Biochemical and Technological Properties of *Rosa Canina* L. Fruits from Spontaneous Flora of Oltenia, Romania

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ABSTRACT

Rosa canina (wild rose, bush, bramble, dog rose, rosehip) is a shrub commonly encountered in the wild flora of Romania, spread from the coast up to altitudes of 1200 m (1700), with low requirements to pedoclimatic factors. From this species are used the false-fruits (*Cynosbati fructus*) mature, dried, harvested from wild flora or cultures, with food and therapeutic importance, due to their multiple properties, but mostly because of its high content of vitamin C. In this way, it were studied the germoplasm sources existent in some areas of Oltenia (Romania) to identify valuable biotypes from biochemically and technologically point of view. The results indicate a high and very high variability of the analyzed parameters. Thus, the content of TSS was recorded between 10% (B2) and 18% (M1), vitamin C varied from 53mg/100g (B3) to 563 mg /100g to populations (S1, S3) and acidity from 1.4% (B3) to 3.6% (M4). Recorded values for the mass of 100 fruit, between 117g (A1) and 286g (B3 and T4) and the percentage of pulp/100g fruit ranged from 49.2 (M1) and 66.5 (T1).

Keywords: *biodiversity, rosehips fruits, vitamin C*

INTRODUCTION

Rosa canina is a spontaneous species with multiple uses. It has been used as a rootstock for ornamental roses (Wagner, 2002; Nețoiu *et al.*, 2008; Shirdel *et al.*, 2013). Also it is one of the important medicinal (Kazaz *et al.*, 2009; Sharafi, 2010) and food plants (Kaack and Kuhn, 1991; Özcan, 2002; Șerban, 2011). In terms of the food, rosehip fruit can serve as raw material to obtain the paste, jam, marmalade for dessert soup, wine, juices, etc. (Kaack and Kuhn, 1991; Wagner, 2002; Güneş, 2010). In Hungary, rosehip fruits are used in the manufacture of brandy, in Danish markets are available the powder of dried rosehip fruit and in Sweden, the fruits are used especially in commercial soups (Gaik, 2011).

Rosehip, it can be used to prevent soil erosion and as shelterbelts or defensive fence (Nețoiu *et al.*, 2008). Some authors said that *Rosa canina* fruits are rich in vitamin C and presents benefic

effect on human health (Haas, 1995; Demir and Özcan, 2001; Mabellini *et al.*, 2011; Roman *et al.*, 2013).

Rosehip fruits also contain minerals: P, K, Ca, Fe, Cu, Mn, Zn, Na, B, flavonoids and carotenoids such as lycopene, the pigment that gives the red-orange (Demir and Özcan, 2001; Kazaz *et al.*, 2009), polyphenols (Roman *et al.*, 2013). The oil of dog rose seed contains fatty acids like oleic, linoleic, palmitic, stearic, and arachidonic (Özcan, 2002; Kazaz *et al.*, 2009).

A key priority in the global human diet is the orientation towards organic products derived from this species. By establishing ecological plantations of *Rosa canina*, production can be used as raw material contributing to the development of processors for organic products.

In other countries, rosehip is cultivated from a long time, but in Romania, recently began to setting up experimental plantations realised with

hybrid not from varieties of wild flora (Roman and Holonec, 2012).

The aim of the study is to identify some valuable genotypes from biochemical and technological point of view, from spontaneous flora sites existing in Oltenia area.

MATERIALS AND METHODS

For the study, were harvested in 2013, rosehip fruits from 24 local populations, existing in Dolj and Olt county, especially in the areas not worked for a period of over 10 years. Analyzed biotypes became from areas rich in *Rosa canina* clumps of villages: Carcea (Banu Maracine), Șimnic, Morunglav, Teslui and Argetoaia. The altitude ranged from 148 m to 191m.

Within these populations was followed the variability of some technological parameters: fruit length, fruit diameter and fruit weight. For the analyzes, 100 rosehip fruit samples were

formed and the results were statistically analyzed calculating the arithmetic mean, standard deviation and coefficient of variance (Botu and Botu, 2010). Percentage of pulp was reported to 100g fresh fruit. To determine the biochemical content were analyzed: TSS, vitamin C and acidity. The content of soluble dry substance (TSS) was determined with Abbe refractometer, titratable acidity was determined with 0.1 N NaOH in the presence of phenolphthalein as indicator and vitamin C was determined by iodometric method.

RESULTS AND DISCUSSIONS

Rosehip fruits length is a character with high variability. In the populations studied this character recorded a magnitude of variation ranging between 1.42 cm (A1) and 2.49 cm (B2). Regarding the coefficient of variation, it was between 5.37 and 18.54%, indicating variability from small to medium (Tab. 1).

