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DETERMINATION OF HIGHER FATTY ACIDS IN THE COMPOSITION OF URTICA DIOICA LEAVES

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Abstract: *Introduction***.** Urtica dioica is a tall perennial plant with an unbranched stem and large simple serrated leaves. Urtica is widespread in many parts of the globe. Including in North Africa, in some regions of Asia, Europe and North America. Urtica contains many biologically active substances, such as flavonoids, carotenoids, phenolic compounds, vitamins and minerals, which have a beneficial effect on the human body. Due to its antioxidant, anti-inflammatory and antibacterial properties, it is used in medicine and cosmetology. Currently, urtica dioica is widely used by traditional medicines. *The purpose* of the study. Determination of the upper fatty acids contained in the leaves of dioecious nettle. *The research method.* A gas-liquid chromatograph "Crystallux-4000 M" with a mass spectrum detector of the PIT and MS 7-800 brands was used. *The object of the study* was a dioecious nettle, collected in 2021 from Mount Medeu, Almaty. The study showed that the leaves of the dioecious nettle contain 8 fatty acids. The most common in the leaves of urtica dioica are methyl butyrate, methyl hexanoate. *The conclusion of the study.* High fatty acids in the composition of dicotyledonous nettle leaves were detected in a gas-liquid chromatograph "Kristallux-4000 M" with a mass spectrum detector of the PID brand and "MS7-800". As a result, 8 fatty acids with a high content were found in the dioecious nettle leaf. Of these, methylbutyrate and methylhexanoate are found in the largest amounts.

Keywords: higher fatty acids, urtica dioica, gas chromatography-mass spectrometry, methylbutyrate, methylhexanoate

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1. Introduction

Urtica dioica is a tall perennial plant with an unbranched stem and large simple serrated leaves [1]. Urtica is widespread in many parts of the globe. Including in North Africa, in some regions of Asia, Europe and North America [2].

Currently, urtica dioica is widely used by traditional medicines to treat various diseases such as nephritis, hematuria, jaundice, menorrhagia, arthritis and rheumatism. Thanks to phytochemical studies, it was found that urrtica dioica contains many valuable chemical compounds, such as phytosterols, saponins, flavonoids, tannins, proteins and amino acids. In addition, nettle contains a significant amount of biologically active compounds. For example, the leaves are rich in terpenoids, carotenoids, fatty acids, as well as various essential amino acids, chlorophyll, vitamins, carbohydrates, polysaccharides, minerals and polyphenols, and the roots contain oleanolic acid, sterols and sterile glycosides [3]. Ointments for hands and hair can be obtained from nettle and other plant extracts. Ointments containing nettle extract are used to strengthen the hair roots, giving them shine [4].

As a result of the spectrophotometric quantitative determination of Ioana Nancy, Laurian Vleis and Viorika Istudor, it was found that dicotyledonous nettle leaves have a predominant content of phenolic carboxylic acids, a low content of flavonoids, and a smaller amount of carotenoids than other biologically active substances [5].

Iranian researchers Jinous Asgharpan and Razia Mohajerani found that urrtica dioica has pharmacological functions, including anti-inflammatory, analgesic, antiandrogenic, antihyperglycemic, antihyperlipidemic, antiviral and antitumor activity [6].

Polish scientists Dorota Kregel, Evelina Pawlikowska and Hubert Antolak have shown that all parts of nettle have antioxidant, antimicrobial and beneficial properties. Most urrtica dioica preparations are made from flowers, stems and leaves, and the roots are used in pharmacology. This valuable plant is often used as a diuretic and for the treatment of muscle pain, eczema, gout and anemia. Nettle can be used as an ingredient in vegetables, juices, tea and many dishes [7].

2. Experimental part

Urtica dioica from Medeu Mountain, Almaty was taken as the object of the study. The plants were dried at room temperature for 1-2 weeks. Then the dried leaves of the plants were crushed.

