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Biomorphological and phytochemical parameters of *Chelidonium majus* L. in the conditions of Kungei-Alatau

In the pharmaceutical industry, the stability of the relationship between synthetic drugs and natural drugs has changed recently. This is because drugs made from natural plants are more in demand than chemically prepared drugs. The advantages of herbal medicines are their low toxicity, a significant complex of biologically active compounds, the versatility of pharmacotherapeutic effects, and the possibility of long-term use without obvious adverse reactions. In addition to the therapeutic effect of the biologically active substances contained in the medicinal products, the preventive effect is also effective. Therefore, it is important to analyze the composition of natural medicinal raw materials of plant origin. The aim of the work is to study macrodiagnostic features and composition of active natural compounds of medicinal plant *Chelidonium majus* L. *C. majus* plant collected in the Kungei Alatau region and medical, cosmetic and hygienic dry kits prepared on the basis of *C. majus* sold in pharmacies were used as the research object. Pharmacognosy, macroscopic and gas chromatography-mass spectrometry (GC-MS) methods were used in the research. The results of the macroscopic analysis confirmed the conformity of the composition and characteristics of the finished raw materials in the samples. *C. majus* plant samples showed stable component composition of sufficient biologically active substances. All samples contained 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z), Methyl 19-methyl-eicosanoate, Protopine compounds were determined. Conducting clinical trials to evaluate the therapeutic potential of the plant and its efficacy and safety in pharmaceuticals is the basis for future research. The obtained results allow an objective assessment of the quality standards of pharmacopoeial medicinal plant *C. majus* materials.

Keywords: *Chelidonium majus*, pharmacology, medicine, medicinal plant, alkaloids, organic compounds, Kungei Alatau, preparation.

Introduction

The 2020 pandemic has dramatically increased demand for herbal medicines and nutritional supplements in global sales. The global increase in interest in plant-based products leads to an increase in demand for them, and the expansion of production to meet demand is often dependent on their quality [1-3]. Compared to synthetic drugs, the advantages of herbal drugs are: low toxicity, presence of an important complex of biologically active compounds, versatility of pharmacotherapeutic effects and the possibility of long-term use without obvious negative reactions. Regulating all vital functions, the role of biologically active substances is not only effective therapeutic, but also preventive [4].

Phytochemical research on the medicinal plants of the flora of Kazakhstan in the pharmaceutical market of the country, and the creation of effective, safe and affordable medicines based on them is one of the main tasks. The increase in the demand for herbal medicines from daily visitors to the pharmacy shows that they are often used among the population [5, 6]. Each patient has the opportunity to be treated at home by preparing medicinal decoctions and tinctures in compliance with the rules of use. In addition, the cost of preparations and decoctions made from plants is relatively low. According to the requirements, medicinal plant raw materials should be of high quality, effective and safe [7, 8]. Even now, when pharmacology and the pharmaceutical industry are developed, the use of medicinal plants remains relevant. One of the widely used plants for the preparation of phytopreparations for skin diseases and many drugs in dermatology is the *C. majus*.

Chelidonium majus (*Papaveraceae*) is a popular medicinal plant widely distributed in Europe, Asia and North Africa and widely used in European countries and Chinese herbal medicine against various diseases [9]. In traditional and alternative medicine systems, various parts of this plant are used to treat stomach ulcers, stomach cancer, oral infections, liver diseases, general pain and various skin condition [10]. Due to its choleric and antispasmodic properties, it is widely known to treat biliary disorders, dyspepsia

and irritable bowel syndrome [11]. In Chinese medicine, it is used to treat whooping cough, blood stasis, chronic bronchitis, asthma, jaundice, gallstones and gallbladder pain, and to improve diuresis in edema and ascites [12, 13]. Ultrahigh dilutions (potencies) of *C. majus* extract have therapeutic effects against various types of liver diseases, including liver cancer [14]. In addition to these properties, it is known to be a popular medicinal plant that helps with various skin diseases. The very name of the medicinal plant, which contains isoquinoline alkaloids with anti-inflammatory effects, describes its cleansing properties. Therefore, it is in demand in dermatology and is also popular in cosmetology as a drug added to lotions and baths [15]. Due to the local anti-inflammatory effect, it is used in complex therapy of diseases accompanied by itching — psoriasis, dermatitis, eczema [16].

