ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

PUBLISHED SINCE 1944

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JANUARY – FEBRUARY 2019

ALMATY, NAS RK

NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабаршысы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

«Қазақстан Республикасы Ұлттық ғылым академиясының Хабаршысы».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы»РҚБ (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5551-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 2000 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
http://www.bulletin-science.kz/index.php/en/

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Вестник Национальной академии наук Республики Казахстан».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5551-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год
Тираж: 2000 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел. 272-13-19, 272-13-18.
www: nauka-nanrk.kz, bulletin-science.kz

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

Bulletin of the National Academy of Sciences of the Republic of Kazakhstan.
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 5551-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 2000 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz /, http://bulletin-science.kz

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

BULLETIN OF NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
ISSN 1991-3494
Volume 1, Number 377 (2019), 6 – 13 **https://doi.org/10.32014/2019.2518-1467.1**

UDC 615.32:616.441
DOI 10.32014/2018.2518-1467

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PHARMACOTHERAPEUTIC ACTION ANALYSYS OF MINERAL SUBSTANCES OF MEDICINAL PLANTS, WHICH ARE USED IN THYROID GLAND DISEASES

Abstract. Diseases of thyroid gland refer to the most widely spread ones, and are accompanied by the change of hormonal background of the human organism in the whole and lead to disorders of vitally important processes in other organs, triggering appearance of concomitant diseases. Among major causes of thyroid gland diseases are psychological and emotional overloads; malnutrition and unbalanced nutrition that results in deficiency of mineral substances and vitamins in the organism; radioactive conditions and unfavorable ecological situations; chronic diseases.

Taking into account such a great role of macro- and microelements in the normal work of the thyroid gland, it is necessary to provide their physiologically necessary content in the organism. The sources of mineral substances can be medicinal plants and remedies made of them.

Therefore, the aim of the work was to determine content of macro- and microelement composition of medicinal plants - Lycopus herb, Feijoa leaves, Cetraria islandica thalli, Bugleweed European herb, Genista herb, leaves of Lemna minor, thalli of Fucus vesiculoses and thalli of Laminaria, which are used in treatment of thyroid gland diseases and their water extracts and 10 %, 30 % and 50 % alcohol tinctures. Quantitative content determination of macro- and microelements has been carried out by the atomic emission spectrography method. Quantitative determination of general iodine content has been performed by the iodometry method (titrant – 0.01 M sodium thiosulphate solution) after preliminary burning of the raw material in the alkaline solution by the methodology of State Pharmacopoeia of Ukraine 2.0 volume 3, monograph «Buri vodorosli».

The presence of 15 macro and microelements has been determined in the result of the performed spectral analysis of the studied types of medicinal plant raw materials and their extracts. Silicium, mangan, magnesium, calcium, sodium and potassium are contained in comparatively big amounts. When determining qualitative and quantitative content of mineral substances our attention was focused on the elements which had great significance at diseases of thyroid gland, the deficiency or misbalance, which can damage the thyroid gland or other organs functioning, the use of which can eliminate negative symptomatic manifestations in diseases of thyroid gland (Fe, Mn, Mg, Ca, Cu, Zn, Se, I). The representatives of brown algae – Laminaria (0,11 %) and Fucus (0,05 %) and also the representative of fresh water reservoirs – duckweed (0,028 %) are characterized by the highest iodine content. The samples of Laminaria, Fucus, Feijoa and Lemna (duckweed) were characterized by the highest iodine content. The most maximum iodine content had water extracts, when ethyl alcohol concentration was increased, the iodine content didn't change significantly. High selenium content has been determined in the thalli of Laminaria (0,81 mg/kg), Lemna (duckweed) (0,72 mg/kg) and fresh Feijoa fruit (0,31 mg/kg). The highest selenium content (mkg/l) had water Fucus extract (40) and 50 % Lemna (duckweed) tincture (14). There is an interesting fact, that iodin:

selenium ratio in these samples was 1:4(5), that can stipulate similar mechanisms of the effect for thyroid gland. Among the tested substances high selenium and iodine content had simultaneously Laminaria samples – 5 % tincture (3,8) and 10 % tincture (6,6). Though the iodine: selenium ratio had another character and made 18(19):1.

Keywords: Laminaria, Fucus, Cetraria islandica (L.) Ach., Lemna minor S.F. Gray, Xanthium strumarium L., Genista tinctoria L., Lycopus europaeus L., Feijoa sellowiana Berg., Feijoa sellowiana Berg., correction of minereal substanceses deficiency, thyroid gland diseases.

