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ИЗВЕСТИЯ

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Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабарлары. Химия және технология сериясы" 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. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Химия және технология сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді химиялық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия химии и технологий» 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 Известия НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по химическим наукам для нашего сообщества.

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COMPARATIVE ANALYSIS OF CERTAIN MICRONUTRIENTS OF PLANTS OF THE *SUAEDA* GENUS

Abstract. The article presents a comparative analysis of the content of some biologically active micronutrients, namely ascorbic acid, retinol and tocopherol in 6 six representatives of the genus Suaeda of the Amaranthaceae family.

In this paper, we study the micronutrients of the aerial parts of plants of the genus *Suaeda:Suaeda acuminata, Suaeda microphylla, Suaeda altissima, Suaeda spicata, Suaeda vera, Suaeda splendens*.

Species of *Suaeda spicata, Suaeda vera* harvested in the province of Lliedia, Spain. Types of *Suaeda acuminata, Suaeda microphylla, Suaeda altissima, Suaeda splendens* in Ili district, Almaty region

As a result, it was established that in all studied objects, tocopherol is present in the largest quantity (from 10 to 16 mg per 100 g).

The amount of ascorbic acid varies in the range of 3.2-4.5 mg per 100g. The content of retinol in 6 studied species ranges from 1.7 to 3.0 mg per 100g. The highest content of tocopherol is found in the aerial part of *Suaeda microphylla* - 16 mg per 100g. Ascorbic acid is also found in the greatest amount in the aerial part of *Suaeda microphylla* - 4.5 mg per 100g. Retinol is found in the greatest amount in the aerial part of the species Suaeda acuminate - 3.0 mg per 100g.

Keywords: *Suaeda,* ascorbic acid, retinol, tocopherol, aerial parts,*Amaranthaceae.*

Introduction

Micronutrients considered by us belong to the class of biologically active substances known as vitamins.

Vitamins are compounds that cannot be synthesized in the human body, but at the same time are necessary for the functioning of the body, which makes them a necessary part of the diet.

For example, vitamin A deficiency (retinol) is a serious public health problem in developing countries, resulting in 130 million children with an increased risk of morbidity and mortality from infectious diseases [1].

Vitamin-related disorders include blindness (vitamin A), vitamin deficiency (vitamin B1), pellagra (vitamin B3), anemia (vitamin B6), scurvy (vitamin C), and rickets.

Some of the most valuable and essential are vitamins with antioxidant properties, carotenoids (provitamin A), ascorbate (vitamin C) and tochochromanols (vitamin E, including both tocopherols and tocotrienols) [2-6].

For this reason, an important task is to find the sources of these compounds among plants in the interests of health and veterinary medicine.

Swede (from the Arabic “Suwedmullat” or “Suaedabaccata” ”) is a large genus of halophyllous plants of the Mud family (Chenopodiaceae), including about 100 species around the globe, except for the Arctic zone. 25 species are described on the territory of the CIS, 17 of them in Kazakhstan. The main species of

the genus *Suaeda –SuaedaphysophoraPall.,Suaedadendroides (CAM) Moq., Suaedaaltissima (L.) Pall., (Suaedamicrophylla Pall., SuaedaparadoxaBge., Suaedalinifolia Pall., SuaedaeltonicaIjin,). (Kar.Et. Kir) Bge.,Suaedapygmaea (Kar. Et. Kir) Iljin.,Suaedatransoxana (Bge.) Boiss.,SuaedaconfusaIljin., Suaedaacuminata (CAM) MoqSuaedaprostrata Pall., Suaedacorniculata (CAM) Bge., Suaeda salsa (L.) Pall.,SuaedakossinskyiIljin., Suaedaheterophylla (Kar. Et. Kir) Bge.*

Species of the genus *Suaeda* are annuals or perennial grasses, dwarf shrubs and shrubs, mostly with alternate narrow succulent leaves with small flowers. They usually grow in masses in saline places, sea coasts, and coast of saline reservoirs, as well as on depleted steppe and sandy soils. Most representatives of Kazakhstani species of *Suaeda* are valuable winter and autumn forage plants [7].

Representatives of the genus *Suaeda* can serve as a source of flavanoids, alkaloids, polysaccharides, carotenoids, saponins, coumarins, tannins and other biologically active substances [8].

