Journal homepage: www.fia.usv.ro/fiajournal
Journal of Faculty of Food Engineering,
Ştefan cel Mare University of Suceava, Romania
Volume XIV, Issue 3 - 2015, pag. 327 - 330

THE INTAKE OF MINERALS IN THE DIET BROUGHT BY THE CONSUMPTION OF SEA BUCKTHORN (*HIPPOPHAE RHAMNOIDES L.*) BERRIES AND JUICE

***Anca-Mihaela SIDOR[1]**
[1]Stefan cel Mare University of Suceava, Food Engineering Faculty, Romania,
anksidor@yahoo.com
* Corresponding author
Received August 26th 2015, accepted September 29th 2015

Abstract: *The main goal of this study is to quantify the intake of minerals in the diet brought by the consumption of sea buckthorn (Hippophae rhamnoides L.) in different forms: berries and juice. The relevance of the subject approached in this paper lies in the importance of the sea buckthorn as a plant with immense medicinal and therapeutic potential. The analyzed sea buckthorn fruits were collected in Botoşani County, Romania and the sea buckthorn juice was obtained trough the cold pressing of the sea buckthorn berries, followed by pasteurization. The analysis of samples was done using atomic emission in plasma coupled with mass spectrometry technique with ICP-MS Agilent Technologies 7500 Series. Five of the essential minerals – calcium, iron, magnesium, manganese, sodium, and four of the trace elements - chromium, cobalt, selenium, vanadium were determined, all of them necessary for the properly functioning of the human organism. Considering the presence of all these valuable essential minerals and oligoelements in sea buckthorn berries and juice, and from the scientific knowledge of their importance, it can be stated that sea buckthorn should be more and more used as one of the main nutritional sources in the diet.*

Keywords: sea buckthorn, essential minerals, oligoelements, nutritional source.

1. Introduction

Adequate intakes of the mineral nutrients are only obtained by following a pattern of food selection, especially the inclusion of plant foods [1].
In our "plastic" world the role of the herbs and the medical products is rising. One of the important herbs is sea buckthorn [2]. Sea buckthorn is a medicinal and aromatic plant that is both cultivated and naturally grown in various parts of the world. The distribution of sea buckthorn ranges from the Himalayan regions, including India, Nepal, Bhutan, Pakistan and Afghanistan, to China, Mongolia, Russia, Kazakhstan, Hungary, *Romania*, Switzerland, Germany, France, and Britain, and northwards to Finland, Sweden, and Norway [3].
Sea buckthorn *(Hippophae rhamnoides L.)* is widely grown all over the world for its valuable berries [4]. Sea buckthorn, an ancient crop with modern virtues has recently gained worldwide attention, mainly for its nutritional and medicinal value [5]. Medicinal applications of sea buckthorn have been well-documented since ancient times, and are still in use in Europe and Asia [6].
The sea buckthorn berries contain different kinds of nutrients and bioactive compounds including vitamins, fatty acids, free amino acids and elemental components [5].
The main goal of this study is to quantify the intake of minerals in the diet brought by the consumption of sea buckthorn (*Hippophae rhamnoides L.*) in different

forms: berries and juice. The relevance of the subject approached in this paper lies in the importance of the sea buckthorn as a plant with immense medicinal and therapeutic potential [7].

2. Materials and methods

2.1. Sample material

Fruits of sea buckthorn *(H. rhamnoides L.)* were collected in Botoșani County, Romania, GPS location: N: 47°39'44.9", E: 26°48'15.2" (fig. 1), from ten randomly selected 5-year old male and female trees, grown at a 2×3 m spacing without fertilization and irrigation. The fruits were preserved by freezing at -30°C until the analyses could be carried on.