Thyroid gland diseases, especially connected with iodine deficiency are widely spread in the world and in Ukraine, that is connected with the content of "nonspecific" strumagenes in the environment [1, 2]. A lot of chemical compounds are referred to them, they are contained in the industrial wastes, pesticides, some medicinal preparations and also macro- and microelement misbalance. Low efficiency of iodotherapy in conditions of ferum deficiency has been proved, that is explained by the participation of ferume in the modification of L-phenylalanine into L-thyrosine. At the same time a positive dynamics has been marked among the patients with hypothyroidism against a background of therapy with vitamin A. Malnutrition, low content of vitamin A in the diet leads to the damage of thyreoglobulin structure, and, correspondently, synthesis of thyrotrophic hormones (TH). Deficiency or excess of other mineral substances (Co, Cu, Fe, Br, Mn) can be correlated by means of TH biosynthesis [3-5].

Selenium, zinc and chrome play specific role in the iodine metabolism. As selenium is a constituent of iodinthyroninedefodinaze – enzeme, which is responsible for peripheral change of T_4 in T_3 in liver and kidneys, its deficiency is accompanied with deficiency of the above-mentioned enzeme, and, as a result, incompleteness of iodine exchange. Zinc effects secretion of the thyroid stimulating hormone, therefore, its deficiency can be one of the reasons of hypothyroidism (some patients are registered to have deficiency of zinc or disorders of zinc : cuprum ratio).

Data concerning correlating dependency between communication of the thyroid disease and abnormality of content in the environment of manganese, cobalt, zinc, molybdenum, cuprum are given in the literary sources. There are experimental and clinical data, that prove the hypothesis of the goitrogenecity effect of the zinc deficiency - important component of many metabolic processes. Zinc is contained in more than 200 metal proteins, including nuclear receptor T_3 [6, 7], it explains the necessity of this element for realization of TH biologic effect. Changes in the zinc level in the daily urine – indicator for evaluation of thyroid gland dysfunction; therefore, in case of its dysfunction, a decreased excretion of zinc with urine is observed. Hypoplasia of thymus and immunodeficiency development, mainly of T-cellular, has been determined under experimental zinc deficiency. Zinc deficiency can lead to increased accumulation of cadmium, lead and cuprum in blood (functional antagonists of zinc), especially against the background of the protein deficiency in the diet. Carcinogenic properties of cadmium, zinc and other toxic metals are connected with their ability to replace zinc ions in the "finger" proteins of the karyons, transcription factors and proteins that bind hormones, damaging intracellular transduction of signals and gene expression [8, 9].

The main significance of cobalt is that it is a component of vitamin B_{12}. Along with it, it is known, that cobalt suppresses the iodine binding with thyroid gland due to the unknown mechanism, and overdosage of cobalt in children sometimes can result in hypothyroidism and hyperplasia of a thyroid gland. The thyrostatic effect of this microelement is rather noticeable, therefore, in 1950-th there were attempts to use cobalt chloride for hypothyroidism treatment. On the territory of Ukraine there are biogeochemical territories with endemic cobalt deficiency, and therefore, the goiter develops in children living on this territories, and sometimes with decreased function of thyroid gland. The ferum deficiency in children with endemic iodine deficient goiter and ferum deficient anemia interferes with the therapeutic effect of the iodine containing products. It is not excluded, that ferum takes part in the TH synthesis or its deficiency reduces absorption of iodine [10, 11]. Molybdenum in small amounts is useful for organism, it is known, that the level of cAMF cell increases under the effect of the molybdenum compounds, it can be one of the central mechanisms of its influence on the immune system. Mangan can be found in the composition of different organism tissues, being a cofactor of guanylcyclase, the functions of which are important for cellular proliferation, and also is a component of enzymes, including superoxidedismutase, that protects from peroxide radicals. A disorder of the magnesium balance leads to appearance of a number of immune radicals - abnormal activation of the compliment, high frequency of allergic reactions and infectious processes develop, the most frequent of which are chronic fungal and viral diseases [8, 11].

