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ХИМИЯ ҒЫЛЫМДАРЫ ИНСТИТУТЫ»
АКЦИОНЕРЛІК ҚОҒАМЫ

# ҚАЗАҚСТАННЫҢ ХИМИЯ ЖУРНАЛЫ

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# METHODS OF DISTRIBUTION OF THE POLYPHENOL EXTRACTS FROM THE LEAVES OF A PLANT CARTHAMUS

**Abstract.** From the Carthamus plant leaf are extracted polyphenol extracts, composition and construction have been proven by methods of IR, UV spectral analysis. Ether extract is 3%, 360 nm wavelength ε = 4,070 Rutine, Ethyl Acetate Extract 3,2%, its wavelength 350 nm, ε = 4,268 Quercetin compound, 90% ethyl alcohol 2,92%, 365 nm Wavelength , ε = 4,359 in the zone of quercetin, and 70% in ethyl alcohol 3,64%, 331 nm wavelength, ε=4,359 in the zone of euclidein and the final 50% of ethyl alcohol in the extract was 2,79%, 329 nm, ε=4,614 according to the compound of the acid compound.

**Key words:** carthamus, polyphenol extracts, biologically active substances.

**Introduction.** Plants are the main source of various organic and biologically active substances, including the most common compounds in nature: flavonoids, caratinoids, polyphenols, ethanols, alkaloids, terpenoids, essential oils, phenolic acids, amino acids, trace elements, vitamins. Natural compounds are widely used in medicine. However, the knowledge and methods of chemistry of natural compounds are very important in their distribution, purification, construction, production and product quality control [1].

Carthamus (translation in Kazakh language – Мақсары) is a plant, oilseed crop, belonging to a sophisticated flower family. The main homeland is Ethiopia and Afghanistan. Carthamus grows in Central Asia - in Uzbekistan and Kazakhstan. Today it is grown in Azerbaijan, India, Egypt, Iran, Central and South America, Australia and Western Europe. Carthamus plant is one of the most widely studied medicinal plants [2, 3].

According to historical data, the Xinjiang region is one of the earliest cultures of the carthamus. The appearance of the Great Silk Road contributed greatly to the spread of carthamus and its exploration. Today, carthamus includes cuisine, medicine, cosmetics and in other areas.

The southern regions of the republic cultivating of carthamus plant. The main homeland of the Mediterranean coast, the carthamus, has not been long enough to grow and produce products in the country. It's just that recently. The main product from it is gingerbread. The quality of carthamus oil is not less than sunflower and cottonseed. You can not say that the price is as expensive as that. It is much cheaper than cotton oil [4, 5].

Carthamus plant stems are vertical, spruce, lumpy, height up to 90 cm. The leaves are oval, the edges can be the sting. Flower bricks - baskets, from one 5-6 to 30-50 baskets in one plant. The flowers are like a yellow or orange tube. When the seeds ripen, they do not sprout on the ground. Weight of 1000 grains is 20-50 g. Carthamus is a heat-resistant, very desert-resistant. The growth period is

90-150 days. The cross is pollinated (by insects and by land), can also spontaneously spray. They do not need a special soil for grow. At a depth of 5-6 cm on a hectare of 6-10 kg per hectare, sow the system intervals 45-60 cm. Products are harvested from each hectare up to 8 centimeters. It is obtained from the seeds of 25-35% of the seeds, 46-60% of the seeds of fat, flower [6, 7].

Flower, leaf, seeds and oils of Carthamus plant are widely used in many countries for medical purposes. In Iran, fat is used for hepatic and heart treatments, while safflower is used in Pakistan for treating urinary tract infections with sugar, while carthamus oil in India is used for the treatment of gastric ulcer. China produces medications for various diseases. And we are feeding the cattle as long as we can not handle it.

Therefore, for the cheap and accessible natural home remedy, the study of the composition of medicinal plants grown in the country and the distribution of biologically active substances is one of the topical issues today. Including polyphenol extracts from the Carthamus plant.