Many types of *Suaeda* in folk medicine have long been used as raw material for the production of potash, from which people used it for cooking the so-called “black” soap, which was used as an anti-inflammatory and wound-healing agent for various skin diseases [9].

According to folk remedies, the aerial part of *Suaedaphysophora* Pall. used as an anthelmintic agent. Broths, dry, water, alcoholic extracts and tinctures have antihypertensive properties. Aqueous extract improves cardiac activity, is less toxic than papaverine, and is proposed as a remedy for the symptomatic treatment of hypertension [10].

According to modern scientific data, herbal medicine based on *Suaedaphysophora*Pall. has a strong hypertensive (for nonadrenaline - 55%, against 37%), antioxidant (for propyl gallate - 89.02%, against 95.5%), antibacterial (*Salmonella typhi*, *Pseudonondsorenogenosa* - for tetracycline - 55%, against 100%) and weak anti-inflammatory (for ibuprofen - 35%, against 65%) activity [11].

Based on the literature on pharmacological agents, the aerial part of *Suaedamaritima* is used in medicine as a means for the complex treatment of hepatitis. Broths, dry, water, alcoholic extracts and tinctures have antiviral, antibacterial, hepatoprotective, laxative and antioxidant activities [12].

From the literature it is known about the presence of antimicrobial activity in Suaedamonoica. The antimicrobial activity of the halophyte Suaedamonoica (Forsst ex Geml) was studied using the extracts of the leaves of this plant on various test microorganisms, including several antibiotic-resistant bacteria and pathogens. Thus, it turned out that the aqueous extract of Suaedamonoica has the highest antimicrobial activity against the following microorganisms: *Rhizopusstolonifer,Mucarrecemosus, Saccharomyces cerevisiae,* and relatively moderate activity against *Bacillus subtilis, Klebsiellapneumoniaea, Bacillus megaterium, Lactobacillus acidophilus,Escherichia coli, Enterobacteraerogenes, Enterobactercloace, Rhizoctoniasolana.*

A high level of antimicrobial activity was also shown by the methanol extract against *Bacillus megaterium* bacteria, and moderate against the microorganism *Lactobacillus acidophilus*. Hexane extract has the highest level of antimicrobial activity against bacteria of the species *Bacillus subtilis, Lactobacillus acidophilus*, and moderate against *Bacillus megaterium, Escherichia coli, Enterobacter aerogenes, Enterobacter cloace, Klebsiella pneumonia*. Chloroform extract is only effective against bacteria *Klebsiella pneumonia* [13].

The study concluded that water, methanol and hexane extracts of *Suaeda monoica* leaves have great potential as antimicrobial agents. As a result, they can be used as inhalation drugs in the treatment of infectious diseases of the respiratory tract and ear canals caused by resistant pathogenic microorganisms, as well as for wastewater treatment of infectious diseases clinics [14].

The methanol and ethanol extracts of the plant *Suaeda monoica* have high antioxidant activity. To detect antioxidant activity, these extracts were tested on various model antioxidant systems. This fact indicates a high value of the potential of the aerial part of Suaeda monoica, which can be used to treat mediated diseases caused by free radicals [15].

In addition, *Suaeda monoica* is used in the complex treatment of hepatitis, as the plant has a pronounced antiviral activity, which is explained by the presence of triterpenoids and styrenes in the phytochemical composition of this plant [16].

Ethanol extract of the plant *Suaeda baccata* and, isolated from this plant, its constituent component, triglinear alkaloid, exhibit pronounced antimicrobial activity against *Staphylococcus aureus* (*Staphylococcus* stamp) [17].

A significant content of biologically active substances in the aerial and underground organs of the medicinal plant *Suaeda japonica* predetermined its use in medicine as a remedy with antioxidant, antidiabetic, and anti-neuroinflammatory activities [18].

Thus, the diversity of biologically active substances in the composition of various species of *Suaeda*, and the associated therapeutic effect cause the need for further research on various species of these plants.

The objects of study were selected aboveground parts of the following representatives of the genus *Suaeda*: *Suaeda acuminata, Suaeda microphylla, Suaeda altissima, Suaeda spicata, Suaeda vera, Suaeda splendens*.