Cuprum is one of the essential microelements necessary for human vital functions. A significant part of the blood plasma cuprum is in the ceruloplasmin, the most important cuprum containing protein. Corticosterone and thyroxin cause cuprum reduction in blood. In human, on the contrary, the increase of this element concentration in blood is observed under hyperthyroidism and its reduction is observable under hypofunction of thyroid gland. Under cuprum deficiency in the organism, the reduction of superoxide dismutase activity is determined, superoxide dismutase, in its turn, is responsible for inhibiting of peroxide oxidation in the cell membranes lipids, and also cuprum dependent enzeme – lysiloxidase, that take part in the formation of the transverse links of collagen and elastic fibers [13]. When giving a total evaluation of the significance of the enzeme autoagression in relation to such highly specialized structures as elastic membranes, it is necessary to think over the role of those endogenic factors, which provide their trophism, functioning and keeping in the human organism. It is easily to assume, that the enzymatic attack turns out to be the most destructive just for structures, which are constitutionally incomplete, in particular, not provided with normal microelemental composition. A significant improvement of the treatment results of the toxic goiter with 131 I by taking lithium carbonate due to its positive effect on the iodine pickup has been registered [14].

A number of authors discuss the hypothesis that light deficiency of selenium can make a definite contribution into a development and progression of the autoimmune thyroiditis. The reduction of the antibodies titre till thyroperoxidase (for 40 % in comparison with the group of patients, who were taking only L-T_4) and change of the gland echogenicity have been registered in the result of the treatment of patients suffering from compensed hypothyroidism and who were prescribed sodium selenite [6, 7].

Taking into consideration such a great role of macro- and microelements for the normal work of thyroid gland, it is necessary to maintain their physiologically necessary content in the organism. Different mineral and vitamin-mineral complexes are used for this aim, besides, the source of these mineral substances can be both medicinal plants and drugs made of them. The advantage of the former is the fact, that they both liquidate macro- and microelements deficiency, and have other medioprophylactic properties, providing complex effect for the organism [15, 16].

Therefore, the aim of our work was to determine macro- and microelement content of medicinal plants – bugleweed herb (Lycopus), Feijoa leaves, Cetraria thalli, fresh Feijoa fruit, thalli of Cetraria islandica, Lycopus eurapaeus, Genista herb, leaves of Lemna minor, thalli of Fucus vesiculoses and thalli of Laminaria, which are used in thyroid gland diseases and their water extracts and 10 %, 30 % and 50 % alcohol tinctures.

Materials and methods. The determination of the macro- and microelements quantitative content was performed by the atomic emission spectrography method, that is based on the plant ash evaporation in the electric arc, photographic recording of the emission distributed in spectrum and intensivity measuring of some elements spectral lines [17]. Quantitative determination of the general fund was performed by the iodometry methods (titrant – 0.01 M sodium sulphate solution) after preliminary burning of the raw material in the alkaline media by the methodology of the State Pharmacopoeia of Ukraine 2.0 Volume 3, the monograph “Bury vodorosli” [18].

Results and discussion. In the results of the performed analysis результаті проведеного аналізу, it has been determined that Lycopus herb, Xanthium strumarium herb, Feijoa leaves, fresh Feijoa fruit, thalli of Cetraria islandica, Lycopus herb (трава дроку красильного), leaves of the Lemna minor, thalli of Fucus vesiculoses and thalli of Laminaria contain in their composition 15 macro- and microelements (table 1). Silicium, mangan, magnesium, calcium, sodium and potassium are contained in comparatively big quantities.

When determining qualitative and quantitative content of mineral substances, first of all, we were interested in the elements, that have primary significance at thyroid gland diseases, deficiency or misbalances of which can be disturbed by the thyroid gland functioning, and the use of which can eliminate negative symptomatic signs at diseases of thyroid gland (Fe, Mn, Mg, Ca, Cu, Zn, Se, I).

It is necessary to pay attention that above-mentioned elements play important role under thyroid gland pathologies. Therefore, in cases of thyroid gland diseases the calcium metabolism is damaged, that leads to calcium deficiency in the organism. Magnesium deficiency leads to hyperexcitability, irritation, emotional disorders, which are the main symptoms in cases of thyroid gland dysfunction. Against the backdrop of constant magnesium deficiency, the risk of the heart arteries atherosclerosis, heart attacks and arrhythmia increases.