The course of work: take 5 g of the prepared sample and place it in a small glass beaker with the addition of 10 ml of H_2SO_4-n and heat it in a water heater until the sample dissolves with continuous stirring. The course of work: 5 g of the prepared sample is placed in a small glass beaker and heated until the sample dissolves, stirring continuously in a water heater with the addition of 10 ml of

sulfuric acid. After the sample is dissolved, the liquid is transferred through the filter to a clean oil dipstick so that the upper part remains dry. The glass and filter are washed several times with sulfuric acid, after which the oil is poured into a measuring cup. Next, isoamyl alcohol (1 ml) is poured and sulfuric acid is poured in such a volume, without bringing it up to 1 cm above the oil meter. Then pre-hold with a towel, clean with filter paper and fix the oil gauge with a dry rubber stopper. The oil prepared in the same way is kept in a water heater at a temperature of 65-70 ° C for 5 minutes until the sample is completely dissolved. Then it is centralized. The centrifuge places an even number of pressure gauges in the opposite direction and centrifuges at a speed of 5 minutes 1000 months/min. After stopping in the centerfuge, we take out the oil meter and lower it down, adjusting the liquid level in the oil meter so that the oil column coincides with the scale, and then we measure the oil. The oil holds the pressure gauge vertically and measures. The upper fat scale should be at eye level. Moving the plug up and down, count the pieces from the scale of the oil meter to the bottom point and measure the resulting oil.The upper limit of fat should be at eye level. Moving the plug up and down, measure the oil, counting the parts from the scale of the oil meter to the bottom point.

The amount of fat (g) is calculated by the formula:

$$X=a\cdot 0.0113c/\ g \qquad (1)$$

Carrying out measurements.

The chromatograph establishes the following conditions for the analysis of oils that do not contain low molecular weight acids (except coconut oils;

- temperature of the column thermostat- 180-190°C;
- evaporator temperature-250°C;
- detector furnace temperature-200°C;
- gas carrier flow rate (nitrogen, argon, helium) - 30-40 cm/ min;
- sample volume - methyl (ethyl) esters of acids in hexane 1 mm^3;
- The release time of methyloleate is no more than 15 minutes.

The calculation of the content of methyl (ethyl) esters of fatty acids is carried out by internal oxidation. S1, the vertex area of the component, mm2, is calculated by the formula:

$$S_1 = h_1\cdot a_1 \qquad (2)$$

a_1 is the width measured by half the height, mm^2.

The result of measuring the height of the vertex is written in integers, the width of the vertex is written down to the first decimal place [8].

3. Results and discussion.

Humidity and ash content of raw materials were determined by gravimetric method. Humidity was 15.00%, ash 8.00%. The reason for the high ash content of raw materials.

Table 1 - The content of higher fatty acids in the leaves of urtica dioica

№	Component	Square , %	Concentration , % мас.	General formula
1	Methyl Butyrate	49.2640	3.685467	$C_5H_{10}O_2$
2	Methyl Hexanoate	45.9080	152.695639	$C_7H_{24}O_2$
3	Methyl Undecanoate	0.0229	0.001177	$C_{12}H_{24}O_2$
4	Methyl Laurate	0.0414	0.003877	$C_{13}H_{26}O_2$
5	Methyl Palmitate	0.0553	0.013808	$C_{17}H_{34}O_2$
6	Cis-11,14 - Eicosadienoic acid methyl ester	2.2113	0.176407	$C_{21}H_{38}O_2$
7	Cis-13,16- Docosadienoic acid methyl ester	0.1626	0.011754	$C_{23}H_{42}O_2$
8	Methyl Erucate	2.1510	0.115721	$C_{23}H_{44}O_2$

