ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Mineral Composition of Sea Buckthorn.

Zhaiyk Tokhtarov*, Kumarbek Amirkhanov, Amirzhan Kassenov, Mukhtarbek Kakimov, Duman Orynbekov, and Zhanar Moldabayeva

Faculty of Engineering Technology, Shakarim State University of Semey, 20 A Glinki Street, Semey 071412, Kazakhstan.

ABSTRACT

This study represents the result of mineral composition of sea buckthorn. According to the results, the major minerals of sea-buckthorn are sodium (Na, 28.67%), potassium (17.13%) and magnesium (14.43%). Next group minerals are phosphorus (P, 9.27%), sulfur (S, 9.33%) and silicon (Si, 7.33%). In small amount the sea-buckthorn contains calcium (Ca, 3.27%), iron (Fe, 2.37%), aluminum (Al, 3.77%) and chlorine (5.20%).

Keywords: sea buckthorn, mineral, composition, X-ray microanalysis

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Consumption of vitamin and protein rich, high-quality food, improves immunity of the human against different diseases, and also prevents accumulation of harmful waste in a human body. But not everybody in society has an opportunity to eat exclusively necessary products enriched with vitamins and proteins. Moreover, the nutritional content of daily food (meat, milk and cereals) not always satisfies the uptake of vitamins by human. Therefore nowadays food experts have a task on product-line expansion of vitamin-rich and high nutritive food [1].

The problem of rational use of natural raw material resources and food production is the major economic task and accomplishment of this task will provide the population with functional and nutraceutical food. One of such groups of food is fruits and berries can be an important source of raw materials for the enterprises of processing industry for their nutritious properties and prevalence. However the range of fruit and berry raw materials is limited and requires searching of new cultures from the local zones [2].

In this context of particular interest is the wild-growing sea-buckthorn, which is still not widely disseminated in food technology because of low level of study the chemical composition and technological properties. Significant areas of cultural plantings of sea-buckthorn in modern farms provide steadily big crops that promote creation of additional amount of foods rich in vitamins, mineral elements and other biologically active agents. Thus, involvement in economic turnover of local vegetable raw materials, in particular, of sea-buckthorn, will promote not only to rational use of natural raw material resources, but also the fullest satisfaction of needs of the population for various and high-quality food.

The wild sea-buckthorn grows in many regions of Kazakhstan and beyond its borders. Especially in mountain, east and southeast areas: in Altai, Dzhungar Alatau mountain, starting from Northern Tien Shan, to the West it is stretched on thousands of hectares to Rocks Karatau [3]. In the East Kazakhstan region sea-buckthorn grows in Zaysan, Saur-Tarbagatai and in the foothills Manyrak along the small lakes.

The sea-buckthorn is a promising small fruit crop. It is valued for its good environmental adaptability, soil protective, therapeutic and nutrition qualities. Sea-buckthorn is the multivitamin food product, it is abundant fruits and its fruits are consumed in fresh and canned form. They contain all complex of water- and fat-soluble vitamins and vitamin compounds, tocopherols and carotenoids, polyunsaturated fatty acids, organic acids, pectins and minerals. The pulp, skins and seeds of fruits contain lipids, which are successfully used in medical practice [4, 5].

From the berries are prepared sea buckthorn juice, marmalade, jam, filling for chocolates, jelly, jellies, sea buckthorn fruit is used for making wine, liqueurs, cordials, soft drinks, commonly used for the production of valuable medicinal products - sea buckthorn oil [6, 7].

The fruits of sea buckthorn are used to develop functional foods as a rich source of vitamin C, β-carotene, bioflavonoids, pectin and other valuable substances. Increased use of sea buckthorn fruits and leaves is of great importance for the maintenance of the population with valuable foodstuff [8, 9].

The purpose of this study is to determine the mineral composition of sea-buckthorn.

MATERIALS AND METHODS

The regional testing engineering laboratory “Scientific center of radioecological researches” has a low vacuum analytical scanning electron microscope «JSM-6390LV» from «JEOL» company (Japan) with a system of X-ray microanalysis “INCA ENERGY-250” (Great Britain) (Figure 1).

Determination of chemical elements in the food samples depends on the sample preparation of various type of foodstuff. If no moisture in the sample, so the sample could be fixed on sample holder of the microscope. Frequently, the sample is fixed with two-sided carbon adhesive tape. If the sample is wet, it must be dried. Most of the biological objects are very sensitive to the temperature expose, and the drying temperature does not exceed 60 °C.

ISSN: 0975-8585

1 – Low vacuum analytical scanning electron microscope «JSM-6390LV JEOL»; 2 – system of X-ray microanalysis «INCA ENERGY 250, OXFORD INSTRUMENTS»: 3 – microscope control panel; 4 – computer for data processing of scanning observation; 5 – computer for data processing of X-ray microanalysis; 6 – binocular microscope "Mikmed-6"; 7 – water cooler.