Polyphenols are a simple potent antioxidant plant pigment. In addition to grapes, polyphenols are found in chocolate, shade, apple, and other coconut fruit, pomegranate juice, cranberries. Polyphenols are found to be in the form of additives with plants similar to those found in the molecular weights of 300-5000. Many of them are dissolved in water, diluted or boiled. Alkaline acids can be obtained on the basis of these sugars together with polyesters or complex dipepsid compounds [8, 9].

At present, about six thousand polyphenols are extracted from the plant composition. Polyphenols, along with useful plants, are contained in vegetables and fruits. In the human body, food contains about 1 g of antioxidant ingredients per day, with a few vitamins, containing about 100 mg of β-carotene, vitamins C, E. Polyphenol is a large number of atomic phenols and their derivatives. It a vital role in the biological role of plants in the world of metabolism. Plants are widely spread in the form of tanning substances (fluogridin, pyrogallol, etc.) and glucosides and essential oils. Polyphenols are found in many nutrients. Their oxidation products (such as quinones) create tasty odor and aromatic texture for the food products. Production polyphenols - catecholomein and some hormones and mediators (adrenaline and noradrenalin) [10, 11].

Polyphenols protect the skin against sunburn, ozone and other toxins and prevent aging. Cranberries can be used in diseases of the kidneys, renal disease. Polyphenols improve cardiovascular disease and bleeding. Polyphenols are important in the treatment of cancer, liver, kidney, diabetes, atherosclerosis, cancer and various diseases. The metabolism participates in photosynthesis process. Performs the function of a fundamental element that holds skin tissues. Therefore, doctors warn that excessive amounts of alcohol can have an adverse effect on the body. In addition, excessive use of polyphenols (such as the daily use of blue or black tea) may cause kidney and liver disease [12]. The aim of the work is determination of composition, composition and structure of polyphenols extracting from Carthamus plant leaf.

## EXPERIMENTAL PART

The object of the study was leaf from autumn Carthamus plant, which was harvested in September and October 2014-2016, Boradilai village, Baydibek district, South Kazakhstan region.

Extraction method is used to extract polyphenols from Leaf leaves of Carthamus. It is separated by the fractionation of polyphenols from the Carthamus plant.

Polyphenols are extracted by extracting the raw material with water and aqueous alcohol, pure ether or ether alcohol to extract extracts. The resulting product is a cleaner product, followed by separation of the individual substances.

For extraction, first of all, the raw materials are cleaned, dried and sieved, the diameter of the sieve is 3-5 mm. 10 g of raw material are weighed. Extragent is extracted 3 times in 2 hours in hot distilled water, 1:10 in the leaves of the Carthamus plant. If the solution is filtered and used for inulin, it extracts the sunflower by the next fraction.

I fraction. For separation from polyphenols, including oxicoric acid and catechin, it is filtered through filter paper to extinction for 30 minutes at room temperature of 200C at 1: 5 with diethyl ether. The solvent is evaporated in a water bath on a porcelain plate. The resulting leaf extract is 3%.

II fraction. In the following fraction extracted leukocancias, dimeric prostanthanidins, oxicoric acid ether and other compounds are extracted with organic solvent 1: 1 or 1:20 at ethyl acetate for 2 hours, filtered by extraction and evaporated in a water bath. The resulting yield of leaf is 3.2%.

III fraction. 90%, 70%, 50% ethyl alcohol for 1 hour to 2 hours to pass to solution in the final fraction of extraction in 90%, 70%, 50% ethyl alcohol in various concentrates to dissolve in many solvents and other phenolic compounds is added to the refrigerant and extracted in a water bath. The extracted extracts account for 90% of ethyl alcohol in 2,92%, and 70% for ethyl alcohol in 3.64% and 50% in ethyl alcohol with 2,79% [13].

