ACUMULAREA SUBSTANȚELOR NUTRITIVE ÎN FRUCTELE DE CĂTINĂ ALBĂ
ACCUMULATION OF NUTRIENTS IN SEA BUCKTHORN FRUITS

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Abstract

This article presents the results obtained in a study of sea buckthorn varieties introduced in Republic of Moldova during the years: 2005; 2010; 2013. The plantation was established in 1999 by using a planting distance of 3.0 to 2.0 m and studied varieties: 'Nivelina', 'Botaniceskaya', 'Podaroc sadu', 'Trofimovskaya' and 'Otradnaya'. Our research allowed us to set the limit of variation for the values of accumulated nutrients in fruits, using the following indices: dry weight from 7.87 to 10.07%, the amount of sugar accumulated between 2.14 to 8.18%, between 1.5-4.5% titratable acidity, tannins and coloring substances from 29.10 to 83.14 mg% and the sugar / acidity coefficient from 1.15 to 4.81.

Cuvinte cheie: *Hippophae rhamnoides*, soiuri, fructe, nutrienţi
Keywords: sea buckthorn, varieties, fruits, nutrients

1. Introducere

Sea buckthorn (*Hippophae rhamnoides*), which belongs to the *Elaeagnaceae* family, is a unisexual and dioecious species, with different male and female plants. It is widespread in temperate climates of Eurasia. We encountered forms of shrub or trees with a habit of 1.5 to 3.5 m, 10-15 m with numerous strong spines. Plants are appreciated for its superior value like food, ornamental and medicinal. As underbrush herb has been recognized since antiquity. Research conducted in the area of sea buckthorn plantations Altaiului are already in the 3rd year of fruiting, and can get 10 kg / bush and harvest plantation increases with age and may reach 10-15 t / ha (Bukştînov,Trofimov et al, 1978).

This culture is widespread in Russia, being introduced into culture by the Horticulture Research Institute of Siberia in the name of MA Lisavenko who worked there for a long time. He have done much hybridization and obtained a lot of selections and now in 2011 displayed 40 varieties, including varieties with large fruits, with a small number of spines or without spines, adaptable to different climatic conditions, and for any type of soil. Sea buckthorn started to produce fruits from the 3rd year after planting and production lasts 18-20 years (V. Dadînkin, 2011).

As a result of studying the chemical composition of sea buckthorn fruits in plantations, it was found that contains twice as much vitamin C than the rose, and 10 times more than citrus. The ripe fruit content than 400-800 mg per 100g of fresh juice. Other vitamins presented in fruits are A, B1, B6, B9, E, K, P, F. Rounding cellulose, beta-carotene (a rate much higher than in carrot pulp), trace elements as phosphorus, calcium , magnesium, potassium, iron sodium complex oils, etc. (Trofimov, 1976).

In this fruit, in addition to vitamins, - accumulate different amounts of sugars - 2 to 8.7 %, organic acids - 1.16 to 3.8 %, tannins and coloring - 0.21 to 0.29 % to 15, among which trace elements manganese, boron, sulfur, aluminum, silicon, titanium, etc. Also, the varieties with yellow and orange fruits, acumulate carotenoids far fewer than in the varieties of dark orange and red colored (Ermakov, Faustov, 1983).

2. Material and methods

The underbrush of experimental set up in 1999 within the resort techno- experimental field an area of 0.20 ha with planting scheme 3.0 x 2.0 m, soil type average clay mold, non-irrigated sector. Served like a subjects the varieties: 'Nivelina', 'Botaniceskaya', 'Podaroc Sadu', 'Trofimovskaya' and 'Otradnaya' (Fig.1, 2). Experimental research on the sea buckthorn, were made during the years 2005, 2010, 2013. The aims of the researches are biometric field observations and records which are complemented by biochemical analysis and economic calculations.

3. Results and discussions

The amount of nutrients accumulated in sea buckthorn fruit depends on the variety and capabilities of the climatic conditions of the year. Research conducted to study the varieties of sea buckthorn allowed to obtain results on nutrient accumulation in fruits: solids, sugars, vitamin C, tannins and coloring and acidity, and the results are presented in Table 1.

As a result of investigations it was established that sea buckthorn cultivars studied fruits, accumulated different amounts of nutrients, which highlight the quality of the variety. For the accumulation of nutrients in sea buckthorn fruits, variety plays an important role and also, the weather conditions during the growing season.