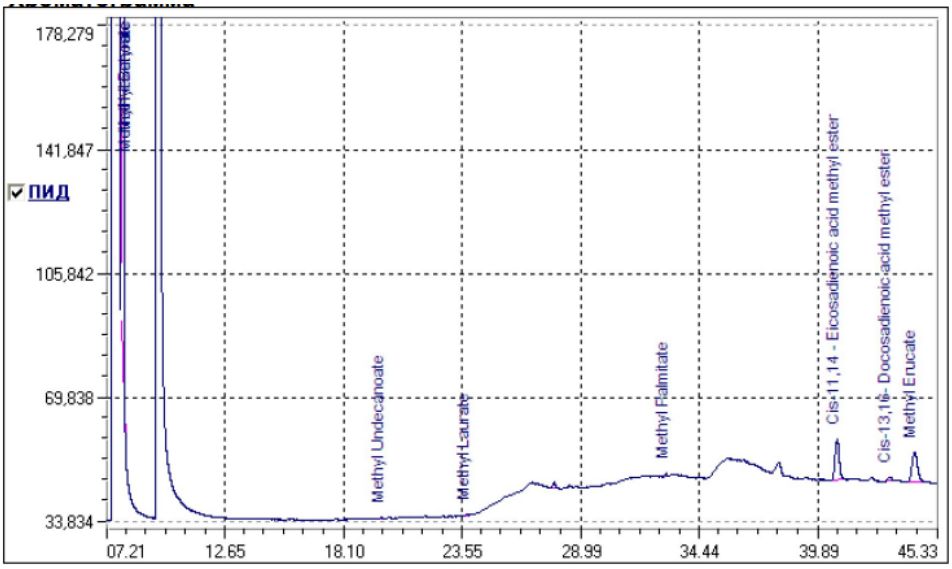

Figure 1 - Chromatogram of higher fatty acids contained in the leaves of urtica dioica.

According to table 1 and figure 1, the leaves of urtica dioica contain 8 fatty acids. These are: methyl butyrate, methyl hexanoate, methyl undecanoate, methyl laurate, methyl palmitate, methyl ester of cis-11,14 - eicosadienoic acid, methyl ester of cis-13,16 - docosadienoic acid, methyl erucate.

A fatty acid is a saturated or unsaturated carboxylic acid with a long aliphatic chain. Most fatty acids have a straight chain with an even number of carbon atoms occurring in nature, from 4 to 28. Fatty acids are the main component of lipids (up to 70%) [9].

Methyl butyrate is also known by the names: methyl butanoate, methyl ester butanoic acid, methyl ester fatty acid. Methyl butyrate, like other esters, has a characteristic pleasant smell and taste. Because of this feature, methyl butyrate is used in the food and perfume industry as an additive.

Methyl butyrate is the main enzyme that kills bacteria in the stomach and intestinal tract. It promotes bone growth, acts against colds and throat diseases and prevents colon cancer [10].

Methylhexanoate is a colorless liquid. It also has the names methyl capronate, methyl ester of hexanoic acid, methyl ester of nylon acid. The general formula is $C_7H_{14}O_2$. Molar mass 130 g / mol. Methylhexanoate is produced in large quantities for use as a flavoring agent and is flammable [11].

4. Conclusion

High fatty acids in the composition of dicotyledonous nettle leaves were detected in a gas-liquid chromatograph "Crystallux-4000 M" with a mass spectrum detector of the PID brand and "MS7-800". As a result, 8 fatty acids with a high content were found in the dioecious nettle leaf. These are: methyl butyrate, methyl hexanoate, methyl undecanoate, methyl laurate, methyl palmitate, methyl ester of cis-11,14 - eicosadienoic acid, methyl ester of cis-13,16 - docosadienoic acid, methyl erucate.

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Methylhexanoate is a colorless liquid. It also has the names methyl capronate, methyl ester of hexanoic acid, methyl ester of nylon acid. Methylhexanoate is produced in large quantities for use as a flavoring agent and is highly flammable.

