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VARIABILITY OF SOME *ROSA CANINA* L. GENOTYPES FROM SOUTHERN AREA OF OLTENIA

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Abstract

The aim of this paper was to identify valuable rosehip genotypes in the southern part of Oltenia region, Romania. Selected genotypes were studied in terms of fruit morphological characteristics such as fruit height, fruit diameter, fruit weight, fruit shape index and fruit volume. The height of the fruits varied between 11.35-32.14 mm, the diameter between 9.12-18.04 mm, the weight between 0.63-4.81 g, the fruit shape index between 0.92-2.25, the volume of 100 fruits between 130.00 cm^3 and 361.54 cm^3. The coefficient of variation in terms of fruit height varied between 6.41% and 18.99%, fruit diameter between 4.93% and 8.94%, fruit weight between 11.46% and 28.04%, fruit shape index between 5.51-14.37% and fruit volume was 31.49%. Knowledge of fruit morphological characteristics is important for the selection of biotypes that can be furthered used successfully in breeding programs but also in food and medicine industry.

Key words*: dog rose, fruits, morphology, rosehips.*

INTRODUCTION

The genus *Rosa* includes over 100 species globally, widespread especially in Europe, Asia, Middle East and North America (Ercisli, 2007; Mármol et al., 2017). *Rosa canina* L., dog rose, is part of the *Rosaceae* family and is a deciduous shrub, decorative in flowers and fruits, climbing up to 2-3 m tall, with strong thorns, flowers (blooming in May - July) with 5 white or pink petals many stamens and pistils in a hypanthium and alternate serrate compound leaves. The pseudo-fruits, bright red hips resulting from thickening of the receptacle, are ellipsoidal, glabrous, edible, rich in vitamins important for human consumption. Inside the fruits are numerous hairy achenes, improperly called seeds. Dog rose can be found at the edge of forests, in fields, up to the bottom of the mountains, old pastures and at the edge of roads. Fruit species found in spontaneous flora have been used both for food and for medicinal purposes, due to their high content of bioactive compounds with antioxidant and antimicrobial action (Mármol et al., 2017; Cosmulescu et al., 2020). *Rosa canina* L. is used as a rootstock for roses, and for that, aromatic fruit genotypes with a high percentage of pulp, few thorns and numerous stems are preferred (Kazankaya et al., 2005). It is also a source of food during the cold season for many species of birds and mammals, this being the main vector of seed dispersal. In addition to being self-fertile, pollination is also made by insects. It is an unpretentious species to climatic conditions and adapts very well to almost any type of soil. Prefers sunny exposures, does not tolerate shading and the soil needs to have a good drainage. The large phenotypic adaptability of the species while many are remarkably polymorphic with different geographical biotypes have attracted the interest of many researchers (Singh et al., 2020; Stoenescu & Cosmulescu, 2020; Popa et al., 2020). The morphological characteristics have been frequently studied by many authors, and this paper aims to add information on existing biotypes found in the southern part of Oltenia region, Romania, important for both food and medicine industry and also for breeding programs of valuable genotypes.

MATERIALS AND METHODS

21 genotypes were selected for fruit harvesting taking into account the quality and quantity of fruits obtained per individual. Determinations were made regarding the maximum height of the shrub with a measuring tape, the existing stems within each genotype were counted, while the geographical coordinates and altitude were determined with GoogleEarth application. 100 carefully selected fruits from each genotype were harvested during their ripening period for morphological determinations. The height and diameter of the fruits were determined with a digital caliper (accuracy ± 0.1 mm), the weight of the fruit with the analytical balance Radwag AS220.R2, and the volume of 100 fruits was determined using a graduated cylinder. The fruit shape index (FSI) was calculated by the ratio between the fruit height (length) and the fruit diameter, and according to Brewer et al. (2006), a value higher than 1.00 indicates elongated fruits, equal to 1.00 indicates round fruits and a value lower than 1.00 indicates flattened fruits. The obtained data was processed in Excel descriptive statistics and represents the mean (X), standard deviation (SD), variation limits and coefficient of variation calculated with the formula CV% = SD/X*100.