Evaluation of natural products with known biological activity requires new scientific research and extensive screening process. There is little data in literary sources about the chemical composition and pharmacological properties of *C. majus* grown in our country. And it is very important to perform a preliminary phytochemical analysis to assess the quantitative composition of pharmacologically active natural compounds in the plant. On the basis of the above, botanical-pharmacognostic and phytochemical studies of the *C. majus* grown in Kungei Alatau as the main source of medicinal plant raw materials were conducted.

The purpose of the research work: to study the composition of macrodiagnostic features and active natural compounds of medicinal *Chelidonium majus* plant.

Experimental

Morphological analysis

Identification of raw materials is carried out by the staff of the Department of Botany of the Karaganda University named after academician E.A. Buketov. During the analysis of morphological indicators, the peculiarities of growth, appearance, surface structure, color of shoots, leaves, inflorescences, flowers and stems were studied [17]. Samples of raw materials were studied and photographed using a Digital Microscope Levenhuk DTX 30. When describing the morphology of plant samples, we used the principles described in the works of V.N. Vekhova, L.I. Lotovoi and regulations of the Pharmacopoeia of the Republic of Kazakhstan [18-21].

C. majus plant grown in Kungei Alatau was taken as the main object of research. In addition to conducting a comparative analysis, medical, cosmetic and hygienic dry sets of *C. majus* from three manufacturers (“Bella”, “Lekraset”, “DauLet”) sold in pharmacies were offered.

Pharmacognosy method

Freshly collected and dried plant: Aerial parts of *C. majus* plant from Kungei Alatau area were collected in dry weather. The collected plant raw materials were checked to be free of mold, mosquitoes and other animal pests. A minimal amount of medicinal plant raw material is spread in a thin layer. Foreign inclusions were checked by visual inspection or using a magnifying glass (6×). Medicinal plant raw materials: sampling and preparation of samples was carried out according to the general method [22].

Macrodiagnostic method

External signs: The structure of the stems, leaves, and flowers in the collection of *C. majus* plants were observed with the naked eye or with the help of a (10x) magnifying glass. The color of dry raw materials is determined in daylight; smell — by smelling, taste — by tasting a piece of dry raw material. In the macroscopic analysis of the raw material, attention was paid to the shape, size, and length of the plant parts in the set [22].

Extract preparation: 5 g of crushed plant sample was placed in a 100 ml glass container. 96 % ethanol was used as an extractant, and 50 ml was added to the ground samples. In order to completely extract organic compounds from the matrix, extraction was carried out using an ultrasonic bath for 2 hours at room temperature, and then the samples were left in the dark for 24 hours.

Analytical method: samples were analyzed by gas chromatography with mass spectrometric detector (7890A/5975C) [22].

Analytical conditions: 2.0 µl volume of unsplit sample injection temperature 250 °C. The separation was carried out using a DB-35ms chromatographic capillary column with a length of 30 m, an internal diameter of 0.25 mm and a film thickness of 0.25 µm at a constant carrier gas (helium) rate of 1 ml/min. Chromatography temperature was programmed from 40 °C (0 min hold) to 280 °C (15 min hold) with a heating rate of 5 °C/min. Analysis time is 63 minutes. Detection was carried out in SCAN m/z 34-750 mode. Agilent MSD chemstation (Version 1701EA) software was used to control the gas chromatography system,

record and process the obtained results and data. Data processing included detection of retention times, peak areas (peaks), and processing of spectral information obtained using a mass spectrometer detector. Wiley 7th edition and NIST'02 (total number of spectra in the libraries more than 550,000) libraries were used to interpret the obtained mass spectra [23, 24].

Results and Discussion

The aerial parts of the *C. majus* plant were collected during the flowering period from the territory of Kungei Alatau, Almaty region, GPS coordinates: N 42°59'91"; E 78°20'07", 1712 m above sea level. Perennial herbaceous plant with a short rhizome (Fig. 1).