Figure 1: Scanning electron microscope «JSM-6390LV JEOL»

A specimen is introduced into the specimen chamber (Figure 2) by drawing out the specimen stage. The specimen holder is fitted into the dovetail on the specimen stage. The specimen holders for 10mm and 32mm diameter specimen, and the adapter for four 10mm diameter specimens are provided as standard. The maximum specimen size is 150mm diameter.

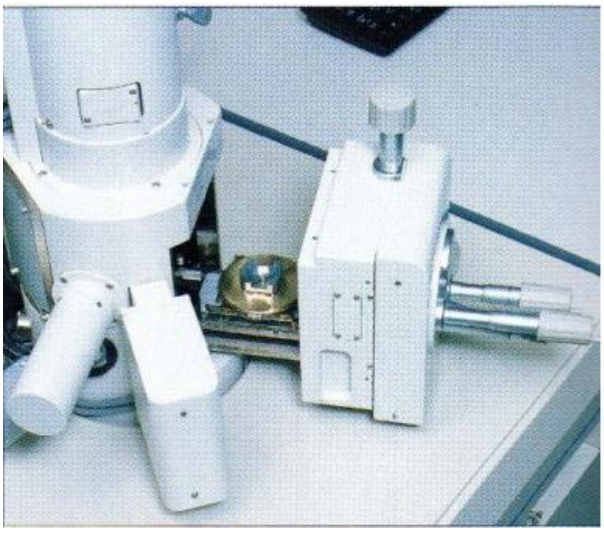

Figure 2: Chamber for specimen

For observing the structure of the biological objects is often used the substitution method. Formalinum is used in the laboratory as more accessible fixing agent. After fixation the samples storage for 3 hours in each ethanol solution of 30%, 50%, 80% and 96%.

This process helps to remove formalinum and water from the sample and fixes the tissues. Then, for removing ethanol solutions the sample put into the 50% solution of tretbytanol for one hour. After this, the

ISSN: 0975-8585

sample storage in the 100% solution of tretbytanol during 10 minutes and then put on the special dish for cooling. As a freezing temperature of tretbytanol is + 25 °C, for freezing the sample the ambient temperature is enough.

Frozen sample dried in the lyophilization dryer under the vacuum. Then, the sample evaporated with carbon or other metal, which is not allowed to accumulate electron charges on the surface of the sample and distort the image [10].

RESULTS AND DISCUSSION

Mineral composition of sea-buckthorn is presented in the table 1. The sea-buckthorn contents such minerals as Na, Mg, Al, Si, P, S, Cl, K, Ca and Fe.

Table 1: Mineral composition of sea-buckthorn (%)

Spectrum	Na	Mg	Al	Si	P	S	Cl	K	Ca	Fe
Spectrum 1	32,8	16,6	4,6	6,2	8,2	8,2	2,8	15,4	2,4	2,9
Spectrum 2	33,5	16,2	2,5	6,7	7,5	8,1	4,6	15,1	3,7	2,1
Spectrum 3	19,7	10,5	4,2	9,1	12,1	11,7	8,2	20,9	3,7	2,1
Mean	28,67	14,43	3,77	7,33	9,27	9,33	5,20	17,13	3,27	2,37