RESULTS AND DISCUSSIONS

The phenotypic characteristics of the genotypes can be found in Table 1. All studied genotypes are classified by habit as shrubs, with many thorns, having an average height of 212.52 cm with a minimum value of 109.00 cm at genotype 19 and a maximum value of 420.00 cm at genotype 6. The number of stems ranged from 5 at genotype 17 to 27 at genotype 2 with a mean value for this characteristic of 13.52. The coefficient of variation for these two characteristics was 48.00% for the number of stems and 39.61% for the plant height. The high coefficient of variability indicates differences from one genotype to another, an aspect that can be influenced by the age of the plant, climatic conditions, land exposure, proximity to the groundwater or in some cases even the nearby watercourses. The altitude varied between 54 m and 61 m, studied genotypes being located at the edge of a forest ecosystem. Other representative fruit species located near dog rose was *Prunus spinosa* L. and *Crataegus monogyna* (L.) Jacq. Fruits are the useful part of the plant, with food and medicinal importance, therefore, their quality, expressed by morphological characteristics (size, weight) is important for the selection procedures. The morphological determinations of the fruits can be found in table 2. The height of the fruits varied between 11.35 mm corresponding to genotype 11 and 32.14 mm at genotype 20, with an average for this characteristic of 21.43 mm.

Table 1. Phenotypic characteristics of the identified *Rosa canina* L. genotypes

Genotype	Number of stems	Plant height (cm)	GPS coordinates	Altitude (m)
1	7	254	44°06'N 23°53'E	56
2	27	286	44°07'N 23°54'E	54
3	7	410	44°06'N 23°53'E	55
4	11	196		56
5	14	245		57
6	18	420		61
7	21	203	44°06'N 23°54'E	54
8	9	149		54
9	23	262		54
10	11	214		57
11	9	194		55
12	8	157		54
13	20	267		54
14	7	138		54
15	17	170		54
16	18	159	44°07'N 23°53'E	56
17	5	110		56
18	23	205		56
19	11	109		55
20	9	177	44°06'N 23°53'E	55
21	9	138	44°07'N 23°53'E	56
X±SD	13.52 ± 6.49	212.52 ± 84.20		
Variation limits	5 - 27	109.00 - 420.00		
CV%	48.00	39.61		

The fruits diameter had values between 9.12 mm at genotype 12 and 18.04 mm at genotype 20 with an average value for this parameter of 13.00 mm. The results are similar to those obtained by Demir & Özcan (2001) who had an

average fruit height of 17.29 mm and 19.68 mm and an average fruit diameter of 11.16 mm and 13.20 mm for fruits from spontaneous flora genotypes in two Turkey regions. At the same time, Kazankaya et al. (2005) reported at dog rose selections in eastern Anatolia, Turkey, values between 12.30-44.30 mm for fruit height and 10.30-26.60 mm for fruit diameter which are larger than those obtained in this study.