Figure 1. *Chelidonium majus* plant in Kungei Alatau region

Morphological description

The height is up to 80-90 cm, the branched stems are straight. Bare and hairy, with yellowish sap. The leaves are flat, rounded or oval in shape; upper sessile, lower — on petioles; pinnatipartite; the edge is round-toothed (Fig. 2).

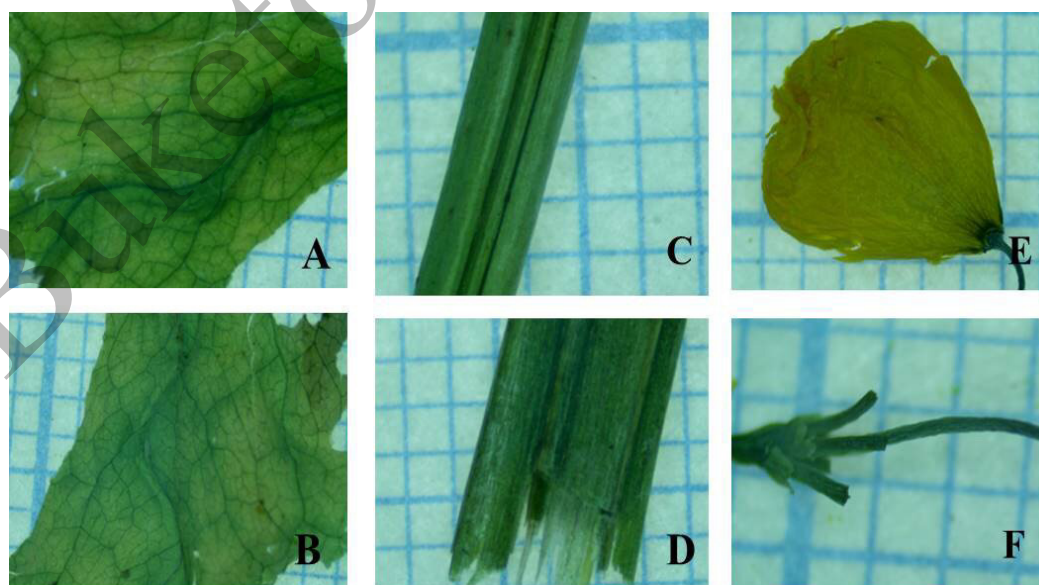


Figure 2. Pictures of raw material parts *Chelidonium majus*: A — upper side of the leaf plate; B — lower side of the leaf plate; C — Appearance of shoot; D — The color of the stem on the scrap; E — Appearance of flower; F — Peduncle

The upper side of the leaf blade is bare, dark green in color, the lower side is lighter with protruding veins. Venation is pinnately reticulate. Shoots straight or evading, few, rounded and ribbed. The surface is smooth, the color is light green, at the break it is almost white. Peduncles ascending, thin, rounded in cross section, thinly pubescent with simple white trichomes. Flowers at the tops of peduncles, 3-5 pieces. The flowers themselves are actinomorphic, consisting of 4 to broadly ovate petals of a bright yellow color, up to 1.0 cm long.

For a comparative study, samples of "*Chelidonium majus*" raw materials sold in pharmacies were taken from 3 different manufacturers: i) Sample № 1– "Bella" company Herbal care, wart herb, cosmetic; ii) Sample № 2– "Lekraset" company, dry cosmetic and hygiene product prepared from plants; iii) Sample № 3 — "DauLet" company, cosmetic product; iv) Sample № 4–Kungei is a herbal combination prepared from the *C. majus* grown in the Alatau region.

Macrodiagnostic features and external signs of the raw materials of selected manufacturers' products were analyzed. It was determined that the boxed *C. majus*, crushed raw materials are a mixture of leaves, stems, inflorescences, and parts [22]. Table 1 shows a description of a sample of cosmetic and hygiene products produced on the basis of the *C. majus*.