According to the data in the table 1, the 'Botaniceskaya' variety accumulated solids with values between 7.87 (2010) and 10.07% (2013).

The amount of accumulated quantity of sugar in fruits ranged from 2.14 ('Botaniceskaya', 2013) - 8.18% ('Trofimovskaya', 2008) and according to the literature value set ranged from 4.4 to 5.7% (Bukştînov, Trofimov et all, 1978).

Fruit acidity ranged from 1.54 ('Podaroc Sadu', 2005) up to 4.52 % ('Nivelina', 2010), but according to the literature data values range from 2.0 to 3.5 % (Bukştînov, Trofimov et al, 1978).

Tannins and coloring substances accumulation ranged from 29.10 ('Trofimovskaya', 2010) -83.14 mg% ('Nivelina', 2013) compared to other geographic regions which vary in a different range, between 48 -55 % (Bukştînov, Trofimov et all, 1978).

Quantities of vitamin C determined at the studied varieties, varies between 69.52 ('Botaniceskaya' - 2010) and 117.96 mg% ('Otradnaya', 2013). The sea buckthorn fruit varieties grown in European parts of Russia accumulated an amount of vitamin C which varies between 30 -70 % (Bukştînov, Trofimov et all, 1978).

The coefficient of sugar /acid, calculated on the studied varieties, allowed us to determine the quality of sea buckthorn fruits. The results allow us to appreciate the best variety with the highest coefficient of 5.02 ('Trofimovskaya', 2005), the poor quality and the lowest coefficient of 0.55 being obtained by 'Botaniceskaya', in 2013.

Analyzing the data presented in Figure 3 was observed that the highest amount of vitamin C was accumulated in sea buckthorn fruit varieties, except the variety 'Trofimovskaia', 2013, with respective values: 99.40 mg%, 90.42 mg%, 110.0 mg% 114.40 mg% (Trofimovskaya) 117.96 mg%. Best variety 'Trofimovskaia' evidenced in 2010 with a maximum of 124.96 mg%. The lowest result was obtained by the variety 'Botaniceskaya' with an amount of of 69.52 mg% in 2010.

The ratio of sugar and acidity, calculated on the studied varieties allowed to determine the quality of sea buckthorn fruit. The results allow us to appreciate the best variety with the highest ratio of 5.02 ('Trofimovskaya', 2005) and the poor quality and the lowest coefficient of 0.55 ('Botaniceskaya', 2013).

During the research period with various climatic conditions for plant development, the fruit quality was mainly influenced by variety. Under the conditions of 2013 all studied varieties recorded higher values of accumulation of dry substances, which ranged from 8.27 to 10.27 % and from 90.42 to 117.96 mg Vitamin C %, whereas the amount of sugars accumulated was smaller than acidity. This favored obtaining a coefficient sugar / acidity lower compared with the others years of research, in a lower quality fruit taste.

4. Conclusions

According to literature data buckthorn is a species less pretentious, adaptable to different climatic conditions, any type of soil, withstand temperatures as low, withstand severe drought in temperate zones or temporary flooding, Its fruits are very precious because accumulated substances have herbal properties important in the interest of producers.

According to the results obtained in the study of varieties of sea buckthorn during the years 2005, 2010, 2013 we can say that:

Accumulation of the dried matter of variety 'Trofimovskaya' fruits reached the highest values – 9.1% and the lowest in variety 'Nivelina' - 8.2%.

The average values of the amount of sugar accumulated, peaked at variety 'Nivelina' - 5.01 % and the minimum was recorded by the variety 'Botaniceskaya' - 3.45%.

Average fruit acidity was obtained by the variety 'Nivelina' maximum - 3.2 % and 'Otradnaya' - 1.88%.

After accumulating average amount of vitamin C in fruits, stand the variety 'Trofimovskaya' -110.58 mg % and the variety 'Botaniceskaya' - 88.64 mg%.

Quality of the varieties fruits was expressed by the average sugar / acidity coefficient , which spiked the variety 'Otradnaya' - 4.81, and the variety 'Botaniceskaya' - 1.15.