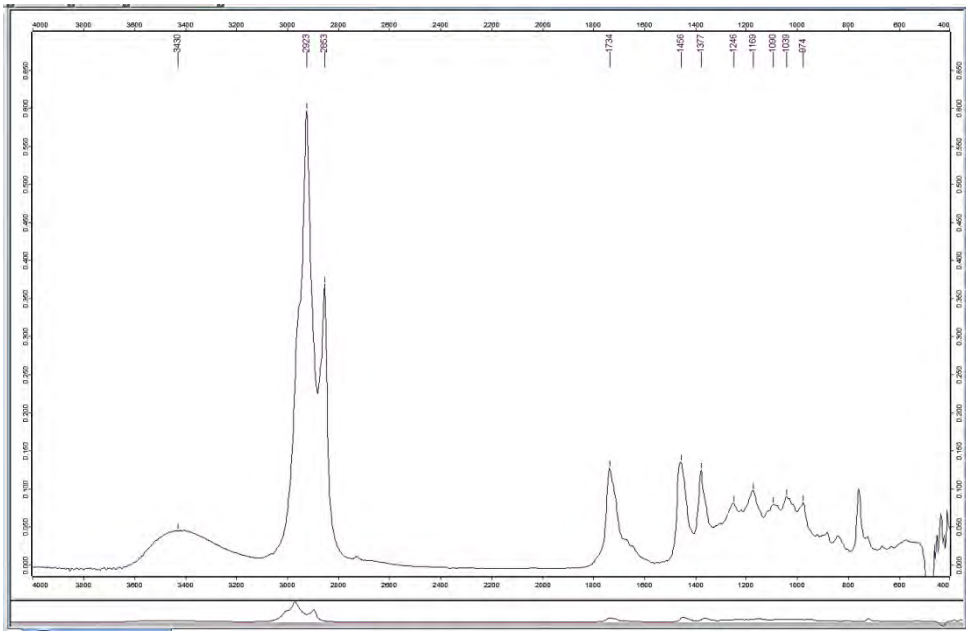
## RESULTS AND DISCUSSION

The polyphenols were extracted from the I-III fraction by the KBr tablets in the 400-4000 $cm^{-1}$ IR-Bruker ALFA spectrometer, and in UV-SI Analytics Uviline 9400-9100 spectroscopy.

The frequency of oscillations in the IR spectrum of polyphenols derived from Carthamus plant varies from 3429 to 3286 $cm^{-1}$ with the aromatic C-H group. The oscillation frequency in the range of 2925-2919 $cm^{-1}$ showed the oscillations of $CH_2$ groups, oscillations of the O-N groups of carboxylic acid in the range of 2853-2844 $cm^{-1}$, the oscillation frequency of carbon dioxide C=O in 1633-1710 $cm^{-1}$, and 1657 The frequency of oscillations of -1597 $cm^{-1}$ corresponds to the groups of aromatic C=C, the frequency of the aromatic group $CH_2$ is 1455-1414 $cm^{-1}$, the frequency of aromatic $CH_3$ is 1381-1373 $cm^{-1}$, and the frequency of the fluctuation is 1256-1244 $cm^{-1}$ -N group, the pendulum oscillation corresponds to the interval 993-843 $cm^{-1}$ [14].

Table 1 – IR spectra of polyphenols derived from Carthamus leaf, $cm^{-1}$

| Group | Extracts | | | | |
|---|---|---|---|---|---|
| | Diethyl ether | Ethyl acetate | 90% ethyl alcoho | 70% ethyl alcohol | 50% ethyl alcohol |
| $\nu_{Ar}$ C-H aromatic | 3429 | 3362 | 3328 | 3296 | 3286 |
| $\nu$ $CH_2$ | 2923 | 2921 | 2919 | 2925 | 2925 |
| $\nu$ OH carboxylic acids | 2852 | 2851 | 2850 | | |
| $\nu$ C=O carboxylic acids | 1733 | 1733 | 1713 | | |
| $\nu_{Ar}$ C=C | | 1657 | 1650 | 1651 | 1597 |
| $\delta$ $CH_2$ | 1455 | 1454 | 1453 | 1415 | 1414 |
| $\delta$ $CH_3$ | 1376 | 1376 | 1373 | 1381 | |
| $\gamma$ CH | 1246 | 1244 | 1254 | 1256 | |
| Pendulum oscillations | 973 | 849 | 843 | 993 | 923 |



