ACUMULAREA SUBSTANȚELOR NUTRITIVE ÎN FRUCTELE SPECIILOR ARBUSTIVE
NUTRIENTS ACCUMULATION IN FRUITS OF BERRY SPECIES

Sava Parascovia, Calaraș Cristina, Tcaci Valentina, Gherasimova Elena, Crivaia Parascovia, Vițelaru Olga
Institute of Scientific and Practical Horticulture and Food Technologies, Chisinau, Republic of Moldova

Abstract

As a result of observations and biochemical analysis of the berries made during the years 2013-2014 in Republic of Moldova, it was found that bacciferous species included in the study had a wide spectrum of colors, from white, orange, red to blue and black. The possibility to extend the consumption of fresh berries is because these species ripen in series starting with honeysuckle in May, then one by one until September: strawberry, raspberry, currant, gooseberry, barberry, jostaberry, blueberry, sea buckthorn, blackberry, chokeberry, guilder rose. Chokeberries accumulated the highest average amount of soluble solids - 18.02%, jostaberries highlighted with the highest average amount of accumulated sugars - 9.56%. Red currant highlighted with the highest acidity - 5.22%, while blueberries with low acidity - 1.43%. Rosehip has accumulated the highest average amount of tannins and coloring substances - 546.65 mg%. Rosehip berries accumulated the highest amount of vitamin C average - 292.38 mg%, the black currant - 179.69 mg%, jostaberry - 112.86 mg%, and sea buckthorn - 96.7 mg%. The highest average values of the coefficient sugar / acid certifying good qualities were found in: blueberries - 4.39, guelder rose - 3.93, gooseberry - 3.55.

Cuvinte cheie: specii, culori, maturare, arbuști fructiferi, substanțe nutritive
Keywords: species, colors, ripening, berries, nutrients

1. Introduction

Small fruits occupy a distinct place in the tree species both by biological particularities of growth and fruiting, but especially through their high complex and diverse nutrients content, in fruits, leaves, flowers and other plant organs (Mladin et all.1992). The berries with their content of nutrients with anti-radiation phytotherapeutical effects, helps to the remove of radionuclide and heavy metal salts from the body, decreases the frequency of harmful mutations, suppresses the activity of the so-called free radicals that affect the human genetic apparatus and stimulates the development of many dangerous diseases, including cancers (Cazacov, et all.,2009). Vitamins do not have much food value and do not release energy, but are necessary to achieve optimal use of essential metabolic processes. Most vitamins cannot be synthesized by the human body, so it must provide the necessary vitamins from outside. The tannin, which is contained in berries, is easily recognized by the astringent taste and has an important role in protecting mouthparts and the fight against the diseases (Gosch, 2006, 2014). The sugars that the small fruits contain are easily assimilated by the human body and are considered in some cases substitutes for diabetics (levulose from raspberry fruits). Since these are readily soluble in water, they complete quickly the glycogen reserves from the hepatic cells. Sugars, resulting in particular of fresh fruits, contribute to the regeneration of liver tissue, increasing their resistance to disease; the restored glycogen to the required level defends the liver from degeneration (Mladin et all., 1992).

2. Material and methods

The research was conducted during the years 2013-2014 at the Institute of Scientific and Practical Horticulture and Food Technologies, Chisinau, on the experimental field. As an object of study served the berries species as: strawberry (*Fragaria ananassa*), black currant (*Ribes nigrum*), red currant (*Ribes rubrum*), white currant (*Ribes niveum*), gooseberry (*Ribes uva-crispa*), jostaberry (*Ribes nidigrolaria*), blackberry (*Rubus fruticosus*), raspberry (*Rubus*

idaeum), blueberry (*Vaccinium myrtillus*), guelder rose (*Viburnum opulus*), sea buckthorn (*Hippophae rhamnoides*), chokeberries (*Aronia melanocarpa*), honeysuckle (*Lonicera aedulis*), rosehip (*Rosa canina*). The observation and analysis allowed studying the species of strawberry and fruit bushes that were conducted according to accepted methods for the fruit shrubs.