Table 2. Morphological characteristics of studied *rosehips* genotypes

Genotype	Descriptive statistics	Fruit height (mm)	Fruit diameter (mm)	Fruit weight (g)	Fruit shape index (FSI)	Volume/100 fruits (cm^3)
1	X±SD	23.10 ± 1.82	13.41 ± 1.01	2.26 ± 0.39	1.73 ± 0.14	180.85
	Variation limits	19.50 – 26.52	11.66 – 16.71	1.61 – 3.50	1.46 – 1.95	
	CV%	7.87	7.53	17.25	8.09	
2	X±SD	22.11 ± 2.78	12.71 ± 0.89	1.93 ± 0.39	1.74 ± 0.20	200.00
	Variation limits	17.19 – 27.28	10.87 – 15.48	1.19 – 3.14	1.38 – 2.20	
	CV%	12.57	7.00	20.20	11.49	
3	X±SD	19.20 ± 2.32	12.55 ± 0.80	1.64 ± 0.30	1.53 ± 0.16	164.00
	Variation limits	14.47 – 25.71	10.90 – 14.40	1.11 – 2.67	1.12 – 1.82	
	CV%	12.08	6.37	18.29	10.45	
4	X±SD	18.02 ± 1.86	12.65 ± 0.88	1.67 ± 0.31	1.43 ± 0.13	156.00
	Variation limits	11.78 – 21.69	10.49 – 14.68	1.12 – 2.34	0.92 – 1.80	
	CV%	10.32	6.95	18.56	9.09	
5	X±SD	19.91 ± 1.50	13.48 ± 0.94	2.06 ± 0.30	1.48 ± 0.12	137.50
	Variation limits	17.92 - 23.67	11.48 – 15.07	1.51 – 2.59	1.30 – 1.77	
	CV%	7.53	6.97	14.56	8.10	
6	X±SD	26.65 ± 1.71	14.15 ± 1.13	3.03 ± 0.58	1.89 ± 0.13	300.00
	Variation limits	23.78 – 30.72	11.92 – 16.80	2.10 - 4.32	1.62 – 2.25	
	CV%	6.41	7.98	19.14	6.87	
7	X±SD	17.89 ± 1.98	11.44 ± 0.81	1.35 ± 0.30	1.56 ± 0.12	130.00
	Variation limits	14.75 – 22.26	9.75 – 13.49	0.90 – 2.09	1.24 – 1.89	
	CV%	11.06	7.08	22.22	7.69	
8	X±SD	19.82 ± 2.41	13.31 ± 1.19	1.94 ± 0.50	1.49 ± 0.14	166.67
	Variation limits	15.74 – 25.33	11.23 – 15.94	1.23 -3.11	1.32 – 1.88	
	CV%	12.15	8.94	25.77	9.39	
9	X±SD	21.23 ± 1.51	11.75 ± 0.58	1.57 ± 0.18	1.81 ± 0.14	156.00
	Variation limits	16.59 – 24.20	10.57 – 13.35	1.16 – 2.02	1.46 – 2.08	
	CV%	7.11	4.93	11.46	7.73	
10	X±SD	25.87 ± 2.27	15.13 ± 0.85	2.87 ± 0.43	1.71 ± 0.15	300.00
	Variation limits	19.24 – 29.75	13.42 – 17.42	2.20 – 3.77	1.30 – 1.98	
	CV%	8.77	5.61	14.98	8.77	
11	X±SD	20.27 ± 3.85	12.36 ± 0.95	1.64 ± 0.46	1.67 ± 0.24	176.79
	Variation limits	11.35 - 28.04	10.43 – 15.20	1.00 – 2.89	1.02 -2.08	
	CV%	18.99	7.68	28.04	14.37	
12	X±SD	18.97 ± 2.22	11.40 ± 0.97	1.35 ± 0.33	1.65± 0.19	138.00
	Variation limits	13.56 – 24.41	9.12 – 13.52	0.63 – 2.14	0.95 – 1.93	
	CV%	11.70	8.50	24.44	11.51	
13	X±SD	20.50 ± 2.76	11.50 ± 0.80	1.48 ± 0.31	1.79 ± 0.23	137.50
	Variation limits	13.66 – 26.21	9.57 – 12.94	0.93 – 2.33	1.11 – 2.11	
	CV%	13.46	6.95	20.94	12.84	
14	X±SD	22.25 ± 1.75	13.05 ± 0.69	1.97 ± 0.25	1.71 ± 0.13	170.00
	Variation limits	18.50 – 26.08	11.20 – 14.26	1.37 – 2.47	1.37 – 1.98	
	CV%	7.86	5.28	12.69	7.60	
15	X±SD	20.17 ± 2.35	12.65 ± 1.12	1.73 ± 0.41	1.60 ± 0.18	180.00
	Variation limits	16.27 – 25.24	11.00 – 16.04	1.08 – 2.88	1.30 – 1.93	
	CV%	11.65	8.85	23.69	11.25	
16	X±SD	21.77 ± 2.54	13.11 ± 0.74	2.07 ± 0.38	1.66 ± 0.15	205.36
	Variation limits	17.00 - 27.92	11.48 – 14.79	1.46 – 2.91	1.31 – 1.97	
	CV%	11.66	5.64	18.35	9.03	