Species of *Suaeda spicata*, *Suaeda vera* harvested in the province of Lliedia, Spain. Types of *Suaeda acuminata, Suaeda microphylla, Suaeda altissima, Suaeda splendens* in Ili district of Almaty region

Herbal raw materials are harvested in accordance with the requirements of the Global Fund of the Republic of Kazakhstan harmonized with the European Pharmacopoeia.

Materials and methods

Determination of the content of vitamin C (ascorbic acid) is carried out as follows: a sample of at least 0.3 g (0.3 ml) is placed in a centrifuge tube, the walls of which are covered with sodium citrate powder. After centrifuging the sample for 30 minutes at 3000 rpm, it is transferred to another tube and an equal amount of bidistilled water and a double amount of freshly prepared 5% solution of metaphosphoric acid are added thereto. The protein precipitate is stirred with a stick and centrifuged for 10 min at 3000 rpm. The amount of the supernatant (0.1-0.5 ml) is introduced into porcelain titration cuvettes (2 parallel samples) and titrated with a 0.001 n-0.0005 n solution of sodium salt 2.6 of a dichlorophenol -indophenol from a special 0.1 ml micropipette.

In parallel, a “blind” experiment is carried out with a 5% solution of metaphosphoric acid and bidistilledwater (1: 1).

To determine the concentration of vitamins A (retinol) and E (tocopherol) using the method of simultaneous fluorometric analysis. To 0.2 ml (g) of the sample, add 1 ml of bidistilled water and shake for 30 seconds. After that add 1 ml of 96% ethanol and shake again for 30 seconds. Then adding 5 ml of hexane, repeat the shaking procedure again (similar measures are carried out with the standard). After the sample is centrifuged for 10 minutes at 1500 rpm. For spectrometry, a clearly separated hexane layer (3 ml) was taken; which can be stored for 2 hours in tightly sealed tubes in a dark place.

In parallel with the experimental samples, standard and control (blank) samples are prepared. In standard samples, 0.2 ml of a standard solution (tocopherol and retinol acetate in ethanol) are taken instead of the test sample. In the control samples instead of prototypes - water.

Spectrofluorimetry (Hitachi Spectrofluorometer, Japan): tocopherol is carried out at an excitation wavelength of 292 nm and a fluorescence of 310 nm; retinol - at 335 and 430 nm, respectively.

The results are shown in Figure 1.

Results and discussion

In the aerial part of the selected representatives of the genus *Suaeda*, we determined the content of the following nutrients: ascorbic acid, retinol and tocopherol.

It has been established that in all samples, tocopherol is the dominant micronutrient, not less than 10 mg per 100 g.

The highest content of tocopherol is observed in the aboveground part of the plant *Suaedamicrophylla* (16 mg per 100g), and the lowest in the aboveground part of *Suaeda acuminate* (10 mg per 100g), these figures are quite high for the aboveground parts of the plant, common in arid areas.