Table 1

Description of preparations based on *Chelidonium majus* plant

Sample	Manufacturing company	Description	Composition
1.	<i>Chelidonium majus</i> , Herbal care, 30 g, cosmetic product, "Bella"	A dry collection of different parts of the medicinal plant. Woody, dark green. The smell is pleasant.	100 %
2.	<i>Chelidonium majus</i> , 40 g, cosmetic and hygienic dry plant substance, "Lekraset"	A set of dry cosmetic and hygienic plants prepared from plants. Woody, dark green. The smell is pleasant.	100 %
3.	<i>Chelidonium majus</i> , cosmetic product, 30 g, "DauLet"	Dry color is brown. Most of the collection is woody, with many large stems and hard. The smell is pleasant.	100 %
4.	<i>Chelidonium majus</i> , 30 g, a plant collected from Kungei Alatau territory	It consists of all above-ground parts of the plant collected and dried in natural conditions. Dry, soft, pale green. The smell is pleasant.	100 %

As a result of macroscopic analysis, the characteristics and composition of all dry medicinal raw materials meet the requirements [25, 26]. The determination of the organic compounds in the samples of the complete *C. majus* was analyzed by the gas chromatography-mass spectrometry method. The composition of extracts isolated from 4 samples was determined by GC/MS method.

Analysis was performed as a result of chromatographic analysis of the extract of *C. majus* in the sample taken for the study (Table 2).

Table 2

The result of chromatographic analysis of extracts based on *Chelidonium majus*

Sample	Manufacturing company	The result of chromatographic analysis of the obtained extracts
1.	<i>Chelidonium majus</i> , Herbal care, 30 g, cosmetic product, "Bella"	Ethanone, 1-(2-hydroxy-5-methylphenyl)-(0,92 %), Tetradecanoic acid (0,78 %), Tetradecanoic acid, ethyl ester(1,01 %), Ethyl 13-methyl-tetradecanoate(0,88 %), Hexadecanoic acid(11,00 %), Phytol(22,68 %), Ethyl Oleate(1,24 %), 9,12-Octadecadienoic acid, ethyl ester (21,61 %), Octadecanoic acid(6,62 %),9,12,15-Octadecatrienoic acid, ethyl ester (17,44 %), Drometrizole (1,26 %), Methyl 19-methyl-eicosanoate (0,69 %), Cannabidiol (1,64 %), Protopine(2,24 %)
2.	<i>Chelidonium majus</i> , 40 g, cosmetic and hygienic dry plant substance, "Lekraset"	2,5-Dimethyl-4-hydroxy-3(2H)-furanone(0,79 %), Ethanone, 1-(2-hydroxy-5-methylphenyl)-(0,63), 2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-, (R)-(0,42 %), Tetradecanoic acid(1,38 %), Pentadecanoic acid(0,84 %), Hexadecanoic acid (17,21 %), Phytol(15,21 %), Ethyl Oleate(1,13 %), 9,12-Octadecadienoic acid, ethyl ester(14,13 %), Octadecanoic acid(17,96 %),9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z)- (14,61 %), Drometrizole (0,69 %), 4H-Bis[1,3]benzodioxolo[5,6-a:4',5'-g]quinolizine, 6,7,12b,13-tetrahydro-(11,71 %), Protopine(3,29)