3. Results and discussions

Small fruits berries represents an important source of raw material, extremely valuable for obtaining of some natural products (juice, syrup, sweetness etc.), with raised food value. Crowd of substances contained by the fruits and the leaves of some small fruits species offers the possibility to the pharmaceutical industry to extract some natural compounds (pectins, oils, vitamins, tannins etc.) widely used in medicine and cosmetics (Botez, 1984).

The importance of the berry consummation from shrub species is unquestionably based on its phytotherapeutic qualities. The role of their chemical components is complex and diverse, but also extremely important for the human body, the amount that accumulates is under the influence of climatic conditions: temperature, rainfall, humidity (Figure 1). Research conducted on determining the nutrient content of fruits and bioactive from various shrub species allowed their comparative assessment and the results have been included in Table 1.

The bacciferous species included in the study, had a wide spectrum of colors, from the white currants and continuing with the sea buckthorn with an orange color, and with different shades of red from strawberry, red currant, gooseberries, guelder rose, rose hip, raspberry until the blue color of blueberries and honeysuckle and ending with the dark colors of black blackberry, chokeberry, the jostaberry and black currant that can comfort the eye with its decorative aspect, but can also purify the air around them and strengthen the health of human organisms with its berries.

Because of each fruit species maturation occurs in series, we are able to extend the consumption of fresh berries from honeysuckle, which ripens in the first half of May, then one by one until September with: strawberries, raspberries, currants, gooseberries, jostaberries, blueberries, sea buckthorn, blackberries and guelder rose berries.

As a result of biochemical tests on berries from the studied species was found that chokeberry was highlighted with the highest average amount of soluble solids 18.02%, (maximum 18.74%), while the lowest average amount was in strawberry 8.99%, (minimum 7.77%).

Jostaberry was highlighted with the highest average amount of accumulated sugars 9.56%, (maximum 10.36%), and red currant with the lowest average amount of sugar was 4.34%, while the minimum amount accumulated in sea buckthorn was 2.84%;

Red currant stood out with the highest average for acidity 5.22% (maximum 5.51%), and the minimum value in blueberries was 1.43%.

Rosehip stood out with the highest average amount of tannins and coloring substances of 546.65 mg%, the guelder rose with 331.52 mg%, and chokeberry with a maximum of 363.74 mg%, while the average minimum amount accumulated in raspberry is 22.17 mg%, and the minimum quantity was 20.78 mg%.

The highest average amount of vitamin C in the berries was in rosehip 292.38 mg%, black currant 179.69 mg%, (maximum 198.97 mg%), jostaberry in average 112.86 mg%,(maximum 114.40 mg%), guelder rose 105.93 mg% (maximum 116.16 mg%), sea buckthorn average of 96.7 mg%, (maximum 106.40 mg%).

The highest average values for the sugar / acid coefficient had: the blueberries 4.39, guelder rose 3.93, gooseberries 3.55, maximum gooseberries 5.27, blueberries 5.68. The lowest average of the sugar / acid coefficient proved to be on the red currant fruits 0.83.

4. Conclusions

As a result of observations and of biochemical tests on the berries it was found that: bacciferous species included in the study had a wide spectrum of colors, from white, orange, red to blue and black.

The possibility to extend the consumption of fresh berries is due to the fact that the species ripen in stages, from honeysuckle, which ripens in the first half of May, then one by one until September with: strawberries, raspberries, currants, gooseberries, gooseberries, blueberries, sea buckthorn, blackberries and guelder rose berries.

Shrub species have been highlighted after the accumulated amount of nutrients in the berries. The highest amounts were set at the soluble solids: chokeberries 18.02% guelder rose 16.85%, jostaberries15.69%, gooseberries16.47%, black currants 15.52%.

The highest amounts of sugars turned out to be in: jostaberries 9.56%, gooseberries 8.47%, blueberries 7.68%.

The highest acidity was set in red currant 5.22% and lowest in blueberries 1.43%.

Tanning and coloring substances have been highlighted in rose hips 546.65 mg% guelder rose - 331.52 mg%, chokeberries 290.99 mg%.