17	X±SD	21.90 ± 1.54	13.37 ± 0.94	2.19 ± 0.35	1.64 ± 0.12	225.00
	Variation limits	18.80 – 25.20	11.59 – 15.56	1.67 – 2.89	1.44 – 1.90	
	CV%	7.03	7.03	15.98	7.31	
18	X±SD	19.68 ± 1.98	13.60 ± 1.07	2.02 ± 0.45	1.45 ± 0.08	202.38
	Variation limits	16.54 – 24.35	11.42 – 15.70	1.28 – 3.07	1.28 -1.66	
	CV%	10.06	7.86	22.27	5.51	
19	X±SD	19.40 ± 2.31	12.12 ± 0.86	1.66 ± 0.36	1.60 ± 0.16	154.39
	Variation limits	14.92 – 24.78	10.18 – 13.95	0.87 – 2.81	1.30 – 1.99	
	CV%	11.90	7.09	21.68	10.00	
20	X±SD	27.02 ± 2.94	16.10 ± 0.92	3.48 ± 0.52	1.68 ± 0.19	361.54
	Variation limits	21.04 – 32.14	13.88 – 18.04	2.66 – 4.81	1.28 – 2.17	
	CV%	10.88	5.71	14.94	11.30	
21	X±SD	22.14 ± 1.73	13.78 ± 0.89	2.36 ± 0.39	1.61 ± 0.12	180.00
	Variation limits	17.90 – 25.28	12.22 – 16.59	1.77 – 3.29	1.31 – 1.85	
	CV%	7.81	6.45	16.52	7.45	
All genotypes	X±SD	21.43 ± 3.53	13.00 ± 1.53	2.01 ± 0.70	1.65 ± 0.20	191.52 ± 60.32
	Variation limits	11.35 – 32.14	9.12 – 18.04	0.63 – 4.81	0.92 – 2.25	130.00 – 361.54
	CV%	16.47	11.76	34.82	12.12	31.49

Another study with similar results to those obtained was performed by Celik et al. (2009) which reported values between 23.53-33.83 mm for fruit height and 13.11-18.40 mm for fruit diameter while Dogan & Kazankaya (2006) reported in the basin of Lake Van, Turkey an average fruit height of 20.70 mm and an average fruit diameter of 13.20 mm. Other similar results were obtained by Rosu et al. (2011) with an average fruit height of 25.00 mm in genotypes from the northeastern part of Romania, in Erzurum, Turkey, Ercişli & Eşitken (2004) had fruit height results between 23.40-34.36 mm and a fruit diameter between 15.30-21.14 mm while Šindrak et al. (2012) in a study from Zagreb, Croatia, had values in terms of fruit height between 20.40-25.30 mm and fruit diameter between 13.10-16.00 mm. Soare et al. (2015) recorded values for rosehips in Oltenia region, between 14.20 mm and 24.90 mm in terms of fruit height, and for fruit diameter between 9.10 and 14.40 mm. In another study by Soare et al. (2014) also in Oltenia region, the diameter of the fruits was between 9.50 mm to 15.10 mm and the fruit height between 14.30 mm to 30.20 mm. Roman et al. (2013) had values for rosehip fruits in Transylvania area between 12.00 mm and 46.00 mm for fruit height while Ghiorghiţă et al. (2012) recorded values for fruits in the area of Moldova between 18.50-24.75 mm for fruit height and 11.86-16.80 mm for fruit diameter. Bilgin et al. (2020) had results in terms of morphological characteristics of rosehips an average of 19.29 mm for fruit height and 11.17 mm for fruit diameter while Ancu et al. (2012) had maximum values for genotypes from Pitesti, Romania of 26.80 mm for fruit height and 19.36 mm for fruit diameter. The weight of the fruits varied between 0.63 g corresponding to genotype 12 and 4.81 g in genotype 20 with an average of studied genotypes of 2.01 g. Kazankaya et al. (2005) reported, for rosehip selections higher values between 1.02-6.10 g for fruit weight and also mentions values close to those studied in this paper in other Turkey regions, of 1.65-5.49 g in Gumushane, 1.28-2.20 g in Izmir, 0.82-2.22 g in Bursa, 1.74-3.99 g in Gevas and Ahlat and 0.60-4.95 g in other areas. Similar values for fruit weight are mentioned by Celik et al. (2009) with 2.60-4.95 g and Chrubasik et al. (2008) between 1.25 g and 3.25 g. Another study by Dogan & Kazankaya (2006) reports rosehips with an average weight of 2.35 g, a value similar to the average obtained in this study. Ercişli & Eşitken (2004) had values between 3.64-4.62 g, Šindrak et al. (2012) between 1.88 g and 2.96 g, Soare et al. (2015) between 1.06 g and 2.74 g, Roman et al. (2013) up to 3.25 g, and 1.24 g for fruit weight studied by Bilgin et al. (2020). Ancu et al. (2012) had maximum values at studied genotypes of over 3.7 g in terms of fruit weight. The morphological results of the studied fruits are similar to the representative values of the *CAN* variety which has fruits of 2.4-3.4 g, with a height of 23.00-32.00 mm and a diameter of 12.00-17.00 mm. The fruit shape index had limits of variation between 0.92 at genotype 4 meaning slightly flattened round fruits and 2.25 at genotype 6 with an average value of all genotypes of 1.65