Table 1 – The results of determination of mineral substances content in the tested types of raw materials

Composition in mkg/100g															
Fe	Si	P	Al	Mn	Mg	Pb	Ni	Mo	Ca	Cu	Zn	Na	K	Se, мг/кг	I, %
Herb of Xanthium															
1,6	5,4	9,2	1,1	8,1	81,0	<0,03	0,11	<0,02	215	0,27	<0,01	5,4	54,0	<0,15	0,019
Herb of Genista															
12,0	570,0	76,0	16,0	7,5	69,0	<0,03	0,09	<0,02	290,0	0,19	<0,01	810,0	2100,0	<0,15	0,013
Herb of Lycopus European															
16,0	630,0	140,0	40,0	20,0	485,0	<0,03	0,16	0,08	670,0	4,0	0,81	970,0	2430,0	<0,15	0,016
Leaves of Feijoa															
5,1	825,0	105,0	20,0	1,0	310,0	<0,03	0,10	<0,03	1030,0	0,26	<0,01	105,0	2060,0	<0,15	0,024
Fresh fruit of Feijoa															
14,2	510,0	160,0	29,0	5,3	410,0	<0,03	0,11	<0,03	2100,0	0,31	<0,01	230,0	2900,0	0,31	0,037
Lemna minor															
934,0	2495,0	515,0	155,0	155,0	935,0	<0,03	0,93	<0,02	4990,0	0,78	<0,01	1870,0	4680,0	0,72	0,028
Thalli of Cetraria islandica															
17,0	75,0	21,0	25,0	4,2	34,0	0,08	0,04	<0,03	68,0	0,13	8,0	21,0	170,0	<0,15	0,023
Thalli of Laminaria															
30,0	160,0	34,0	20,0	30,0	1200,0	<0,03	<0,03	0,1	1600,0	0,5	<0,01	3600,0	6000,0	0,81	0,110
Thalli of Fucus vesiculosus															
24,0	110,0	25,0	13,0	34,0	800,0	<0,03	<0,03	<0,03	1200,0	0,3	<0,01	3100,0	5400,0	<0,15	0,050
Co < 0.003; Cd < 0,001; As < 0,001; Hg < 0,001; Sr < 0,1.															

Phosphor in the form of phosphoric acid takes part in the building of numerous enzymes, necessary for fat exchange, carbohydrates synthesis and their disintegration, regulates metabolism, takes part in the nervous system activity. Due to potassium ions the neurotransmission from neuron to neuron takes place. Potassium deficiency leads to disorders of cardiovascular system and can cause muscle weakness. Potassium deficiency in the organism in thyroid gland diseases is connected with dyspnea, fatigue, insomnia, low sugar level in the blood. Potassium is necessary for heart muscles, one of the major regulators of water-salt metabolism. Ions of ferum are found in the composition of the blood pegment hemoglobin, that has one of the most important functions in the organism – transmission of oxygen to cells and tissues [8, 10].

High content of elements had duckweed leaves (mkgr/100 г): ferum – 934, mangan – 155, magnesium – 935, calcium – 4990, cuprum – 0,78. High zink content had Cetraria thalli – 8 mkg/100 g and Lycopus herb – 0,81 mkg/100 g.

Selenium is a constituent of iodothironindefodinase – enzyme, responsible for peripheral conversion of T_4 into T_3 in liver and kidney, and its deficiency is accompanied by deficiency of the above-mentioned enzyme, and, as a result, incompleteness of iodine exchange. High selenium content has been determined in Laminaria thalli (0,81 mg/kg), duckweed leaves (0,72 mg/kg) and fresh Feijoa fruit (0,31 mg/kg). In other types of medicinal raw materials, the selenium content was determined as <0,15 mg/kg, what is explained by the sensitivity of this method.

For Fucus and Ascophyllum thalli the State Pharmacopoeia of Ukraine gives iodine content in raw material by the iodometry methods as follows: not less than 0.03 % and not more than 0.2 % of the total iodine ($A_м$ 126.9), on dry raw material base; for Laminaria thalli – not less than 0,1 % of the total iodine ($A_м$ 126.9), on dry raw material base. The results of the obtained experimental data demonstrated that all thalli of raw materials samples of Laminaria, Fucus and Ascophyllum met the requirements of the normative documentation. According to table 1 data, by the titration analysis results, the highest iodine content has been determined for representatives of brown algae – Laminaria (0,11 %) and Fucus (0,05 %), and also representatives of fresh water reservoirs – Lemna (duckweed) (0,028 %). Among geophytes the

tendency of iodine contents (%) is the following: Feijoa fruit (0,037) > Feijoa leaves (0,024) > Centraria thalli (0,023) > Xanthium herb (0,019) > Lycopus herb (0,016) > Genista herb (0,013).