Continuation of Table 2

3.	<i>Chelidonium majus</i> , cosmetic product, 30 g, "DauLet"	1-Eicosanol(1,70 %), 2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-, (R)-(0,53 %), Pentadecanenitrile (1,69 %),3,7,11,15-Tetramethyl-2-hexadecen-1-ol(0,68 %), Tetradecanoic acid, ethyl ester(0,95 %), 9,12-Octadecadienal, dimethyl acetal(0,31 %), Octadecanal(1,41 %), 2-Pentadecanone, 6,10,14-trimethyl-(0,79 %), Pentadecanenitrile (2,87 %), 2-Heptadecanone (0,64 %), Hexadecanal(0,80 %), Hexadecanenitrile (4,34 %), Ethyl 9-hexadecenoate (1,88 %), 1-Nitrododecane (1,31 %), Octadecanenitrile (7,80 %), Phytol(27,74 %), Heptadecanoic acid, 16-methyl-, methyl ester(2,00 %), Ethyl Oleate(2,53 %), 9,12-Octadecadienoic acid, ethyl ester(21,38 %),9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z)-(14,10 %), Methyl 19-methyl-eicosanoate (0,61 %), 4H-Bis[1,3]benzodioxolo[5,6-a:4',5'-g]quinolizine, 6,7,12b,13-tetrahydro- (2,25 %), Protopine (1,66 %)
4.	<i>Chelidonium majus</i> , 30 g, a plant collected from Kungei Alatau territory	Ethanone, 1-(2-hydroxy-5-methylphenyl) (1,8 %), Tetradecanoic acid, ethyl ester (0,8 %), Phytol (13,8 %), Ethyl Oleate (3,6 %), 9,12-Octadecadienoic acid, ethyl ester(22,7 %),9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z)-(17,1 %), Drometrizole (1,2 %), Methyl 19-methyl eicosanoate (1,1 %), Canadine (4,4 %),4H-Bis[1,3]benzodioxolo[5,6-a:4',5'-g]quinolizine, 6,7,12b,13-tetrahydro-, (±)-(30,2 %), Protopine (3,5 %)

Sample № 1 — As a result, 14 different Ethanone, 1-(2-hydroxy-5-methylphenyl), Tetradecanoic acid, Tetradecanoic acid, ethyl ester, Ethyl 13-methyl-tetradecanoate, Hexadecanoic acid, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, Octadecanoic acid, 9,12,15-Octadecatrienoic acid, ethyl ester, Drometrizole, Methyl 19-methyl-eicosanoate, Cannabidiol, Protopine were found to be present. Phytol (22,68 %) and 9,12-Octadecadienoic acid, ethyl ester (21,61 %), 9,12,15-Octadecatrienoic acid, ethyl ester (17,44 %) and Octadecanoic acid (16,62 %) were present in the highest percentage of the identified compounds. Accordingly, the chromatogram of the extract with more than 20 percent compounds was observed in a high peak.

Sample № 2 — "Lecrasel" company, *Chelidonium majus* was analyzed as a result of chromatographic analysis of dry cosmetic and hygienic substance extract prepared from plants. Chromatographic analysis of cosmetic and hygiene extract revealed 14 active substances, among which 17.96 % Octadecanoic acid, 17.21 % Hexadecanoic acid and 15.21 % Phytol were in the highest percentage.

Between 0 and 1 percent 2,5-Dimethyl-4-hydroxy-3(2H)-furanone (0.79 %), Ethanone, 1-(2-hydroxy-5-methylphenyl)-(0.63 %), 2 (4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-, (R)- (0.42 %), Pentadecanoic acid (0.84 %) and Drometrizole (0.69 %) was determined. Among the identified compounds, 2,5-Dimethyl-4-hydroxy-3(2H)-furanone, Pentadecanoic acid was not found in other samples.

Sample № 3 – 23 compounds *Chelidonium majus*, were found in the chromatographic analysis of "DauLet" cosmetic extract. Phytol (27.74 %), 9,12-Octadecadienoic acid, ethyl ester (21.38 %) and 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z)- (14.10 %) were compounds. According to the obtained results, among the 23 compounds presented in Table 2, 1-Eicosanol, Pentadecanenitrile, 9,12-Octadecadienal, dimethyl acetal, Octadecanal, 2-Pentadecanone, 6,10,14-trimethyl, 2-Heptadecanone, Hexadecanal, Hexadecanenitrile, Ethyl 9-hexadecenoate, 1-Nitrododecane, Octadecanenitrile, Heptadecanoic acid, 16-methyl-, methyl ester compounds were not found in other samples.

Sample № 4 – A total of eleven main bioactive compounds were determined as a result of the chromatogram of the *Chelidonium majus* plant extract grown in Kungei Alatau. That is, they are Ethanone, 1-(2-hydroxy-5-methylphenyl), Tetradecanoic acid, ethyl ester, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z), Drometrizole, Methyl 19-methyl-eicosanoate, Canadine, 4H-Bis[1,3] benzodioxolo[5,6-a:4',5'-g]quinolizine, 6,7,12b,13-tetrahydro-, (±)-, Protopine, according to Table 2, respectively.