which indicates elongated fruits according to Brewer et al. (2006) classification. Similar values were obtained by Dogan & Kazankaya (2006) with 1.63 and Šindrak et al. (2012) with values between 1.48 and 1.86. The volume of 100 fruits varied between 130.00 cm^3 at genotype 7 and 361.54 cm^3 at genotype 20, with an average value for all studied genotypes of 191.52 cm^3. The coefficient of variation in terms of fruit height varied between 6.41% at genotype 6 and 18.99% at genotype 11, with 16.47% value for all genotypes. Similar values were obtained by Soare et al. (2015) with a coefficient of variation between 5.37% and 18.54% for this characteristic. The diameter of the fruits had a minimum CV% of 4.93% at genotype 9 and a maximum of 8.94% at genotype 8, and the value of all genotypes was 11.76% while Soare et al. (2015) obtained higher values with a coefficient of variation between 7.13% and 24.25% for this characteristic. In terms of fruit weight, the coefficient of variation was between 11.46% in genotype 9 and 28.04% in genotype 11 with a CV % corresponding to the studied genotypes of 34.82% which indicates a high variability within individuals. Similar values were obtained by Soare et al. (2015) with a CV% for this characteristic between 9.98% and 41.87%. The fruit shape index had a coefficient of variation between 5.51% in genotype 18 and 14.37% at genotype 11, with a value of all genotypes of 12.12%. The volume of fruits registered a coefficient of variation of 31.49% among the studied genotypes. The determination of the coefficient of variation for all studied morphological characteristics indicates a degree of variability within the genotypes. In order to establish the relationships between these characteristics, coefficient correlations were calculated (Table 3).

Table 3. Determination coefficient (R^2) and correlation (r) between the analyzed morphological parameters

Fruit morphological parameters	R^2	r
Diameter – Weight	0.859	0.927
Height - Weight	0.723	0.850
Height - Diameter	0.473	0.688

A positive correlation is between the fruit diameter and fruit weight with r = 0.927 and R^2 = 0.859 which means that the diameter of the fruits influences their weight in a fairly large percentage (85.9%). Regarding the correlation between fruit height and fruit weight, the correlation coefficient had a value of r = 0.850 and R^2 = 0.723 while between the height of the fruits and their diameter was r = 0.688 and R^2 = 0.473. It turns out that the size of the fruit influences their weight in high percentage (72.3-85.9%).

CONCLUSIONS

In conclusion, the degree of variability of the rosehip genotypes identified in the southern area of Oltenia presents fruits with intermediate values compared to those identified in the literature, which highlights the genetic diversity of this species. Using this diversity, valuable genotypes can be selected for their fruits morphological characteristics important in food and medicine, but also biotypes with representative features for breeding programs in order to obtain new varieties or improve the existing ones.