Determination of the macro- and microelemental composition in the plant substances is a logical continue of the investigation concerned with the mineral composition determination in crude plant materials, and is necessary for getting more complete information as for the composition and effect of the obtained plant substances in cases of thyroid gland diseases. Spectral analysis of macro- and micro-elements in the tested substances has shown the following tendency: potassium > sodium > magnesium > > phosphorus > silicium > aluminium > mangan > ferum > zinc > cuprum (downward quantitative content) (table 2).

Table 2 – The results of determination of mineral substances content in plant substances

Content, mkg/100g															
Fe	Si	P	Al	Mn	Mg	Pb	Ni	Mo	Ca	Cu	Zn	Na	K	Se, mkg/l	I, mkg/ml
Water extract of Laminaria															
0,96	0,60	6,00	0,60	0,30	54,00	<0,03	<0,03	<0,03	36,00	<0,01	<0,01	72,00	360,00	<3,0	183±15
30 % tincture of Laminaria															
0,02	55,40	3,50	0,14	0,04	45,00	<0,03	<0,03	<0,03	137,00	0,07	0,11	190,00	670,00	<3,0	75±6
50 % tincture of Laminaria															
0,03	77,30	2,90	0,29	0,06	87,00	<0,03	<0,03	<0,03	145,00	0,09	0,14	230,00	870,00	<3,0	73±7
5 % tincture of Laminaria															
5,40	270,00	37,80	0,27	0,13	162,00	<0,03	<0,03	<0,03	324,00	0,03	0,54	432,00	270,00	3,80	69±6
10 % tincture of Laminaria															
0,04	0,40	40,00	0,04	0,02	180,00	<0,03	<0,03	<0,03	120,00	0,02	<0,01	240,00	120,00	6,60	130±9
Water extract of Lemna															
1,00	10,40	11,70	0,78	1,90	11,70	0,08	0,08	<0,03	19,50	0,01	0,03	23,00	117,00	<3,0	4,6±0,5
30 % tincture of Lemna															
0,24	27,20	3,40	0,03	0,34	10,2	<0,03	0,03	<0,03	3,40	0,05	0,02	17,00	36,00	<3,0	1,5±0,3
50 % tincture of Lemna															
0,92	3,70	7,80	0,14	1,80	20,7	<0,03	0,05	<0,03	9,20	0,04	<0,01	27,00	138,00	14,00	2,5±0,7
Water extract of Fucus															
0,70	35,00	4,90	0,07	0,17	21,00	<0,03	<0,03	<0,03	68,00	0,13	8,00	21,00	170,00	40,00	10±1
30 % tincture of Fucus															
1,70	33,60	5,60	2,80	0,03	16,80	0,05	0,03	<0,03	28,00	0,02	0,03	45,00	168,00	<3,0	7±2
50 % tincture of Fucus															
0,03	5,50	3,40	0,02	0,34	20,70	<0,03	0,03	<0,03	17,20	0,03	<0,01	41,00	185,00	<3,0	5±2
Water extract of Genista															
0,19	7,60	4,70	0,19	0,09	5,70	<0,03	0,04	<0,03	15,20	<0,01	0,02	9,50	57,00	<3,0	0,6±0,2
30 % tincture of Genista															
0,05	5,00	4,10	0,01	0,24	7,20	<0,03	<0,03	<0,03	12,00	0,012	<0,01	2,40	48,00	<3,0	1,3±0,5
50 % tincture of Genista															
1,35	24,0	5,10	1,20	0,15	18,00	<0,03	<0,03	<0,03	24,00	0,15	0,30	15,00	150,00	<3,0	0,4±0,1
Water extract of Lycopus															
0,23	7,70	5,80	0,14	0,01	8,70	<0,03	0,03	<0,03	17,40	0,01	0,03	8,70	85,00	<3,0	0,6±0,1
30 % tincture of Lycopus настойка вовконогу															
0,18	5,90	6,30	0,01	0,04	11,00	<0,03	<0,03	<0,03	22,20	0,09	0,02	7,40	110,00	<3,0	0,4±0,1