4H-Bis[1,3] benzodioxolo[5,6-a:4',5'-g]quinolizine, 6,7,12b,13-tetrahydro-, (±)- (30,2 %), 9, 12-Octadecadienoic acid, ethyl ester (17.1 %) and Phytol (13.8 %) showed a high percentage. According to the obtained results, in the chromatographic analysis of the extract of *Chelidonium majus* grown in Kungei Alatau, sample No. 4, the number of compounds is less compared to other samples.

A qualitative analysis of active natural compounds of *Chelidonium majus* L. plant was conducted in the research work. As a result of studying the chromatograms, retention time tables and mass spectra of the determined compounds in *C. majus* extracts were compiled. Each extract was found to contain several different active compounds.

The main classes of organic substances characteristic of plant-based natural objects of the components of the *C. majus* samples given above were known [20; 739]. All analyzed samples contained 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z), Methyl 19-methyl-eicosanoate, Protopine compounds were identified [26, 27]. Qualitative composition in all studied samples is similar, quantitative difference is observed between samples. It is well known that quantitative measurements of the quality of plant activity cannot be replaced by simple biochemical or pharmacological measurements. Sample extract No. 3, Dawlet Company, *C. majus* showed the highest amount of phytochemicals in its cosmetic than other extracts, which may be affected by time, place of collection, extraction procedures, soil composition, humidity, and storage conditions [28, 29].

According to the literature, the phytochemical composition of *C. majus* plant includes alkaloids and other nitrogen-containing compounds, lectins, phytosterols, phenol and higher fatty acids, higher aliphatic alcohols, flavonoids, tannins, essential oils and vitamin C [30-32] and their results in the current study confirmed by the results.

Many studies show that active substances extracted from *C. majus* plant have analgesic, dermatoprotective, immunosuppressant, antispasmodic, antituberculosis, sedative, diuretic anti-inflammatory, antimicrobial, immunomodulatory, antitumor, choleric, hepatoprotective, and pain-relieving properties [33-39]. The main components are isoquinoline alkaloids (sanguinarine, chelidone, chelerythrine, berberine, protopine, coptisine), flavonoids and phenolic acid [40-43]. Both the crude extracts of *C. majus* and the purified compounds obtained from it contain a wide range of biological activities consistent with the traditional uses of the plant [44-47]. These components are of particular importance in the pharmacopoeia. However, in order to promote their commercial use, attention should be paid to studies that increase the therapeutic potential of plant extracts and their isolated active compounds [48-52]. The description of the components of the drugs obtained as a result of the research encourages future research to make decoctions as an anesthetic for diathesis, lichen, scabies, itchy skin, burns, and in the treatment of purulent wounds.

Conclusion

The characteristics of the *C. majus* plant collected from Kungei Alatau and the indicators of the organic compounds contained in it allow us to conclude that it corresponds to medicinal, cosmetic and hygienic dry preparations in pharmacies made on the basis of *C. majus*. The biologically active substances and their compounds contained in the *C. majus* plant are generating new suggestions and interest in the treatment and justification of their well-known efficacy against various diseases. The result of the study suggests the isolation of active compounds from the plant and further elucidation of their structural potential with respect to their various biological activities.

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Күнгеі Алатау жағдайындағы *Chelidonium majus* L. өсімдігінің биоморфологиялық және фитохимиялық көрсеткіштері

Фармацевтика өнеркәсібінде синтетикалық дәрі-дәрмектер мен табиғи препараттар арасындағы арақатынастың тұрақтылығы соңғы уақытта өзгерді. Себебі, халық арасында химиялық жолмен дайындалған дәрілерге қарағанда, табиғи өсімдіктерден жасалған препараттар сұранысқа ие. Өсімдік тектес дәрілік заттардың артықшылығы олардың төмен уыттылығы, биологиялық белсенді қосылыстардың елеулі кешені, фармакотерапиялық әсерлердің көп қырлылығы, айқын жағымсыз реакцияларсыз ұзақ уақыт қолдану мүмкіндігі болып табылады. Дәрілік препараттардың құрамындағы биологиялық белсенді заттардың емдік әсерімен қатар, профилактикалық әсері де тиімді. Сондықтан,