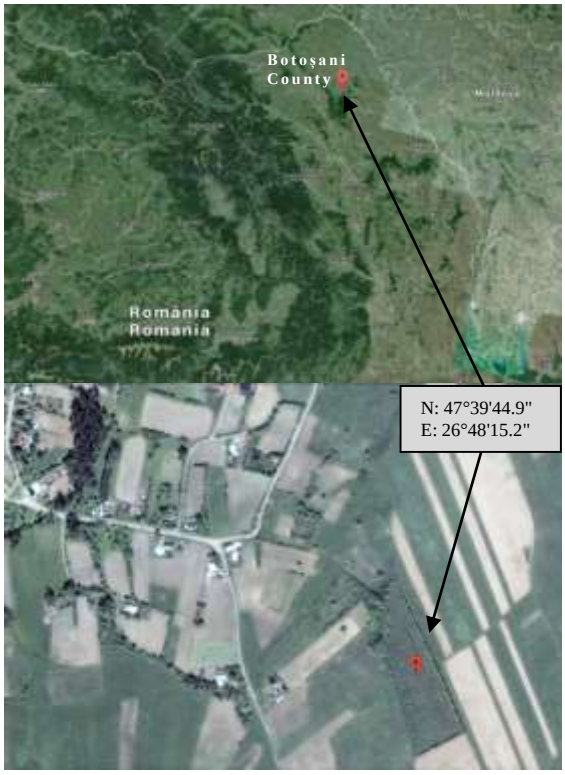

Fig. 1. The sampling area

The analyzed sea buckthorn juice was obtained trough the cold pressing of the sea buckthorn berries, followed by filtration and preservation through HTST (High Temperature Short Time) pasteurization at 82-85°C for 15 seconds. Then, the syrup was bottled in glass containers which were cooled down to 4-5°C temperature.

2.2. Sample preparation

5 grams of sea buckthorn fruits, respectively 5 grams of sea buckthorn juice, were weighed with an accurate of 0,01 g. The organic matter in the samples was destroyed by calcination in an electric furnace at a 600°C temperature for 4 hours. The resulted ash was transferred into a 50 mL volumetric flask, wherein it was dissolved using a nitric acid and deionized water solution, so that the concentration of the nitric acid in the resulting solution into the volumetric flask to be 1%.

2.3. Apparatus

Research on trace-level concentrations requires analytical techniques that are versatile, robust, of the highest sensitivity and capable of providing accurate and reliable information on concentrations and species identity. With respect to most of these criteria, determination of trace elements by ICP MS is performing extremely well and is unchallenged by other MS techniques [8]. Therefore, the analysis of samples was done using atomic emission in plasma coupled with mass spectrometry technique with ICP-MS Agilent Technologies 7500 Series device with a detection limit of 10^{-12} [9].

3. Results and discussion

Within the study, there was determined the mineral content of the sea buckthorn berries and juice: five of the essential minerals – calcium, iron, magnesium, manganese, sodium, and four of the trace elements - chromium, cobalt, selenium, vanadium (tab. 1), all of them necessary for the properly functioning of the human organism.

Tab. 1.
The mineral content (ppb) in the samples

Sample / The mineral element	Content (ppb) in sea buckthorn fruits	Content (ppb) in sea buckthorn juice
Calcium	120.000	60.000
Chromium	60.000	32.000
Cobalt	150	88
Iron	8.500	4.900
Magnesium	4.900	4.500
Manganese	7.100	3.500
Selenium	120.000	56.000
Sodium	9.900	11.000
Vanadium	270	160

Analyzing the data set obtained from the analysis of samples through the mentioned procedure, it can easily bee seen that all targeted mineral elements are present in significant proportions in both studied samples. The data presented in the table above illustrates the importance of sea buckthorn as a source of minerals for the human body. It is noteworthy the high selenium content, known for its antioxidant properties and role in boosting immunity and fertility [10]. It is also remarkable the semnificative content in calcium of the sea buckthorn, a mineral known for its role in maintaining solidity of bones in the body, but also for the functioning of nerve and muscle cells [11].

An important issue resulted after a closer examination of the data is the difference between the mineral intake brought by the seabuckthorn juice consumption compared to sea buckthorn berries consumption. It can be remarked a halving of the mineral content when processing the fruits for obtaining the sea buckthorn juice.

Besides determining the essential minerals and trace elements content, another goal of the study was to detect traces of heavy metals in the analyzed sea buckthorn samples. Therefore, it was concluded that the intake of heavy metals in the body brought by the consumption of sea buckthorn berries and juice is negligible, significantly below the maximum amount allowed by regulations (fig. 1).