Continue. Table 2

50 % tincture of Lycopus															
1,1	15,40	6,10	2,00	1,10	13,20	<0,03	0,11	<0,03	17,60	0,06	0,22	11,00	88,00	<3,0	0,4±0,1
Water extract of Cetraria															
0,52	10,40	2,20	1,00	0,65	3,90	<0,03	<0,03	<0,03	10,40	<0,01	0,65	6,50	39,00	<3,0	1,8±0,2
30 % tincture or Centraria															
0,03	2,10	1,00	0,18	0,03	1,50	<0,03	<0,03	<0,03	3,60	<0,01	0,06	0,90	9,00	<3,0	1,1±0,3
50 % tincture of Centraria															
0,30	6,00	1,70	1,00	0,50	3,00	<0,03	<0,03	<0,03	7,00	<0,01	0,50	1,50	30,00	<3,0	2,5±0,2
Water extract of Feijoa leaves															
0,18	14,40	1,80	0,09	0,09	5,40	<0,03	<0,03	<0,03	14,40	<0,01	0,18	1,80	90,00	<3,0	3,5±0,4
30 % tincture of Feijoa leaves															
0,10	12,30	1,50	0,05	0,06	4,70	<0,03	<0,03	<0,03	10,00	<0,01	0,11	1,40	110,00	<3,0	1,5±0,2
50 % tincture of Feijoa leaves															
0,16	15,00	1,30	0,08	0,07	3,90	<0,03	<0,03	<0,03	12,80	<0,01	0,15	1,60	100,00	<3,0	0,9±0,3
Water extract of Feijoa fruit															
0,06	19,20	0,84	0,04	0,03	3,60	<0,03	<0,03	<0,03	2,40	0,09	0,01	1,20	36,00	<3,0	1,5±0,3
30 % tincture of Feijoa fruit															
0,01	3,00	0,40	<0,01	<0,01	1,20	<0,03	<0,03	<0,03	3,30	<0,01	<0,01	1,80	12,00	<3,0	1,3±0,3
50 % tincture of Feijoa fruit															
0,03	5,00	1,00	<0,01	0,01	5,00	<0,03	<0,03	<0,03	10,0	<0,01	<0,01	5,00	40,00	<3,0	1,5±0,2
Co < 0.003; Cd < 0,001; As < 0,001; Hg < 0,001; Sr < 0,1.															

The biggest selenium content (mkg/l) was characteristic for Fucus extract (40) and 50 % Lemna (duckweed) tincture (14). It is interesting to note that the iodine:selenium ration in the tested samples was 1:4(5), that can stipulate the similar mechanism of the influence for thyroid gland. Among the tested samples high iodine and selenium content had simultaneously Laminaria samples – 5% tincture (3,8), 10% tincture (6,6). Though the iodine:selenium ratio had different character and was 18(19):1. In other types of medicinal crude materials the selenium content was determined as <3,0 mkg/l, that is explained by the sensitivity of this method.

Samples of Laminaria, Fucus, Feijoa and Lemna were characterized by the highest iodine content. The maximum iodine content had water extracts, when ethyl alcohol concentration was increased, significant increase iodine content didn't take place (table 2).

Among other mineral substances, that have great importance for normal functioning of thyroid gland high cuprum content (mkg/100 g) is characteristic for 50 % Lycopus tincture (0,055) and Genista (0,15), 30 % (0,05) and 50 % tinctures of Lemna (0,04), tinctures of Laminaria and Fucus, water extracts of Feijoa fruit (0,09).

Zinc has been determined in almost all plant substances. The highest content (mkg/100 g) had water fucus extract (8,0), also it is necessary to note water Cetraria extract (0,65) and 5 % Laminaria tincture (0,54). High ferum content (mkg/100 g) was characteristic for 5 % Laminaria tincture (5,4), 30 % Fucus tincture (1,7), 50 % Genitsa tincture (1,35), 50 % Lycopus tincture (1,1).

Samples do not have significant changes by quantitative mangan content. The highest content (mkg/100 g) was characteristic for Lemna extracts – water extract (1,9), 30 % tincture (0,34), 50 % tincture (1,8), 50 % Fucus extract (0,34), 30 % Genista tincture (0,24), and Cetraria water extract (0,65).

Laminaria samples (mkg/100 g) – 5 % tincture (324), 10 % tincture (120), 30 % tincture (137), 50 % tincture (145) were characterized by the highest calcium content.