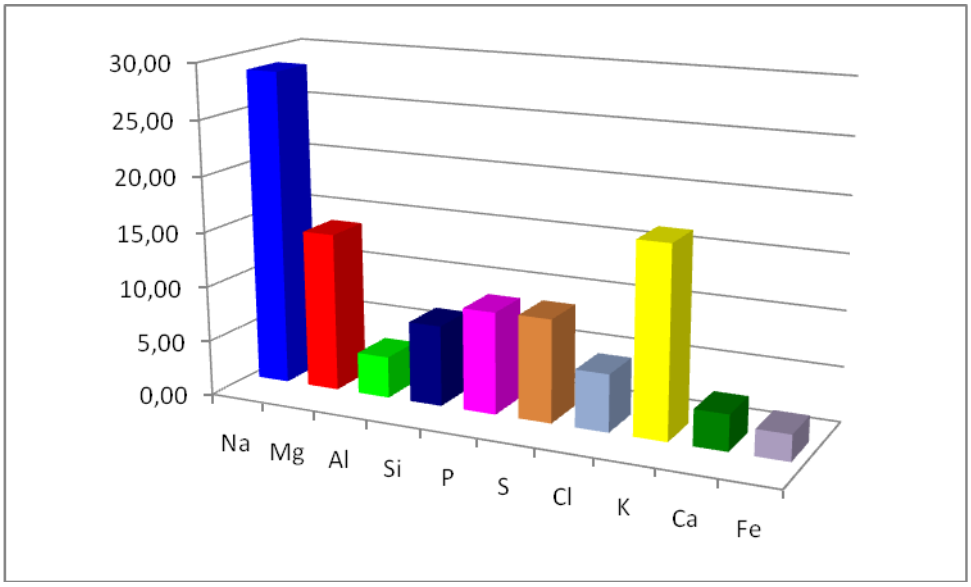

Figure 3: Chart of distribution of minerals in sea-buckthorn

According to the results (fig. 3), the major minerals of sea-buckthorn are sodium (Na, 28.67%), potassium (17.13%) and magnesium (14.43%). Next group minerals are phosphorus (P, 9.27%), sulfur (S, 9.33%) and silicon (Si, 7.33%). In small amount the sea-buckthorn contains calcium (Ca, 3.27%), iron (Fe, 2.37%), aluminum (Al, 3.77%) and chlorine (5.20%).

Minerals, contained in the sea-buckthorn, play an important role in human body. For example, potassium is the main element which regulates degree of acidity (pH) in human body. It is a basic intercellular element required for cell function. It is also important for cardiovascular, regulates heart beat, prevents risk of blood stroke and depression, fatigue and nervousness.

Phosphorus with calcium is the main structural component of bone. Phosphorus stimulates the development of a strong immune system, of strong bones and healthy teeth and it is also involved in most metabolic actions of the body, including the functioning of kidneys, the cellular growth and heart contraction. It intervenes in the assimilation of B vitamins and it is also involved in converting food into energy.

Calcium is an essential component of the prevention of osteoporosis and periodontal disease.

Involved in all stages of blood clotting in the transmission of nerve impulses, influences the processes occurring in the neuromuscular and cardiovascular systems. In combination with brewer's yeast calcium easily absorbed by the body [11].

Aluminum stimulates tissue growth, facilitates reconstruction and regeneration process, and has an effect on enzyme and digestive glands activity [12].

Iron is required for the production of red blood cells (a process known as haematopoiesis), but it's also part of haemoglobin (that is the pigment of the red blood cells) binding to the oxygen and thus facilitating its transport from the lungs via the arteries to all cells throughout the body [12].

Magnesium, is a mineral essential for the life of cells, it maintains normal the muscular and nervous function, it maintains the heart rate within physiological limits and favors the development of strong bones. It is also involved in the energy metabolism (it participates in the transformation of blood sugar into energy) and in the synthesis of proteins.

CONCLUSION

As can be seen from the above, these obtained results will be useful in further studies on developing new process scheme of sea-buckthorn in order to rational use of natural resources. Resolving these issues requires new process solutions, including new technological process and developing new equipment.

REFERENCES

[1] Kakimov M.M. Proceeding of scientific-practical conference (3-4 June, 2009). Novosibirsk State Agrarian University, - Novosibirsk, 2009: 386.
[2] Voicu A., Campeanu G., Bibicu M., Mohora A., Negoita M., Catana L., Catana M. Not. Bot. Hort. Agrobot. Cluj 2009, 37 (1):224-228.
[3] Besschetnov V.P., Nikitina G.P., Zhukov Y.V. Sea-buckthorn, briar, chokeberry. – Almaty: Kainar, 1989. – 240p.
[4] Gnusareva R.S. Trade analysis of sea-buckthorn and its derivative products. PhD-thesis. Moscow, 2005. – 160p.
[5] Dubrovin I. Healthiness sea-buckthorn. Altey Seria: All about plants. 2006. – 48p.
[6] Vinnitskaya V.F., Korschunov A.U., Briksin D.V. Bulletin of MichGau, 2013, 2:53-55.
[7] Yang BR, Kallio HP. J Agric Food Chem. 2001, 49:1939-1947.
[8] Brasovan, A., Codrea, V., Mândroc, V., Câmpean, R., Olah, N. Analele UniversităĠii din Oradea, Fascicula Biologie, 2009, Tom. XVI / 2:40-42.
[9] Isrigova T. A., Salmanov M. M., Mukailov M. D., Ulchibekova N. A., Ashurbekova T. N., and Selimova U.A. RJPBCS, 2016, 7(2):2036-2043.
[10] Kozlov V.V. Materials of the I International Kazakh-Russian-Japan scientific conference and IV Russian-Japan seninar Perspective technologies, equipments and analytical systems for material science and nanomaterials. Ust-Kamenogorsk: East-Kazakhstan State University, June 24-25 2008, p. 106-122.
[11] http://www.nelsonsnaturalworld.com/en-gb/uk/our-brands/spatone/iron-essentials/role-of-iron-in-the-body
[12] Yudina S.B. Technology of functional food. – M.: DeLi Print, 2008. – 280 p.