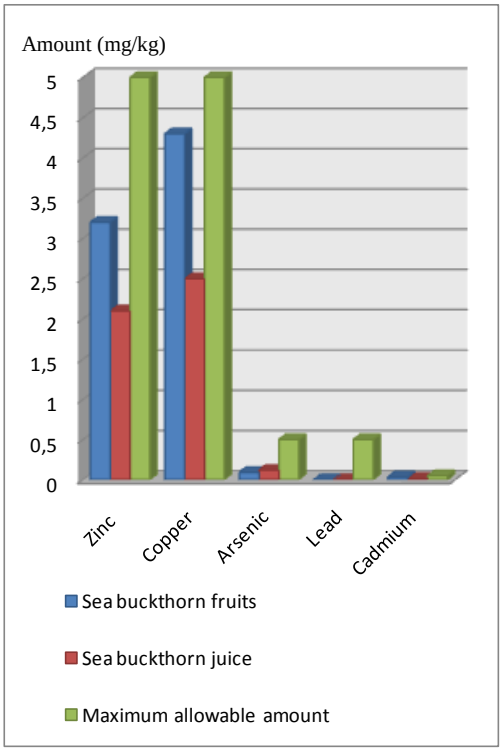

Fig. 1. The heavy metal content of the samples vs. the maximum allowable amount

4. Conclusion

In conclusion, it can be noted that the intake of minerals in the diet brought by the consumption of sea buckthorn (*Hippophae Rhamnoides L.*) berries and juice is considerable, especially by the presence of high amounts of calcium and selenium. At the same time, there are noteworthy the low heavy metals' levels in the analyzed samples.

Therefore, considering the presence of valuable essential minerals and oligoelements in sea buckthorn berries and juice, and from the scientific knowledge of their importance, it can be stated that sea buckthorn should be more and more used as one of the main nutritional sources in the diet.

5. References

[1] ANDERSON J.J.B., Nutrition of Minerals in Relation to Human Function, *Reference Module in Biomedical Sciences*, (2014).
[2] VINCZE I, BANYAI-STEFANOVITS E, VATAI G., Concentration of sea buckthorn *(Hippophae rhamnoides L.)* juice with membrane separation, *Separation and Purification Technology*,57(3): 455-460, (2007).
[3] ZEB A., Chemical and nutritional constituents of sea buckthorn juice, *Pakistan Journal of Nutrition*, 3: 99-106, (2004).
[4] GÓRNAŚ P, ŠNĒ E, SIGER A, SEGLIŅA D., Sea buckthorn *(Hippophae rhamnoides L.)* vegetative parts as an unconventional source of lipophilic antioxidants,*Saudi Journal of Biological Sciences*, *In Press, Accepted Manuscript*, (2015).
[5] BAL L. M., MEDA V., NAIK S.,SATYA S., Sea buckthorn berries: A potential source of valuable nutrients for nutraceuticals and cosmoceuticals, *Food Research International*, 44(7): 1718-1727, (2011).
[6] ZEB A., Important therapeutic uses of sea buckthorn (Hippophae); a review,*Journal of Biological Sciences*, 4: 687-693, (2004).
[7] SURYAKUMAR G., GUPTA A., Medicinal and therapeutic potential of Sea buckthorn *(Hippophae rhamnoides L.)*, *Journal of Ethnopharmacology*, 138(2): 268–278, (2011).
[8] AMMANN A.A., Inductively coupled plasma mass spectrometry (ICP MS): a versatile tool, *J. Mass Spectrom.*, 42: 419–427, (2007).
[9] AMARIEI S., GUTT G., OROIAN M., BODNAR A., Study on toxic metal levels in commercial marine organisms from Romanian market, *Ovidius University Annals of Chemistry*, 25 (2): 59-64, (2014).
[10] BURK R. F., Selenium, an antioxidant nutrient, *Nutrition in Clinical Care*, 5: 75–79, (2002).
[11] ILICH J.Z., KERSTETTER J.E., Nutrition in Bone Health Revisited: A Story Beyond Calcium, *Journal of the American College of Nutrition*, 19(6): 715-737, (2000).