Conclusion. The results of experimental studies of determination of macro- and microelement content in raw material of medicinal plants and their extracts, which are used in thyroid gland diseases have been presented in the article. The presence of 15 macro- and microelements has been determined by

spectral analysis; which contained in their composition silicium, mangan, magnesium, calcium, sodium and potassium in comparatively large quantities; iodine and selenium content has been determined. The representatives of brown algae – Laminaria (0,11 %) and Fucus (0,05 %), and also the representative of fresh water reservoirs – Lemna (0,028 %) were characterized by highest iodine content. Samples of laminaria, fucus, feijoa and Lemna were characterized by the highest iodine content. Water extracts had maximum iodine content, significant increasing of iodine content has not been noticed at ethyl alcohol concentration increasing. High selenium content has been determined in Lamanaria thalli (0,81 mg/kg), Lemna leaves (0,72mg/kg) and fresh Feijoa fruit (0,31 mg/kg). The highest selenium content (mkg/l) had Fucus water extract (40) and 50 % Lemna tincture (14). It is interesting to note that the iodine: selenium ration in these samples was 1:4(5), that can explain similar mechanism of action on thyroid gland. Among tested substances high iodine and selenium content simultaneously had laminaria samples – 5 % tincture (3,8), 10 % tincture (6,6). Though iodine:selenium ratio had another character and made 18(19):1.

Therefore, it is reasonable to take into account the pharmacotherapeutic potential of the vitally important microelements of medicinal plants for development of herbal medicine with predetermined medicinal effects for correction of thyroid gland diseases and microelementosis.

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АНАЛИЗ ФАРМАКОТЕРАПЕВТИЧЕСКОГО ДЕЙСТВИЯ МИНЕРАЛЬНЫХ ВЕЩЕСТВ ЛЕКАРСТВЕННЫХ РАСТЕНИЙ, ПРИМЕНЯЮЩИХСЯ ПРИ ЗАБОЛЕВАНИЯХ ЩИТОВИДНОЙ ЖЕЛЕЗЫ

Аннотация. Заболевания щитовидной железы (ЩЗ) относятся к одним из наиболее распространенных, сопровождаются изменением гормонального фона всего организма и приводят к нарушению жизненно важных процессов в других органах, то есть провоцируют возникновение сопутствующих заболеваний. Среди основных причин заболеваний щитовидной железы выделяют психологические и эмоциональные перегрузки; неправильное и несбалансированное питание, в результате чего в организме возникает дефицит минеральных веществ и витаминов; радиоактивную обстановку и неблагоприятную экологическую ситуацию; хронические заболевания.

Учитывая такую важную роль макро- и микроэлементов в нормальной работе ЩЗ, необходимым является поддержание их физиологически необходимого содержания в организме. Источником минеральных веществ могут быть лекарственные растения и средства, полученные из них. Поэтому, целью работы было определение содержания макро- и микроэлементного состава лекарственных растений – трава дурнишника обыкновенного, листья фейхоа, плоды фейхоа свежие, слоевища цетрарии исландской, трава зюзника европейского, трава дрока красильного, листец ряски малой, слоевища фукуса пузырчатого и слоевища ламинарии, которые применяются при заболеваниях щитовидной железы, их водных экстрактов и 10 %-ных, 30 %-ных и 50 %-ных спиртовых настоек.

Определение количественного содержания макро- и микроэлементов проводили методом атомно-эмиссионной спектрографии. Количественное определение общего йода проводили методами йодометрии (титрант – 0.01 М раствор натрия тиосульфата) после предварительного сжигания сырья в щелочной среде по методике ГФУ 2.0 Т. 3 монография "Бурые водоросли". В результате проведенного спектрального анализа в исследуемых видах лекарственного растительного сырья и их экстрактах установлено наличие 15 макро- и микроэлементов. В сравнительно больших количествах содержатся: силиций, марганец, магний, кальций, натрий и калий. При определении качественного состава и количественного содержания минеральных веществ нас прежде всего интересовали элементы, имеющие первоочередное значение при заболеваниях ЩЗ, при дефиците или дисбалансе которых может нарушаться функционирование ЩЗ или других внутренних органов, а их применение может устранять негативные симптоматические проявления при заболеваниях ЩЗ (Fe, Mn, Mg, Ca, Cu, Zn, Se, I). Наибольшим содержанием йода характеризовались представители бурых водорослей – ламинария (0,11 %) и фукус (0,05 %), а также представитель пресных водоемов – ряска (0,028 %). Высокое содержание йода установлено в образцах ламинарии, фукуса, фейхоа и ряски. Наибольшее содержание йода имели водные экстракты, при увеличении концентрации спирта этилового существенного увеличения содержания йода не происходило. Высокое содержание селена следует отметить в слоевищах ламинарии (0,81 мг/кг), листеце ряски (0,72 мг/кг) и свежих плодах фейхоа (0,31 мг/кг). Наибольшее

содержание селена (мкг/л) было в водным экстракте фукуса (40) и 50 % настойки ряски (14). Интересным является тот факт, что соотношение йод:селен в этих образцах составляло 1:4(5), что может обусловливать похожий механизм влияния на ЩЗ. Среди исследуемых субстанций высокое содержание йода и селена одновременно обнаружено в образцах ламинарии – 5 % настойке (3,8), 10 % настойке (6,6). Хотя соотношение йод:селен имело другой характер и составляло 18(19):1.