Tab. 1. Values of some statistical parameters for fruits length

No.	Population/ County	$\bar{X} \pm s_x$	s	S%
Carcea (Banu Maracine)-Dolj				
1	B1	2.04 ± 0.070	0.222	10.88
2	B2	2.49 ± 0.133	0.422	16.98
3	B3	2.88 ± 0.127	0.402	13.96
4	B4	1.63 ± 0.057	0.182	11.21
5	B5	2.36 ± 0.080	0.254	10.79
Șimnic-Dolj				
6	S1	2.36 ± 0.060	0.189	8.03
7	S2	2.44 ± 0.115	0.365	14.99
8	S3	2.18 ± 0.053	0.168	7.73
9	S4	2.45 ± 0.089	0.283	11.58
10	S5	2.33 ± 0.039	0.125	5.37
11	S6	2.38 ± 0.098	0.311	13.10
12	S7	1.83 ± 0.059	0.188	10.32
Morunglav-Olt				
13	M1	1.56 ± 0.068	0.217	13.91
14	M2	2.13 ± 0.115	0.365	17.15
15	M3	2.0 ± 0.105	0.333	16.66
16	M4	1.83 ± 0.090	0.286	15.67
17	M5	1.99 ± 0.054	0.172	8.68
Teslui - Olt				
18	T1	2.36 ± 0.063	0.201	8.52
19	T2	2.31 ± 0.070	0.223	9.66
20	T3	2.11 ± 0.052	0.166	7.88
21	T4	2.46 ± 0.099	0.313	12.74
Argetoaia-Dolj				
22	A1	1.42 ± 0.068	0.214	15.14
23	A2	1.45 ± 0.070	0.222	15.33
24	A3	1.37 ± 0.080	0.254	18.54

Tab. 2. Values of some statistical parameters for fruits diameter (cm)

No.	Population/ County	$\bar{X} \pm s_x$	s	S%
Carcea (Banu Maracine)-Dolj				
1	B1	1.35 ± 0.103	0.327	24.25
2	B2	1.18 ± 0.035	0.113	9.62
3	B3	1.38 ± 0.092	0.293	21.27
4	B4	1.17 ± 0.061	0.194	16.63
5	B5	1.22 ± 0.038	0.122	10.07
Șimnic-Dolj				
6	S1	1.33 ± 0.030	0.094	7.13
7	S2	1.3 ± 0.039	0.124	9.59
8	S3	1.3 ± 0.042	0.133	10.25
9	S4	1.35 ± 0.082	0.259	19.20
10	S5	1.34 ± 0.049	0.157	11.77
11	S6	1.29 ± 0.034	0.110	8.53
12	S7	1.43 ± 0.068	0.216	15.12
Morunglav-Olt				
13	M1	1.03 ± 0.030	0.094	9.21
14	M2	1.14 ± 0.049	0.157	13.83
15	M3	0.96 ± 0.040	0.126	13.17
16	M4	0.91 ± 0.043	0.137	15.05
17	M5	1.05 ± 0.054	0.171	16.34
Teslui-Olt				
18	T1	1.33 ± 0.039	0.125	9.41
19	T2	1.23 ± 0.047	0.149	12.14
20	T3	1.33 ± 0.065	0.205	15.46
21	T4	1.44 ± 0.070	0.222	15.42
Argetoaia-Dolj				
22	A1	1.18 ± 0.046	0.147	12.50
23	A2	1.19 ± 0.064	0.202	17.01
24	A3	1.31 ± 0.070	0.223	17.05

Other works indicate values between 1.2 to 4.6 cm for some populations of wild flora in Transylvania (Roman *et al*, 2013), between 18.5 to 24.75 mm for wild flora of Moldova (Ghiorghiță *et al*, 2012) and between 1.43 to 3.02 cm for some populations of wild flora Oltenia (Sun *et al*, 2014) and the foreign literature (Van region of Turkey) are given values between 15.28 -33, 83 mm (Celik *et al*, 2009).

In the populations studied, fruits diameter ranged between 0.91 cm (M4) and 1.44 cm (T4), with a coefficient of variation low to high, respectively, from 7.13% to 24.25% (Tab. 2).

In other works are given values between 0.95 to 1.51 cm (Soare *et al*, 2014), 11.86 mm, 16.80 mm (Ghiorghiță *et al*, 2012) and from 13.11 to 19.26 mm (Celik *et al*, 2009).