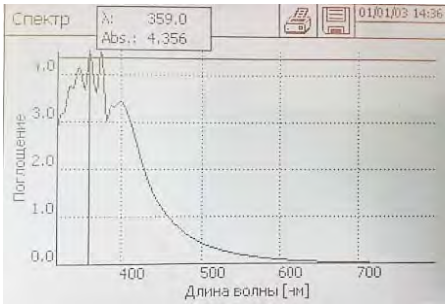
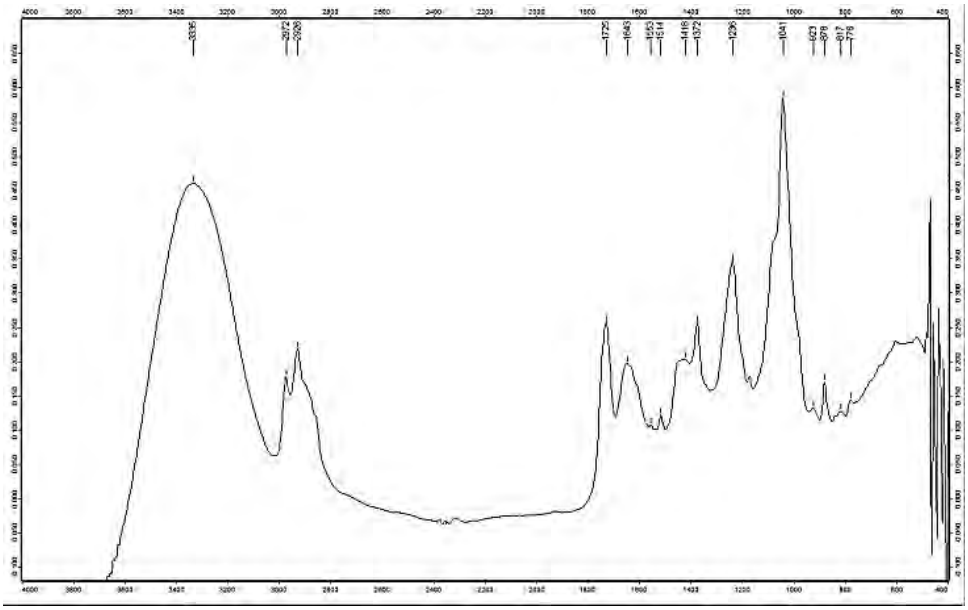




Figure 1 – IR, UV-spectrum extract of diethyl ether of Carthamus



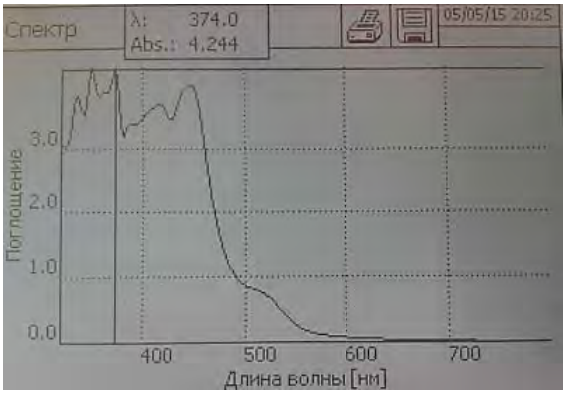
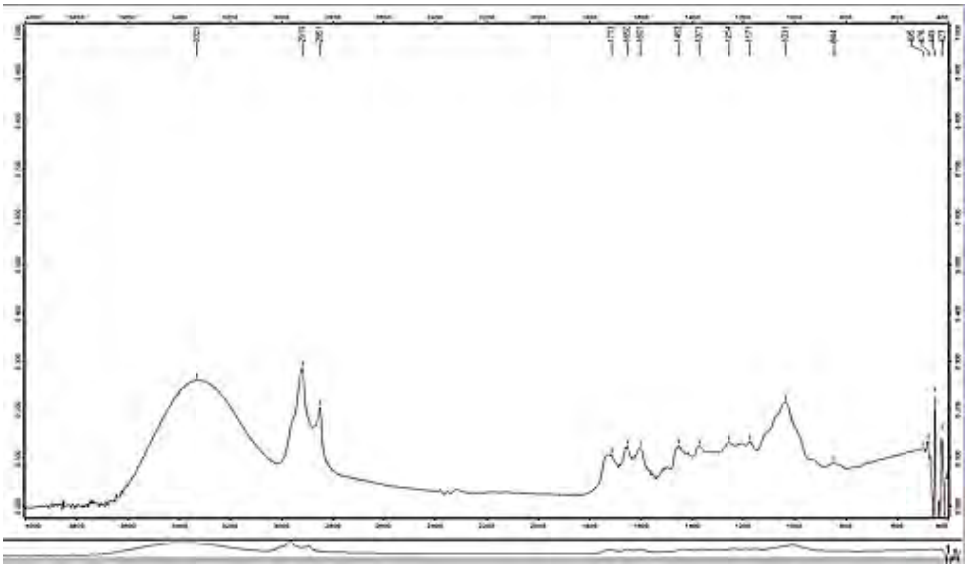