Conflict of Interests: The authors declare no conflict of interests

ҚОСҮЙЛІ ҚАЛАҚАЙ ЖАПЫРАҒЫНЫҢ ҚҰРАМЫНДАҒЫ ЖОҒАРЫ МАЙ ҚЫШҚЫЛДАРЫН АНЫҚТАУ

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Түйіндеме. *Кіріспе.* Қосүйлі қалақай-бұтақсыз сабағы және үлкен, қарапайым, ара тісті жапырақтары бар биік көпжылдық өсімдік. Қалақай жер шарының көптеген бөліктерінде кең таралған. Соның ішінде Солтүстік Африкада, Азияның, Еуропаның және Солтүстік Американың кейбір аймақтарында көп кездеседі. Қалақай қарапайым бақтардан бастап ормандар мен шабындықтарға дейін кез келген жерде өсе алады. Қалақай ылғалды топырақты жақсы көреді және күн шуақты және кішкене көлеңкеде де өсе алады. Ол өзен су қоймаларындағы беткейлер мен шет жағындағы топырақты қорғау үшін де қолдануға болады, себебі қалақай тамыры топырақты нығыз ұстайды. Оның құрамында адам ағзасына пайдалы әсер ететін флавоноидтар, каротиноидтар, фенолды қосылыстар, дәрумендер мен минералдар сияқты көптеген биологиялық белсенді заттар бар. Оның антиоксидантты, қабынуға және бактерияға қарсы қасиеттеріне байланысты медицинада және косметологияда қолданады. *Зерттеудің мақсаты.* Қосүйлі қалақай өсімдігінің жапырағының құрамындағы жоғарғы май қышқылдарын анықтау. *Зерттеу әдісі.* ПИД және "MS7-800" маркалы масс-спектр детекторы бар "Кристаллюкс-4000 М" газды-сұйық хроматографы қолданылды. *Зерттеу нысаны* ретінде Алматы қаласы, Медеу тауынан 2021 жылы жиналған қосүйлі қалақай өсімдігі алынды. *Зерттеу нәтижесінде* қосүйлі қалақай өсімдігінің жапырағында 8 жоғары май қышқылдары бар. Қосүйлі қалақай өсімдігінің жапырақтарында ең көп кездесетіні - метил бутират, метил гексаноат. *Зерттеу қорытындысы.* Қосүйлі қалақай жапырағының құрамындағы жоғары май қышқылдары ПИД және "MS7-800" маркалы масс-спектр детекторы бар "Кристаллюкс-4000 М" газды-сұйық хроматографында анықталды. Нәтижесінде қосүйлі қалақай жапырағында 8 жоғары май қышқылдары анықталды. Олар: метил бутират, метил гексаноат, метил ундеканоат, метил лаурат, метил пальмитат, цис-11,14 - эйкозадиен қышқылының метил эфирі, цис-13,16 - докозадиен қышқылының метил эфирі, метил эрукат.

Түйінді сөздер: жоғары май қышқылдары, қосүйлі қалақай, газды хромато-масс-спектрометрия, метилбутират, метилгексаноат

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ОПРЕДЕЛЕНИЕ СОДЕРЖАНИЯ ВЫСШИХ ЖИРНЫХ КИСЛОТ В СОСТАВЕ ЛИСТЬЕВ КРАПИВЫ ДВУДОМНОЙ

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Резюме. *Введение.* Двудомная крапива – это высокое многолетнее растение с неразветвленным стеблем и большими простыми зубчатыми листьями. Крапива широко распространена во многих частях земного шара. В том числе в Северной Африке, в некоторых регионах Азии, Европы и Северной Америки. Крапива может расти где угодно, от простых садов до лесов и лугов. Крапива предпочитает влажную почву и может расти как на солнце, так и в небольшой тени. Его также можно использовать для защиты склонов и почвы на окраинах речных водоемов, потому что корни крапивы сохраняют почву плотной. Он содержит множество биологически активных веществ, таких как флавоноиды, каротиноиды, фенольные соединения, витамины и минералы, которые благотворно влияют на организм человека. Благодаря своим антиоксидантным, противовоспалительным и антибактериальным свойствам он используется в медицине и косметологии. В настоящее время крапива широко используется традиционной медицине. Благодаря биохимическим исследованиям было установлено, что крапива содержит много ценных химических соединений, таких как фитостеролы, сапонины, флавоноиды, дубильные вещества,

белки и аминокислоты. *Цель исследования*. Определение верхних жирных кислот, содержащихся в листьях двудомной крапивы. *Метод исследования*. Применен газо-жидкий хроматограф «Кристаллюкс-4000 М» с детектором масс-спектра марки ПИД и «MS7-800». *Объектом исследовани*я стала двудомная крапива двудомная, собранная в 2021 году с горы Медеу, г. Алматы. Исследование показало, что листья двудомной крапивы содержат 8 жирных кислот. Наиболее распространенными в листьях двудомной крапивы являются метилбутират, метилгексаноат. *Вывод исследования*. Высокие жирные кислоты в составе двудольных листьев крапивы выявлены в газо-жидкостном хроматографе «Кристаллюкс-4000 М» с детектором масс-спектра марки ПИД и «MS7-800». В результате в двудомном листе крапивы было обнаружено 8 жирных кислот с высоким содержанием.

Ключевые слова: высшие жирные кислоты, двудомная крапива, газовая хромато-масс-спектрометрия, метилбутират, метилгексаноат

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