Ключевые слова: Laminaria, Fucus, Cetraria islandica (L.) Ach., Lemna minor S.F. Gray, Xanthium strumarium L., Genista tinctoria L., Lycopus europaeus L., Feijoa sellowiana Berg., Feijoa sellowiana Berg., коррекция дефицита минеральных веществ, заболевания щитовидной железы.

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REFERENCES

[1] Jukova G. F. Composition in food products and daily intake with the food ration / Jukova G. F., Savchik S. A. // Microelements in medicine. 2004. N 3. P. 1-16.

[2] Gaitan E. Goitrogens in food and water // Ann. Rev. Nutr. 1990. Vol. 10. P. 21-39.

[3] Avcyn A.P. Men's microelementoses: etiology, classification, organopathology. M.: Medicine, 1991. 496 p.

[4] Veldanova M.V. Iodine deficiency in people // Microelements in medicine. 2001. N 1.

[5]Immunopharmacology of microelementrs / A. V. Kudryn, A. V. Skalyniy, A. A. Javoronkov and others. M.: КМК, 2000. 537 p.

[6] Arsenic and Selenium / J. A. Plant, D. G. Kinniburgh, P. L. Smedly, F. M. Fordyce // Environmental Geochemistry, Treatise on Geochemistry. 2005. Vol. 9. Eds: H. D. Holland & K. K. Turekian. P. 17-66.

[7] Arthur J.R. The interactions between selenium and iodine deficiencies in man and animals / J. R. Arthur, J. B. Geoffrey, H. M. Julie // Nutrition Research Reviews. 1999. Vol. 12. P. 55-73.

[8] Babenko G.A. Microelements of a human being: pathogenesis, prophylaxis, treatment // Microelements in medicine. 2001. Vol. 2(1). P. 2-5.

[9] Dymany T.N., Shevchenko S.I. Nutrition of a man in the XXI century. K.: Libra, 2008. 110 p.

[10] Raprelyants L.V., Gorbachyova K.G. Functional products. Odesa: Druk, 2003. 312 p.

[11] Korzun V.N., Bolohonova T.V., Derkach A.V. Nutrition requirements in moderrn ecological situations // Materials MNPK. K., 2016. P. 15-25.

[12] Thyroid gland diseases in women of reproductive age. Guidelines for doctors. M.: ГЭОТАР-Media, 2013. 487 p.

[13] Ivanova V. Thyroid gland diseases and diabetes. M.: Gazetniy myr, 2013. 128 p.

[14] Holmogorov V.V. Everything about thyroid gland diseases and its treatment. M.: Feniks, 2008. 192 p.

[15] Lovkova M.J., Buzuk G.N., Sokolova S.M., Derevyago L.N. About possibility of medicinal drugs use for treatment and prevention of microelementioses and pathological conditions. Microelements in medicine. 2005. Vol. 6, N 4. P. 3-10.

[16] Igamberdiyeva P.K., Usmanov R.D., Danilova E.A. Study of macro- and microelemental composition of medicinal plants of the Southern Fergana and perspectives of their use for treatment diseases // Pharmaceutical journal of Uzbekistan. 2015. N 3. P 7-11.

[17] Havezov I., Zalev D. Atomic-adsorption analysis. L.: Himiya, 1983. 144 p.

[18] State Pharmacopoeia of Ukraine: in 3 vol. / State enterprise «Ukrainian scientific center of medicines". 2-d edition. Kharkiv: State enterprise «Ukrainian scientific pharmacopoeial center of medicines», 2014. Vol. 3. 732 p.

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www:nauka-nanrk.kz

ISSN 2518-1467 (Online), ISSN 1991-3494 (Print)

http://www.bulletin-science.kz/index.php/en/

Редакторы *М. С. Ахметова, Т. М. Апендиев, Д. С. Аленов*
Верстка на компьютере *Д. Н. Калкабековой*

Подписано в печать 11.02.2019.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
19,2 п.л. Тираж 500. Заказ 1.