Figure 2 – IR, UV-spectrum extract of carthamus plant in ethyl acetate



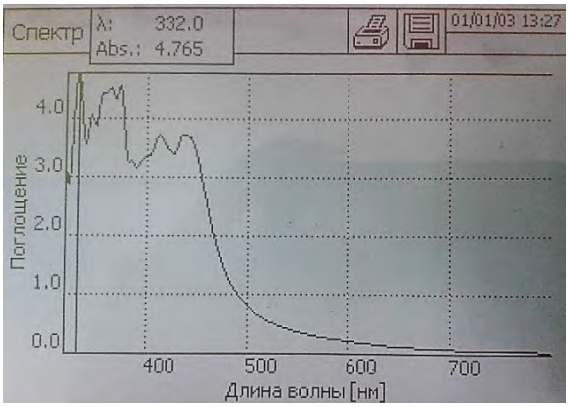
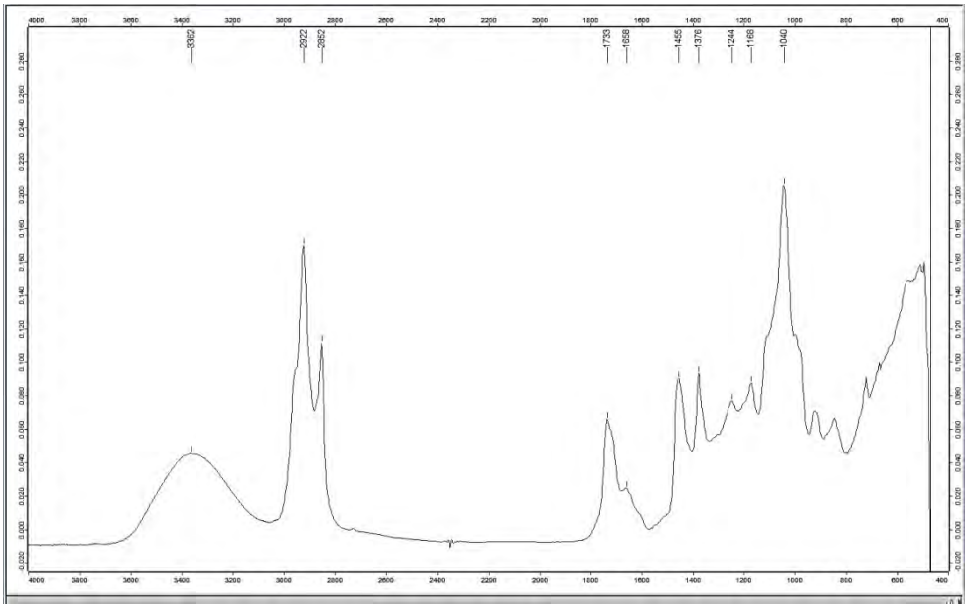