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Tables and figures

Table 1. Biochemical analysis of fruits of some sea buckthorn varieties

Variety	Dry substance %	Sugars,%			Titratable acidity (%)	Tannins and coloring, mg%	Vitamin C, mg % amount	Coefficient sugar/acid mono
		amount	mono	sucrose				
Nivelina: 2005	8.30	4.90	3.20	1.62	2.33	58.20	91.10	2.10
2010	8.13	7.16	3.49	3.67	4.52	37.41	81.90	1.58
2013	8.27	2.99	2.99	0	3.06	83.14	99.40	0.97
mean	**8.20**	**5.01**	**3.20**	**1.76**	**3.30**	**59.58**	**90.80**	**1.55**
Botaniceskaya 2005	8.10	3.62	3.66	0	2.09	83.14	88.00	1.73
2010	7.87	4.60	1.60	3.00	3.92	37.40	69.52	1.17
2013	10.07	2.14	2.14	0	3.84	74.83	90.42	0.55
mean	8.68	3.45	2.46	3.00	3.28	65.12	88.64	1.15
Podaroc Sadu 2005	8.35	6.84	6.01	0.79	1.54	49.88	85.80	4.44
2010	8.06	2.50	2.50	0	4.46	54.04	85.80	1.80
2013	9.00	3.18	2.73	0.45	2.46	83.14	110.0	3.65
mean	8.47	4.17	3.74	0.41	2.82	62.35	93.72	3.00
Trofimovskaya 2005	9.45	8.18	8.18	0	1.88	49.88	92.40	5.02
2010	8.06	3.48	3.48	0	2.97	29.10	124.96	2.71
2013	9.80	3.31	3.31	0	2.58	83.14	114.40	3.79
mean	9.10	4.99	4.99	0	2.48	54.04	110.58	3.66
Otradnaya 2005	9.70	6.32	6.32	0	1.90	74.83	90.20	5.10
2010	-	-	-	-	-	-	-	-
2013	8.40	2.58	2.58	0	1.86	62.36	117.96	4.51
Mean	9.05	4.45	4.45	0	1.88	68.59	104.08	4.81
Limita variation	7.87-10.07	2.14-8.18	2.14-8.18	0-3.67	1.54-4.52	29.10-83.14	69.52-117.96	0.55-5.02

Fig.1. Otradnaya cultivar

Fig. 2. Podaroc Sadu cultivar

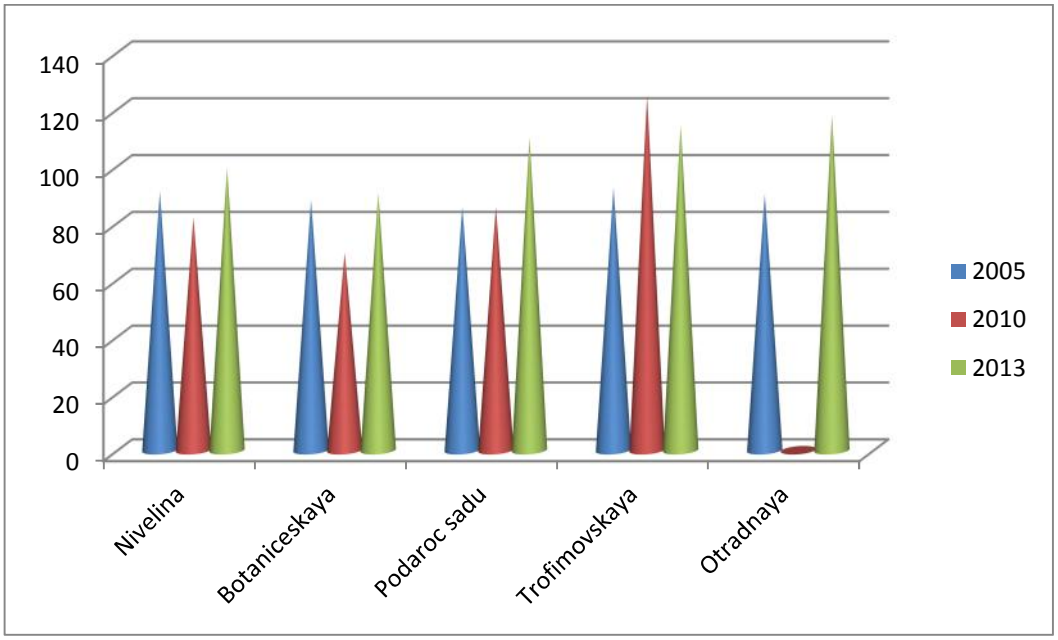

Fig. 3. Changes in vitamin C content in fruits of studied sea buckthorn varieties