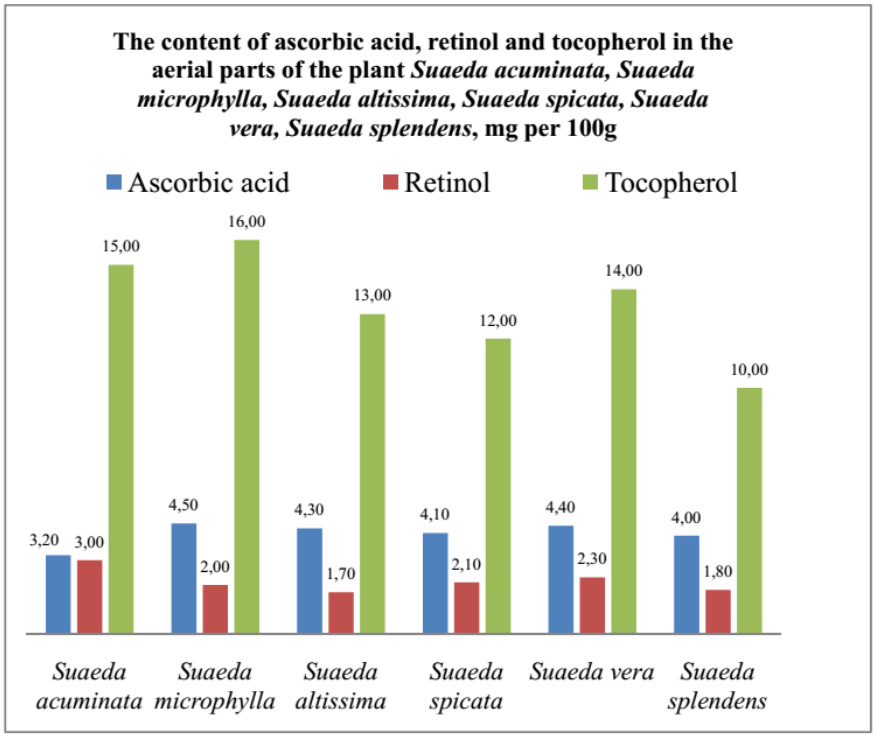

Figure 1 - The content of ascorbic acid, retinol and tocopherol in the aerial parts of the plant *Suaedaacuminata, Suaedamicrophylla, Suaedaaltissima, Suaedaspicata, Suaedavera, Suaedasplendens*, in mg per 100g%

Thus, it was revealed that the above-ground parts of the studied representatives of the genus *Suaeda* can be considered as a source of ascorbic acid, and the seeds and inflorescences are a rich source of tocopherol, based on the fact that the daily human need for vitamin E is 2-6 mg [19-21].

The content of ascorbic acid in the studied species ranges from 3.20 to 4.50 mg per 100g, which is little, but typical for the stems of arid plant species.

Suaedamicrophylla (4.50 mg per 100g) also has the highest content.

Retinol is present in selected species in a relatively small amount, the concentration ranges from 1.80 mg per 100g in *Suaedasplendens* to 3.00 mg per 100g in *Suaeda acuminate.*

Conclusion

In 6 representatives of the genus *Suaeda*: *Suaedaacuminata, Suaedamicrophylla, Suaedaaltissima, Suaedaspicata, Suaedavera, Suaedasplendens*, the following micronutrients were determined: ascorbic acid, retinol and tocopherol. It has been established that in all the objects studied, tocopherol is present in the greatest quantity.

The investigated plant species once again confirmed the importance of the genus *Suaeda*, as a plant requiring attention and careful chemical study, and identifying various types of biological activity.

For the first time, a comparative analysis of the content of ascorbic acid, retinol and tocopherol in the described representatives of the genus *Suaeda.*

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АҚСОРА (SUAEDA) ТЕКТІ ӨСІМДІКТІҢ КЕЙБІР МИКРОНУТРИЕНТТЕРІН САЛЫСТЫРМАЛЫ САРАПТАУ

Аннотация. Келтірілген мақалада *Amaranthaceae* тұқымдасы, (*Suaeda) ақсора* текті алты өсімдіктің құрамындағы кейбір биологиялық белсенді микронутриенттерге, атап айтқанда, аскорбин қышқылы, ретинол және токоферолдың сандық мөлшеріне салыстырмалы сараптау жүргізілген.

Бұл жұмыста (*Suaeda*:) ақсора тегінің, жер беті бөлігінің мына түрлеріне зерттеу жасалған: *Suaeda acuminata*, *Suaeda microphylla*, *Suaedaaltissima*, *Suaedaspicata*, *Suaedavera*, *Suaedasplendens*.

Ақсораның *Suaedaspicata*, *Suaedavera* *түрлері* Испаниядан, Lliedia аймағынан, жазда жиналған. Ал ақсораның *Suaeda acuminata*, *Suaeda microphylla*, *Suaedaaltissima, Suaedasplendens* түрлері Алматы облысы, Іле ауданынан дайындалған.

Зерттеу нәтижесінде барлық ақсора өсімдіктерінде жеткілікті мөлшерде токоферол анықталған (100г-да 10-мг-нан 16-мг-ға дейін). Аскорбин қышқылының мөлшері 100 г-да 3,2-4,5 мг. Ал алты зерттелген өсімдікте ретинолдың 100 г.-да 1,7-3,0 мг. мөлшері белгілі болған.

Suaeda microphylla тегінің жер беті бөлігінде токоферол 100г.-да 16 мг, ал аскорбин қышқылы 100г.-да 4,5мг. анықталған. Ақсораның *Suaeda acuminate* түрінде100г.-да 3,0 мг ретинолдың көп мөлшерде бары белгілі болған.

Түйін сөздер:*Suaeda,* аскорбин қышқылы, ретинол, токоферол, жер беті бөлігінің, *Amaranthaceae*.