Figure 3 – IR, UV spectrum of 90% ethanol alcohol of Carthamus plant



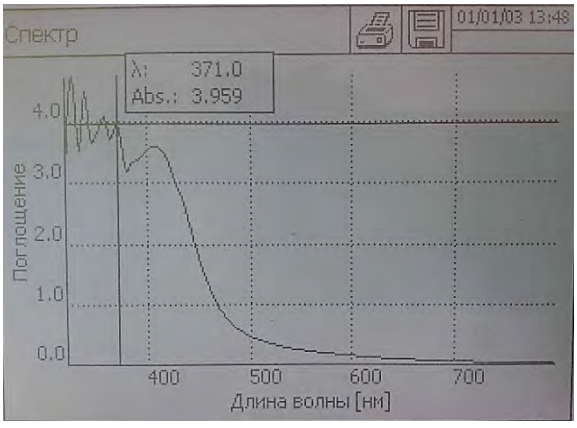
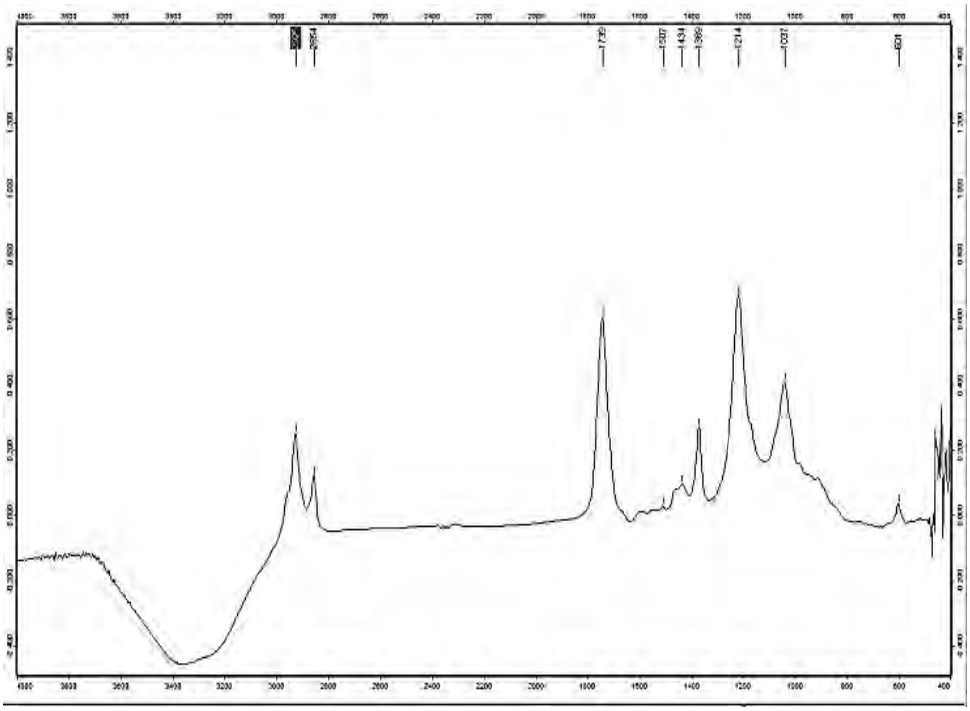