өсімдік тектес табиғи дәрілік шикізат құрамын талдау өзекті. Жұмыстың мақсаты — дәрілік үлкен сүйелшөп (*Chelidonium majus* L.) өсімдігінің макродиагностикалық ерекшеліктері мен белсенді табиғи қосылыстарының құрамын зерттеу. Зерттеу нысаны ретінде Күнгей Алатауы аймағынан жиналған *Chelidonium majus* өсімдігі мен дәріханаларда сатылатын сүйелшөп өсімдігі негізінде дайындалған емдік, косметикалық және гигиеналық құрғақ жинақтары пайдаланылды. Зерттеу жұмысында фармакогнозия, макроскопиялық және газ хроматографиясы–масс-спектрометрия (GC-MS) әдістері қолданылды. Макроскопиялық талдау нәтижелері үлгілердегі дайын шикізаттың құрамы мен сипаттамаларына сәйкестігін растады. *C. majus* өсімдігі үлгілері жеткілікті биологиялық белсенді заттарының тұрақты компоненттік құрамын көрсетті. Барлық үлгілерде 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z), Methyl 19-methyl-eicosanoate, Protopine қосылыстары анықталды. Өсімдіктің терапевтік әлеуетін және фармацевтикадағы тиімділігі мен қауіпсіздігін бағалау үшін клиникалық зерттеулер жүргізу болашақтағы зерттеулерге негіз болады. Алынған нәтижелер фармакопейалық дәрілік өсімдік шикізаты үлкен сүйелшөп сапасының нормаларын объективті бағалауға мүмкіндік береді.

Кілт сөздер: *Chelidonium majus*, фармакология, медицина, дәрілік өсімдік, алкалоидтар, органикалық қосылыстар, Күнгей Алатауы, препарат.

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Биоморфологические и фитохимические показатели *Chelidonium majus* L. в условиях Кунгей-Алатау

В фармацевтической промышленности стабильность соотношения между синтетическими и природными лекарствами в последнее время изменилась. Это связано с тем, что лекарства, изготовленные из натуральных растительных компонентов, пользуются большим спросом, чем лекарства, приготовленные химическим путем. К преимуществам фитопрепаратов относятся их низкая токсичность, значительный комплекс биологически активных соединений, многогранность фармакотерапевтического действия, возможность длительного применения без выраженных побочных реакций. Помимо лечебного действия биологически активных веществ, содержащихся в лекарственных средствах, действие и профилактический эффект. Поэтому важно проанализировать состав природного лекарственного сырья растительного происхождения. Цель работы — изучение макродиагностических особенностей и состава активных природных соединений лекарственного растения чистотела большого (*Chelidoniummajus* L.). В качестве объекта исследования использовали чистотел большой, собранный в районе Кунгей-Алатау и лечебные, косметические и гигиенические сухие наборы, приготовленные на основе травы чистотела, реализуемые в аптеках. В исследовании использовались методы фармакогнозии, макроскопии, газовой хроматографии–масс-спектрометрии (GC-MS). Результаты макроскопического анализа подтвердили соответствие состава и характеристик готового сырья в образцах. Образцы растений *C. majus* показали стабильный компонентный состав с достаточным количеством биологически активных веществ. Во всех образцах обнаружены соединения 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Phytol, Ethyl Oleate, 9,12-Octadecadienoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, ethyl ester, (Z, Z, Z), Methyl 19-methyl-eicosanoate, Protopine. Проведение клинических испытаний для оценки терапевтического потенциала растения, его эффективности и безопасности в фармацевтике является основой для будущих исследований. Полученные результаты позволяют объективно оценить нормы качества фармакопейного лекарственного растительного сырья чистотела большого.

Ключевые слова: *Chelidonium majus*, фармакология, медицина, лекарственное растение, алкалоиды, органические соединения, Кунгей Алатау, препарат.

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