ կալիումի հիդրօքսիդի քանակությունը՝ միլիգրամով, ծախսվել է ազատ թթուների չեզոքացման համար, որը պարունակվում է 1 գ եթերային յուղում:

**Բանալի բառեր.** եթերային յուղ, դափնի, խտություն, բեկման ցուցիչ, թթվային թիվ, օպտիկական ռոտացիա

## ПОЛУЧЕНИЕ И РАЗРАБОТКА КАЧЕСТВЕННЫХ ПОКАЗАТЕЛЕЙ ЭФИРНОГО МАСЛА ЛАВРА В АРЦАХЕ

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Эфирные масла - душистые, легко летучие вещества, содержащиеся в различных частях растений. Эфирные масла легко перегоняются из растительного сырья водяным паром. Листья лавра содержат эфирное масло 0,5 - 0,6%, целебные свойства которого обусловлены содержанием эвгенола, цинеола и ряда терпеновых соединений. Этим объясняются его антимикробные и противовоспалительные свойства, что позволяет использовать лавровое масло в ароматотерапии.

Нами получено эфирное масло лавра методом усложненной паровой дистилляции с многократными перегонками водных паров, после чего определено физико-химические константы: плотность, показатель преломления, кислотное число, оптическое вращение. Определение плотности (удельный вес,  $d_{20}^4$ ) проводили с помощью пикнометра. Показатель преломления (рефракция,  $n_{20}^D$ ) определяли в соответствии с требованиями ГФ XIII издания. Определение показателя преломления проводили с помощью рефрактометра ИРФ 454 Б2М. Предварительно его юстировали по очищенной воде для которой  $n_{20}^D$  равно 1,3330.

Удельное оптическое вращение ( $[\alpha]_{D}^{20}$ ) определено в соответствии с требованиями ГФ XIII издания. Кислотное число (к.ч.) – количество миллиграммов калия гидроксида, израсходованное на нейтрализацию свободных кислот, содержащихся в 1 г эфирного масла.

**Ключевые слова:** эфирное масло, лавр, плотность, показатель преломления, кислотное число, оптическое вращение