Figure 4 – IR, UV spectrum of extract of ethyl alcohol in 70% of Carthamus plant



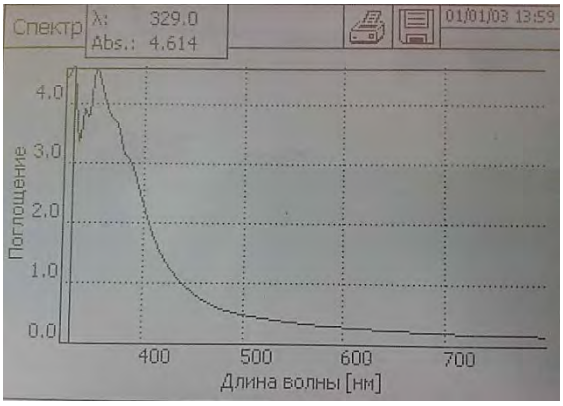
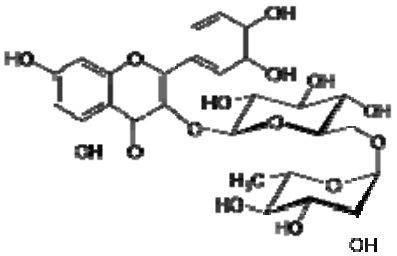
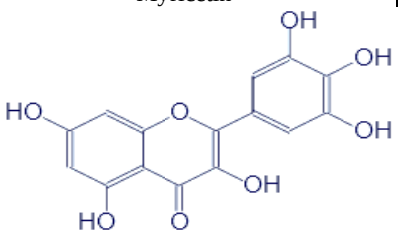
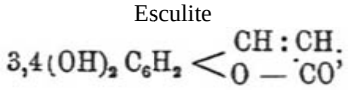
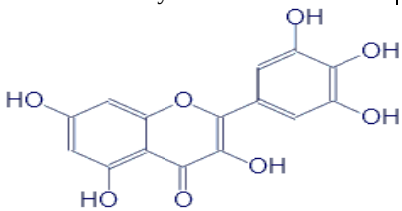
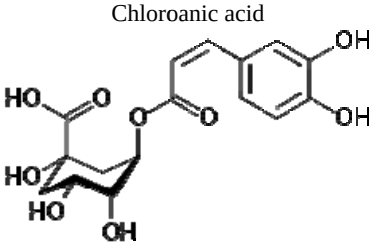



Figure 5 – IR, UV-spectrum extract of 50% of Carthamus plant in ethyl alcohol

Table 2 – The UV spectrum of polyphenols derived from Carthamus leaf

| # | Specimen name | Wavelength, nm | E | Type of connection |
|---|---|---|---|---|
| 1 | Spectrum of extract of diethyl ether 50% sprayed Carthamus plant spray | 359 | 4,356 | Rutin  |
| 2 | Spectrum of Carthamus plant in ethyl acetate | 374 | 4,244 | Myricetin  |
| 3 | 90% of the flower plant of Carthamus is an alcohol-soluble spectrum | 332 | 4,765 | Esculite  |
| 4 | | 371 | 3,930 | Myricetin  |
| 5 | 50% of the Carthamus plant is an alcohol-soluble spectrum | 329 | 4,614 | Chloroanic acid  |

The UV spectrum of polyphenols extracted from Carthamus leaf corresponds to 359 nm wavelength in diethyl ether, rutine in ε = 4,356 and 374 nm wt. In ethyl acetate, quercetin in ε = 4,244, 90% of the ethyl alcohol spatula with 365 nm wavelength, ε = 4,359 in the zone of quercetin and 70% in alcohol, 331 nm wavelength, ε = 4,514 in the zone of esculite and in the last 50% alcohol spirits, the wavelength range is 329 nm, and ε = 4,614 refers to a chlorogenic acid compound [15].

**Conclusion.**

1. Polyphenol extracts from the Carthamus plant leaf are extracted, composition and structure are proven by methods of IR, UV-spectral analysis.

2. Carthamus leaf contains rutin, myricetin, quercetin, esculite, chloroanic acid.

**REFERENCES**

[1] The National Encyclopedia of Kazakhstan. Almaty: The Kazakh Encyclopedia, 2009. P. 315. (Kazakh).

[2] Polymbetova F., Abiyev S., Sarsenbaev B. Travel to the world of useful vegetation Almaty: Science, 1999. P. 46-47. (Kazakh).

[3] Zimin B.M. The Library of Pharmaceutical Journal, the Comprehensive Medicine and Science. Almaty, 1993. P. 153. (Russian).

[4] Kenesarina N.A. Plant physiology and basics of biochemistry. Akmola: Agrarian University, 2005. P. 68. (Kazakh).

