

The Standardization of *Aronia melanocarpa* Fruits Growing on the Territory of Orenburg Region

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ABSTRACT

For standardization of *Aronia melanocarpa* fruits the method of direct spectrophotometry at analytical wavelength 534 nm was used¹. The optimal extraction conditions of flavonoids from fruits of *Aronia melanocarpa* Elliot. - extractant is 96% ethyl alcohol; the ratio of "raw-extractant" - 1:30; extraction time -30 min¹. The relative degree of the determination of the total flavonoids in fruits of *Aronia melanocarpa* Elliot. in used method with confidence probability 0,95 is no more than $\pm 3,64\%$. The content of total flavonoids in fruits of *Aronia melanocarpa* Elliot. varied from 1,6% to 7,5% (calculated on cyanidin-3-O-glikozid).

Keywords: *Aronia melanocarpa* Elliot., fruits, flavonoids, cyanidin-3-O-glikozid, spectrophotometry, standardization.

INTRODUCTION

Aronia melanocarpa is a deciduous shrub up to 2.5 meters with numerous branches^{2,3}. Fruits of *Aronia melanocarpa*, which are harvested after full ripening in September, are used as medicinal raw material⁴. Pharmaceutical effects of *Aronia melanocarpa* fruits are multivitamin, antihypertensive and hemostatic because of flavonoids; vitamins C, B1, B2, E, PP; tannins; organic acids and others in chemical composition⁵. Flavonoids are responsible for the main pharmacological action⁵. The fruits of *Aronia melanocarpa* are used as a multivitamin agent, and also has hypotensive, restorative and hemostatic effect⁵. Despite the fact that the birthplace of *Aronia melanocarpa* is North America⁶, this shrub widely grows in local residents' gardens in Orenburg. The technique of quantitative determination of flavonoids in fruits of *Aronia melanocarpa* by spectrophotometry method at wavelength 534 nm with using standard sample of cyanidin-3-O-glucoside¹ is described in Pharmacopoeia of the Russian Federation.

The purpose of the present research - to compare the content of flavonoids of *Aronia melanocarpa* fruits, growing on the territory of Orenburg region.

RESULTS AND DISCUSSION

Objective. Materials: industrial designs of *Aronia melanocarpa* fruits (OAO "Krasnogorleksredstva"), fruits of *Aronia melanocarpa*, made in September 2016, in the Orenburg region. Electronic spectra were measured on the UV-spectrophotometers "UNICO".

During the research of flavonoids amount in fruits of *Aronia melanocarpa* studied the UV spectra of solutions

of water-alcohol extraction from this raw material, as well as solutions of selected substances.

To quantify flavonoids samples is used the fruits of *Aronia melanocarpa* procedure developed earlier (extractant - 96% ethyl alcohol, the ratio "raw material - extractant" - 1:30, extraction time - 30 min)¹.

Research UV spectra showed that the maximum absorption of the aqueous-alcoholic extract of *Aronia melanocarpa* fruits in the wavelength region of the spectrum is at 534 +2 nm (Fig. 1). Consequently, as analytical wavelength may be used a value of 534 nm, and as the standard sample can be serve the dominant flavonoid - cyanidin-3-O-glucoside¹. In the case of the absence of this standard in the calculation formula can be used the theoretical value of the specific absorption index (= 100)¹. *A technique of quantitative definition of the total flavonoids in fruits of Aronia melanocarpa Elliot*

Analytical sample species is crushed to the size of the particles passing through a sieve with apertures in diameter of about 1 mm. 1 g chopped species (precise linkage) is placed in a flask with a grinding capacity of 100 ml and 30 ml of 96% ethyl alcohol is added. The flask is closed and weighed on calibrated scale accurate to $\pm 0,01$ g. The flask is attached to reverse refrigerator and heated on a boiling water bath (moderate boiling) within 30 minutes. Then the flask is closed with the same tube, weighed again and filled in the missing extragent to the original mass. The solution is filtered through paper filter («red» band) and cooled for 30 minutes. Tested solution is prepared in a following way: 1 ml of obtained extract is placed in a volumetric flask with a capacity of 25 ml, the volume of the solution is brought to the mark with 95% ethanol (test solution). As a solution of comparison is using the solution of 95%