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ НЕКОТОРЫХ МИКРОНУТРИЕНТОВ РАСТЕНИЙ РОДА *SUAEDA*

Аннотация. В статье представлен сравнительный анализ содержания некоторых биологически активных микронутриентов, а именно аскорбиновой кислоты, ретинола и токоферола в 6 шести представителях рода *Suaeda* семейства *Amaranthaceae*.

В данной работе изучаются микронутриенты надземных частейрастений рода *Suaeda*: *Suaedaacuminata*, *Suaeda microphylla*, *Suaedaaltissima*, *Suaedaspicata*, *Suaedavera*, *Suaedasplendens*.

Виды *Suaedaspicata*, *Suaedavera* заготовлены в провинции Lliedia, Испания.Виды *Suaeda acuminata*, *Suaeda microphylla*, *Suaedaaltissima, Suaedasplendens* в Илийском районе, Алматинской области

В результате установлено, что во всех изучаемых объектах в наибольшем количестве присутствует токоферол (от 10 до 16 мг в 100г).

Количество аскорбиновой кислоты варьируется в пределах 3,2-4,5 мг в 100г. Содержание ретинола в 6 изучаемых видах колеблется от 1,7 до 3,0 мг в 100г.Наибольшее содержание токоферола установлено в надземной части *Suaeda microphylla* - 16 мг в 100г. Аскорбиновая кислота также в наибольшем количесве выявлена в надземной части *Suaeda microphylla*- 4,5 мг в 100г. Ретинол в наибольшем количестве обнаружен в надземной части вида *Suaedaacuminate*- 3,0 мг в 100г.

Ключевые слова: *Suaeda,* аскорбиновая кислота, ретинол, токоферол, надземная часть, *Amaranthaceae*.

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REFERENCES

[1] Kramer, K. et al. (2008) Are low tolerable upper intake levels for vitamin A undermining effective food fortification efforts? Nutr.Rev. 6:517–525.Doi:10.1111/j.1753-4887.2008.00084.(inEng).

[2] Demmig-Adams, B. and Adams, W.W. (2002) Antioxidants in photosynthesis and human nutrition. Science 298: 2149–2153.Doi:10.1126/science.1078002 (in Eng).

[3] DellaPenna, D. and Pogson, B.J. (2006) Vitamin synthesis in plants: tocopherols and carotenoids. Annu. Rev. Plant Biol. 57: 711–738Doi:10.1146/annurev.arplant.56.032604.14430(in Eng).

[4] Linster, C.L. and Clarke, S.G. (2008) L-Ascorbate biosynthesis in higher plants: the role of VTC2. Trends Plant Sci. 13: 567–573.Doi:10.1016/j.tplants.2008.08.005 (in Eng).

[5] Foyer, C.H. and Noctor, G. (2009) Redox regulation in photosynthetic organisms: signaling, acclimation, and practical implications. Antioxid.Redox Signal. 11: 861–905.Doi:10.1089/ars.2008.2177(in Eng).

[6] Azari, R. et al. (2010) Light signaling genes and their manipulation towards modulation of phytonutrient content in tomato fruits. Biotechnol. Adv. 28: 108–118.Doi:10.1016/j.biotechadv.2009.10.003(in Eng).

[7] Cazzonelli, C.I. and Pogson, B.J. (2010) Source to sink: regulation of carotenoid biosynthesis in plants. Trends Plant Sci. 15: 266–274.Doi:10.1016/j.tplants.2010.02.003 (in Eng).

[8] Falk, J. and Munne´-Bosch, S. (2010) Tocochromanol functions in plants: antioxidation and beyond. J. Exp. Bot. 61: 1549–1566.Doi:10.1093/jxb/erq030

[9]Me`ne-Saffrane´, L. and DellaPenna, D. (2010) Biosynthesis, regulation and functions of tocochromanols in plants. Plant Physiol. Biochem. 48: 301–309.Doi:10.1016/j.plaphy.2009.11.004(in Eng).

[10]Aitkulova RE, Abubakirova AA, Kudasova DE, Kaldybekova GM (2016) Role of medicinal plants from south-kazakhstan region for addition into livestock's fodder.N e w s of the national academy of sciences of the republic of kazakhstan series of biological and medical 314: 155 – 158https://doi.org/10.32014/2018.2518- 1629(in Eng).