[5] Lazurevsky G.V., Terentyeva I.V., Shamshurin Sh.Sh. Practical work on chemical constitution. M.: Search. The Higher School, 1966. P. 17.

[6] Ayazbekova M.A., Yerzhanov B.K. Chemistry of esophagus products. Almaty: Search. "ATU", 1999. P. 60-60. (Russian).

[7] Lazurevsky G.V., Terentyeva I.V., Shamshurin Sh.Sh. Practical work on chemical constitution. M.: Search. The Higher School, 1966. P. 17. (Russian).

[8] Balzarini J. The mannose – specific plant lectin from Cymbidium hydridum and Epipachis helleborine and the specific plant lectin Urticadioca / J. Balzarini., J. Neyts, M. Schols Hosoya // Antivral Res. 1992. Vol. 18. P. 191-207.

[9] Vegetable resources of the USSR: Spattering, their chemical composition, use: Semirestia Magnoliaceae - Limoniaceae / [Redkol: Sokolov PD [gl.] And L.: Nauka, 1984. P. 460. (Russian).

[10] Korulkin D.U. Polyphenols of Sedum in Rastenia. Almaty, 1998. (Russian).

[11] Policarpova T.A. Polyphenols production. Dissection of catechins from the green chay. 2004. P. 25-31. (Russian).

[12] The National Encyclopedia of Kazakhstan. Almaty: The Kazakh Encyclopedia, 2004. P. 315.

[13] Yergaliyeva Zh.M., Azimbayeva G.E., Research and distribution of extracts of phenolic compounds of the Carthamus plant // International scientific-practical conference on development of science and education in natural sciences. Almaty, 2016. P. 226-229. (Kazakh).

[14] Tarasevich B.N. IR spectrum of basic classes of organic compounds, M.V.Lomonosov Moscow State University, chemistry faculty, Organic Chemistry Department. Moscow 2012. P. 25. (Russian).

[15] Ergalieva Zh.M., Azimbayeva G.E. Methods of distribution of polyphenols from flower of Carthamus // 3rd international congress on social sciences, China to adriatic. Antalya, 2016. P. 20-24. (Kazakh).

**Резюме**

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CARTHAMUS ӨСІМДІГІНІҢ ЖАПЫРАҒЫНАН
ПОЛИФЕНОЛ ЭКСТРАКТЫЛАРЫН БӨЛУ ӘДІСТЕРІ

Carthamus өсімдігінің жапырағынан полифенолды экстрактылары бөлініп, құрамы мен құрылысы ИҚ-, УК-спектрлік анализ әдістері арқылы дәлелденді. Өйткені, полифенолды қосылыстар медицинада қабынуға қарсы, уылдыратын, қан тоқтататын, ауруға қарсы және бактерия жойғыш құралы ретінде, қартаю процессін баяулатып, жалпы иммунды жүйені күшейтеді, өсімдікпен және металл тұздарымен уланғанда, ағзадағы радиоактивті заттарды шығаруда, рак ауруларын, асқазан-ішек жолдарының қабынуында, кілегейлі қабықтардың қабынуында және т.б. ауруларды емдеуде қолданылатын таптырмайтын дәрілік препарат.

**Түйін сөздер:** мақсары, биологиялық белсенді заттар, полифенолды қосылыстар.

**Резюме**

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МЕТОДЫ ВЫДЕЛЕНИЯ ПОЛИФЕНОЛЬНЫХ ЭКСТРАКТОВ
ИЗ ЛИСТЬЕВ CARTHAMUS

Выделены полифенольные экстракты из листьев Carthamus, состав и структура была подтверждена с помощью ИК-, УФ-методов анализа. Полифенольные соединения применяются в медицине, как противовоспалительные, вяжущие, кровоостанавливающие, как средство замедления процесса старения, для укрепления иммунной системы, связывания солей металлов, радиоактивных веществ в организме, при отравлении, раке, воспалении желудочно-кишечного тракта, слизистых оболочек и т.д.

**Ключевые слова:** сафлор, биологически активные вещества, полифенольные соединения.