The highest amount of vitamin C accumulated was in rose hips 292.38 mg%, black currant 179.69 mg%, jostaberries 112.86 mg%, guelder rose 105.93 mg%, and sea buckthorn 96.7 mg%.

The sugar / acid coefficient which highlights the best qualities obtained was at highest values in blueberries 4.39, guelder rose 3.93, and gooseberries 3.55.

References

1. Botez, M., Bădescu, Gh., Botar, A., 1984. Cultura arbuştilor fructiferi, Editura Ceres, Bucureşti.
2. Cazacov, I., Aitjanova, S., Evdochimenco, S., Culaghina, V., Sazonov, F., 2009, Iagodnîe culiturî v Țentralinom Reghione Rossii, Briansc, 3-5.
3. Mladin, Gh., Mladin, Paulina,1992. Cultura arbuştilor fructiferi pe spaţii restrînse. Editura Ceres, București, 3-16.
4. Teresia, Gosch, 2006. Beeren fur den hausgarten, Osterreichischer Agraverlang Druck und Verlags G.m.b.H., Viena, Austria 88.
5. Teresia, Gosch, 2014. Arbuștii fructiferi: cultivare și îngrijire, Editura Casa, Oradea, 72-80.

Tables and figures

Table 1. Berries quality and nutrients on some bacciferous species

The name of the species	Fruit color	Ripening period	Dry substance [%]	Sugars, [%]	Titrable acidity [%]	Tannins and coloring, [mg%]	Vitamin C, [mg%]	Sugar/Acid Coefficient
Strawberry	red	II dec. Mai-						
2013		June	10.21	8.90	4.91	40.34	66.62	1.81
2014			7.77	5.41	1.58	22.06	76.12	3.42
Average			**8.99**	**7.16**	**3.25**	**31.20**	**71.37**	**2.62**
Black currant	black	II dec.June-						
2013		I dec. July	16.23	8.37	4.23	209.80	160.40	1.98
2014			14.80	6.20	4.45	140.50	198.97	1.39
Average			**15.52**	**7.29**	**4.34**	**175.15**	**179.69**	**1.69**
Red currant	red	II dec. June-						
2013		II dec. July	10.86	3.93	4.92	99.78	39.85	0.80
2014			12.50	4.74	5.51	64.40	27.06	0.86
Average			**11.68**	**4.34**	**5.22**	**82.09**	**33.46**	**0.83**
White currant	white	II dec. June-						
2013		II dec. July	-	-	-	-	-	-
2014			10.24	5.21	3.97	72.75	26.88	1.31
Average			**10.24**	**5.21**	**3.97**	**72.75**	**26.88**	**1.31**
Gooseberry	red	III dec. June						
2013		-I dec. July	17.36	10.36	2.08	78.55	38.84	5.27
2014			14.02	6.58	3.62	58.46	26.88	1.82
Average			**15.69**	**8.47**	**2.85**	**68.51**	**32.86**	**3.55**