Another important morphological character for productivity is the weight of the fruits. This character recorded values between 1.06 g (A1)

Tab. 3. Values of some statistical parameters for fruits weight

No.	Population/ County	$\bar{X} \pm s_x$	s	S%
Carcea (Banu Maracine)-Dolj				
1	B1	1.90 ± 0.251	0.795	41.87
2	B2	1.54 ± 0.141	0.447	29.02
3	B3	2.71 ± 0.252	0.796	29.39
4	B4	1.19 ± 0.128	0.405	34.17
5	B5	2.17 ± 0.148	0.470	21.69
Șimnic-Dolj				
6	S1	2.42 ± 0.085	0.270	11.18
7	S2	2.37 ± 0.147	0.465	19.62
8	S3	2.37 ± 0.101	0.322	13.61
9	S4	2.74 ± 0.209	0.662	24.18
10	S5	2.63 ± 0.141	0.445	16.92
11	S6	2.07 ± 0.132	0.417	20.20
12	S7	2.02 ± 0.157	0.497	24.60
Morunglav-Olt				
13	M1	1.36 ± 0.082	0.260	19.18
14	M2	1.94 ± 0.130	0.412	21.25
15	M3	1.26 ± 0.121	0.382	30.25
16	M4	1.40 ± 0.111	0.350	25.12
17	M5	1.67 ± 0.144	0.457	27.6
Teslui -Olt				
18	T1	2.40 ± 0.075	0.240	9.98
19	T2	2.23 ± 0.147	0.464	20.83
20	T3	2.29 ± 0.167	0.530	23.16
21	T4	2.92 ± 0.169	0.537	18.37
Argetoaia-Dolj				
22	A1	1.06 ± 0.046	0.146	13.832
23	A2	1.41 ± 0.183	0.578	41.17
24	A3	1.10 ± 0.040	0.127	11.59

and 2.74g (S4), showing a medium to very large variability, from 9.98% to 41.87% (Tab. 3). The differences between the values are due to differences in altitude of locations and climatic conditions. Other works indicate maximum values for this character up to 3.25 g in Transylvania (Roman *et al*, 2013), 6.1 g in Turkey (Kazankaya *et al*, 2005).

Recorded values for the mass of 100 fruits were between 117g (A1) and 286g (B3 and T4). In terms of percentage of pulp/fruit 100g, it ranged from 49.2% (M1) and 66.5% (T1). The content of soluble dry solids (TSS) determined at harvest fruits ranged between 10-18%. Vitamin C, the main biochemical component of rosehip fruit recorded values between 53 (B3) and 563 (S1 and S4) mg/100g fresh substances (Tab. 4).

Total acidity is an indicator that shows the presence of acids in fruit influencing the flavor. The populations studied recorded values between 1.4% (B3) and 3.6% (M4) (Tab. 4).

Other reports show pulp content between 40.47 and 79.98%, vitamin C content varied from 301 to 1183 mg/100g and TSS between 14.8 and 36.2% for fruits harvested in Turkey (Kazankaya *et al*, 2005).

In Romania, some studies indicate vitamin C content values between 447.37 and 573.2 mg/100g powder, fruits harvested from Danube Plain and Dobrudja (Ropciuc *et al*, 2013) and between 100 and 400 mg/100 g fresh matter for fruits harvested from Harghita and Neamt (Ghiorghiță *et al*, 2012).

CONCLUSIONS

High variability of *Rosa canina* studied characters becoming from spontaneous flora of Oltenia indicating possibilities of using this material in the works to improve the species. thus:
-From technological point of view it remarked B3 population with 2.88 cm fruit length; T4 with 1.44 cm diameter fruit; S4 with 2.74 g fruit weight and T1 with 66.5% for the pulp percentage;

-From biochemical characters were noted the populations: M1 with 18% for TSS; S1 and S3 with 563 mg/100 g fresh substances for vitamin C content and M4 with 3.6% acidity.

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Tab. 4. Average values of some technological and biochemical parameters on the rosehip populations

No.	Population/ County	100 fruit mass (g)	Pulp percentage/ 100g fruits	TSS (%)	Vitamin C (mg/ 100g f. m)	Titrate acidity (%)
Carcea (Banu Maracine)-Dolj						
1	B1	210	60.5	17	88	1.5
2	B2	179	54.7	10	75	1.6
3	B3	286	63.6	12	53	1.4
4	B4	134	52.9	17	106	1.9
5	B5	211	61.6	16	158	1.9
Şimnic-Dolj						
6	S1	257	54.8	17	563	1.7
7	S2	265	59.2	14	493	1.6
8	S3	258	60.7	15	563	1.9
9	S4	269	60.2	16	493	1.7
10	S5	260	57.0	17	475	1.9
11	S6	216	59.9	15	334	1.9
12	S7	222	63.8	16	317	1.8
Morunglav-Olt						
13	M1	134	49.2	18	387	3.5
14	M2	200	56.7	14	317	3.4
15	M3	132	50.7	17	370	3.5
16	M4	149	64.2	16	300	3.6
17	M5	160	52.6	16	264	3.5
Teslui -Olt						
18	T1	248	66.5	13	194	2.5
19	T2	241	62.7	12	141	2.3
20	T3	217	57.6	14	211	2.4
21	T4	286	58.2	14	173	2.6
Argetoaia-Dolj						
22	A1	117	50.4	15	241	2.5
23	A2	152	53.1	13	194	2.5
24	A3	118	53.6	14	176	2.4

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