[11] TursynovaA., Sunnenova NS, Erezhepova N, Sarsenbayeva NB, Kalekeshov AM, E. MakashevK. (2016)Effect of the feed additive based on bentonite and chlorella body of agricultural animals and birds, News of the national academy of sciences of the republic of Kazakhstan series of biological and medical.3: 27 – 33. https://doi.org/10.32014/2018.2224- 526(in Eng).

[12] Akhani, H., Ghorbanli, M. (1993). A contribution to the halophytic vegetation and flora of Iran.Tasks for Vegetation Science 2: 35–44. Doi:10.1007/978-94-011-1858-3_4 (in Eng).

[13] G. Lakshmanan, C. Rajeshkannan, A. Kavitha, B. Mekala and N. Kamaladevi.(2013) Preliminary screening of biologically active constituents of Suaedamonoica and Sesuviumportulacastrum from palayakayal mangrove forest of Tamilnadu. J. ofPharmacognosy and Phytochem2:149-152.ISSN 2278-4136(in Eng).

[14] Prasanna Lakshmi K and NarasimhaRao GM. Antimicrobial Activity of Suaedamonoica (Forsst ex Geml) against Human and Plant Pathogens(2013). J. of Pharmaceutical, Biological and Chemical Sci. 4: 680-685.ISSN: 0975-8585(in Eng).

[15] A. Nishanthini, A. AgnelRuba, V.R. Mohan (2012). Total phenolic, flavonoid contents and in vitro antioxidant activity of leaf of SuaedamonoicaForssk ex. Gmel (Chenopodiaceae),International J. of Advanced Life Sci. 5:34-43.ISSN 2277 – 758X(in Eng).

[16] Eman A. Al – ImarahLaylaJasim Abbas (2009). The chemical composition and antibacterial activity of Suaeda sp. aqueous and alcoholic extracts.Basrah J. Aagric. Scim 5: 202-219. ISSN: 18175868(in Eng).

[17] Al-Mohammadi S. Suhad, Al-KhateebEkbal, Al-Shamma Ali (2005). Anti-microbial investigation of Suaedabaccata (Chenopodiaceae). AJPS 2: 49-51.ISSN: 18150993(in Eng).

[18] Hyun Kang, SushrutaKoppula, Hoi- Ki Kim and Tae-Kyu Park (2013).Suaeda japonica Makino Attenuates Lipopolysaccharide-Induced Neuro-Inflammatory Responses in BV-2 Microgliavia NF-kappa B Signaling. Tropical J. of Pharm 3: 351-356.Doi:10.4314/tjpr.v12i3.12 (in Eng).

[19] Singh S, Mann R, Sharm SK (2013). Phytochemical investigation of Suaedamaritima (L.).Dumort. Stem. J. of Biological & Sci. Opinion. 1: 297-299.Doi: 10.7897/2321–6328.01402(in Eng)

[20] Bajtenov M.S. (2001) Flora Kazahstana. Rodovojkompleksflory. – Almaty: Gylym. ISBN 9965-07-036-9

[21] OscanovB. S., IkhsanovY. S. ,Litvinenko Yu. A. , AdekenovS. M. ,Burasheva G. Sh., Biologically active substances from plant sudaedavera and their anestizing activity N e w s of the national academy of sciences of the republic of kazakhstan series of biological and medical ISSN 2224-5308 https://doi.org/10.32014/2018.2518-1629.8 Volume 5, Number 329 (2018), 63 – 66(in Eng).

[22] Kenzhaliyev B. K. et al., Development of technology for chromite concentrate from the slurry tailings of enrichment.News of the National Academy of Sciences of the Republic of Kazakhstan series of geology and technical sciences. Volume 3, Number 429 (2018), 182 – 188.

[23] Presnyakov, A. A., Kenzhaliev, B. K., Kozhakhmetov, S. M., Panichkin, A. V., &Ponomareva, S. V. (2002). Metal Science and Heat Treatment, 44(1/2), 80–80. https://doi.org/10.1023/a:1015341013948

[24] Kenzhaliev, B.K., Tashuta, G.N., Valutskaya, T.A. et al. Potentiometric Determination of Mercury with Iodide-Selective Electrodes. Journal of Analytical Chemistry (2002) 57: 261. https://doi.org/10.1023/A:1014456602075

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