Jostaberry 2013 2014	black	III dec. June -I dec. July	 15.93 17.00	 9.31 9.80	 2.16 5.11	 124.71 41.57	 114.40 111.32	 4.31 1.92
Average			**16.47**	**9.56**	**3.64**	**83.14**	**112.86**	**3.12**
Blackberry 2013 2014	black	III dec. July- II dec. September	 11.26 10.89	 6.45 5.36	 2.26 3.64	 51.27 65.25	 24.90 22.83	 2.88 1.47
Average			**11.08**	**5.91**	**2.95**	**58.26**	**23.87**	**2.18**
Raspberry 2013 2014	red	II dec. June- II dec. July	 11.18 9.42	 5.96 4.63	 6.09 3.81	 20.78 23.56	 32.57 32.38	 0.98 1.22
Average			**10.30**	**5.30**	**4.95**	**22.17**	**32.48**	**1.10**
Blueberry 2013 2014	blue	I dec July- III dec. August	 10.93 13.40	 7.23 8.13	 2.34 1.43	 87.30 54.86	 30.80 23.10	 3.09 5.68
Average			**12.17**	**7.68**	**1.89**	**71.08**	**26.95**	**4.39**
Sea buckthorn 2013 2014	orange	August	 9.10 9.55	 2.84 6.11	 2.76 3.09	 77.32 49.88	 106.40 87.00	 1.02 1.97
Average			**9.33**	**4.48**	**2.93**	**63.60**	**96.70**	**1.50**
Guelder rose 2013 2014	red	September	 16.20 17.50	 8.38 6.71	 1.74 2.10	 336.72 326.32	 116.16 95.70	 4.66 3.20
Average			**16.85**	**7.55**	**1.92**	**331.52**	**105.93**	**3.93**
chokeberries 2013 2014	black	August	 17.30 18.74	 7.69 6.22	 2.16 2.31	 218.24 363.74	 21.56 17.49	 3.56 2.69
Average			**18.02**	**6.96**	**2.24**	**290.99**	**19.53**	**3.13**
Honeysuckle 2013 2014	blue	Mai	 - 12.0	 - 5.74	 - 2.52	 - 83.14	 - 26.50	 - 2.27
Average			**12.0**	**5.74**	**2.52**	**83.14**	**26.50**	**2.27**
Rosehip 2013 2014	red	August- September	 - -	 - 6.48	 - 2.35	 **-** **546.65**	 **-** **292.38**	 - -
Average			**-**	**6.48**	**2.35**	**546.65**	**292.38**	**-**
Limite of variation			**7.77-18.74**	**2.84-10.36**	**1.43-6.09**	**20.78-546.65**	**9.57-292.38**	**0.8-5.68**

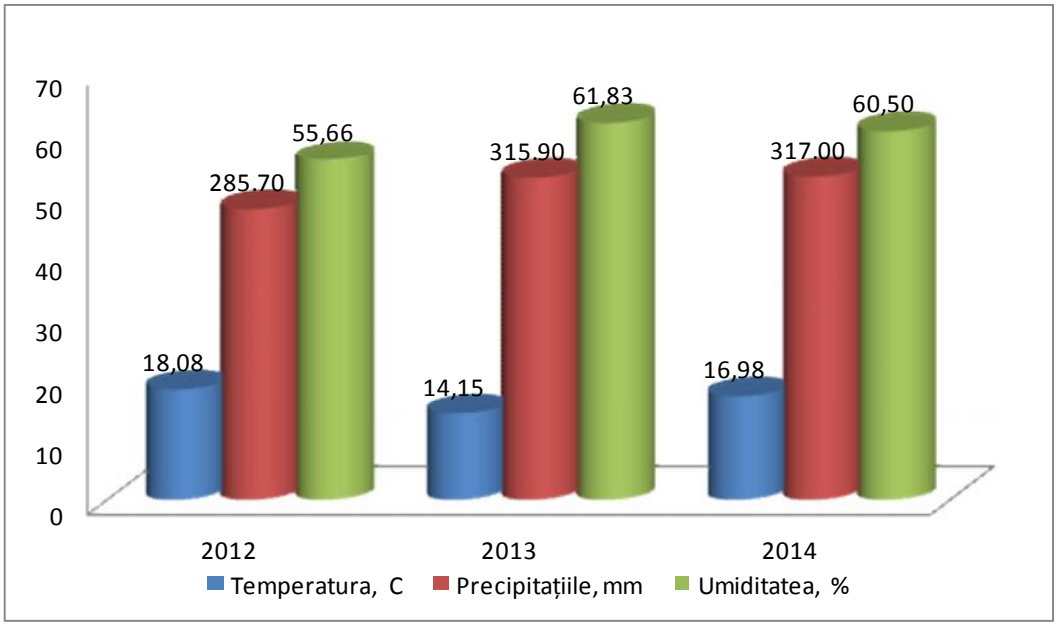

Figure 1. Climatic conditions during vegetation period, March-August, 2012-2014, Institute of Scientific and Practical Horticulture and Food Technologies, Chisinau, Republic of Moldavia