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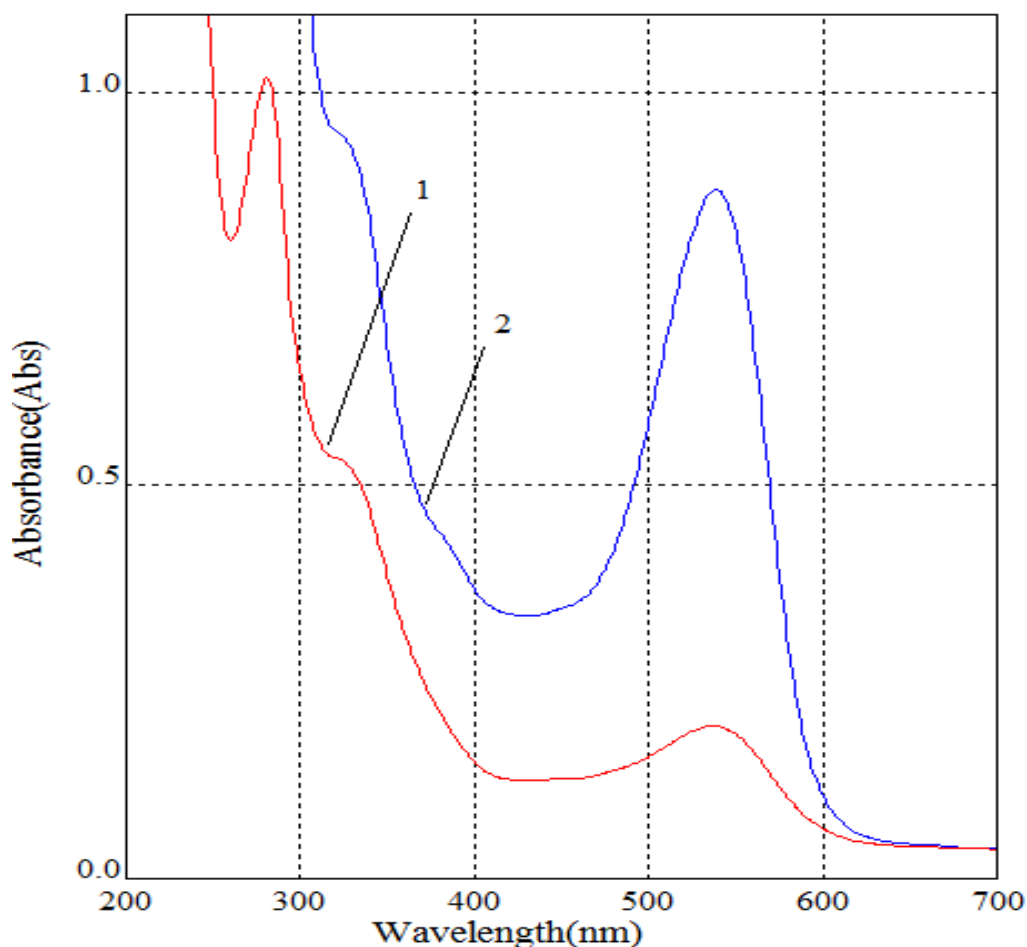


Figure 1: Electronic spectra of aqueous-alcoholic extract from the fruits of industrial designs of *Aronia melanocarpa* (OAO "Krasnogorleksredstva") (1) and aqueous-alcoholic extract from the fruits of *Aronia melanocarpa*, made in an Orenburg region (2).

Table 1: Metrological characteristics of the methods of quantitative determination of the amount of flavonoids in fruits of *Aronia melanocarpa* Elliot.:

Research objects	f	\bar{x}	S	P, %	t (P, f)	ΔX	E, %
Industrial designs of <i>Aronia melanocarpa</i> raw materials (OAO "Krasnogorleksredstva")	10	1,6	0,0289	95	$\pm 2,23$	$\pm 0,0646$	$\pm 3,89$
Raw materials of <i>Aronia melanocarpa</i> , (September 2016, Orenburg region)	10	7,5	0,1224	95	$\pm 2,23$	$\pm 0,2731$	$\pm 3,64$

ethanol with the addition of hydrochloric acid (reference solution A). Measurement of optical density of the solution is carried out on the spectrophotometer at a wavelength of 534 nm¹.

Content amount of flavonoids in fruits of *Aronia melanocarpa* in terms on cyanidin-3-O-glikozid and absolutely dry raw materials in percent (X) is calculated by the formula¹:

$$X = \frac{D * 30 * 25 * 100}{m * 330 * 5 * (100 - W)}$$

where D - optical density of the test solution;
W - loss of mass on drying in percentage;
m - the mass of raw material, g;
100 - specific absorption of the working standard sample cyanidin-3-O-glikozid.

Metrological characteristics of the methodology of quantitative measurement of the amount of flavonoids in fruits of *Aronia melanocarpa* Elliot. presented in table 1. Using the developed methods we analyzed a number of sample practical (Table 1) and determined that the content of the amount of flavonoids varies from 1,6% to 7,5%, which can be recommended as a lower limit for raw materials this plant the content of the amount of flavonoids not less than 1,6 per cent.

CONCLUSIONS

Based on the literature information of chemical researches used the standardization of *Aronia melanocarpa* Elliot. fruits, consisting in the determination of total flavonoids and by using the standard sample of cyanidin-3-O-glikozid. The method of quantitative determination of the

content of total flavonoids in *Aronia melanocarpa* Elliot. fruits was carried out by using UV-spectrophotometer at the analytical wavelength 534 nm. The research results allow to recommend a lower limit on the content of the total flavonoids in practical not less than 1,6 per cent.

REFERENCES

1. State Pharmacopeia of Russian Federation. 13 Edition. Volume 3 (2015). Pharmaceutical article 2.5.0003.15 "Fruits of *Aronia melanocarpa*", Moscow Russian Federation Available from: <http://www.femb.ru/feml> (accessed: 16 March 2017)
2. Georgievsky V.P., Komisarenko N.F., Dmitruk S.E. Biologically active substances of medicinal plants. Nauka, Sibirskoe otd.: Novosibirsk, 1990, 254-255.
3. Kurkina A.V. Flavonoids of plants of the Pharmacopoeia, Samara, 2012, 143-149.
4. Kurkin V.A. Pharmacognosy: textbook for students of pharmaceutical faculties, Edn 2, Samara, 2007, 828-840.
5. Kurkin VA Fundamentals of Phytotherapy: textbook for students of pharmaceutical universities. Samara: OOO "Ofort": GOU VPO "SamGMU Roszdrava"; 2009.
6. Murav'eva D.A., Samylina I.A., Yakovlev G.P., Pharmacognosy. Moscow, 2002, 145-148.