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REFERENCES

Ancu, I., Mladin, G., Nuta, A., Sturzeanu, M., Ancu, S., Butac, M., & Militaru, M. (2012). The study of native small fruits biotypes. *Fruit Growing Research*, 28(1).

Bilgin, N. A., Mısırlı, A., Şen, F., Türk, B., & Yağmur, B. (2020). Fruit Pomological, Phytochemical Characteristic and Mineral Content of Rosehip Genotypes. *International Journal of Food Engineering*, *6*(1), 18-23.

Brewer, M. T., Lang, L., Fujimura, K., Dujmovic, N., Gray, S., & Van der Knaap, E. (2006). Development of a controlled vocabulary and software application to analyze fruit shape variation in tomato and other plant species. *Plant physiology*, *141*(1), 15-25.

Celik, F., Kazankaya, A., & Ercisli, S. (2009). Fruit characteristics of some selected promising rose hip (Rosa spp.) genotypes from Van region of Turkey. *African Journal of Agricultural Research*, *4*(3), 236-240.

Cosmulescu, S. N., Trandafir, I., Scrieciu, F., & Stoenescu, A. M. (2020). Content in organic acids of

Mespilus spp. and Crataegus spp. genotypes. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, *48*(1), 171-176.

Chrubasik, C., Roufogalis, B. D., Müller-Ladner, U., & Chrubasik, S. (2008). A systematic review on the Rosa canina effect and efficacy profiles. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, *22*(6), 725-733.

Demir, F., & Özcan, M. (2001). Chemical and technological properties of rose (*Rosa canina* L.) fruits grown wild in Turkey. *Journal of food engineering*, *47*(4), 333-336.

Doğan, A., & Kazankaya, A. (2006). Fruit Properties of Rose Hip Species Grown in Lake Van Basin (Eastem Anatolia Region), *5*(1), 120-122.

Ercisli, S. (2007). Chemical composition of fruits in some rose (Rosa spp.) species. *Food chemistry*, *104*(4), 1379-1384.

Ercişli, S., & Eşitken, A. (2004). Fruit characteristics of native rose hip (*Rosa* spp.) selections from the Erzurum province of Turkey. *New Zealand Journal of Crop and Horticultural Science*, *32*(1), 51-53.

Ghiorghita, G., Antohe, N., Rati, I. V., & Maftei, D. E. (2012). The study of some parameters of Rosa canina L. genotypes from different native populations and from the same population. *Analele Stiintifice ale Universitatii" Al. I. Cuza" din Iasi*, *58*(1), 19-27.

Kazankaya, A., Turkoglu, N., Yilmaz, M., & Balta, M. F. (2005). Pomological description of *Rosa canina* selections from Eastern Anatolia, Turkey. *International Journal of Botany*, *1*(1), 100-102.

Mármol, I., Sánchez-de-Diego, C., Jiménez-Moreno, N., Ancín-Azpilicueta, C., & Rodríguez-Yoldi, M. J. (2017). Therapeutic applications of rose hips from different Rosa species. *International journal of molecular sciences*, *18*(6), 1137.

Popa, B., Roman, M., Petre, E., Cosmulescu, S., & Stoenescu, A. M. (2020). Software Tools to Manage and Simulate Information from the Natural Environment. In *2020 21th International Carpathian Control Conference (ICCC)*,1-6.

Roman, I., Stănilă, A., & Stănilă, S. (2013). Bioactive compounds and antioxidant activity of Rosa canina L. biotypes from spontaneous flora of Transylvania. *Chemistry Central Journal*, *7*(1), 1-10.

Rosu, C. M., Manzu, C., Olteanu, Z., Oprica, L., Oprea, A., Ciornea, E., & Zamfirache, M. M. (2011). Several fruit characteristics of *Rosa* sp. genotypes from the Northeastern region of Romania. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, *39*(2), 203-208.

Singh, K., Sharma, Y. P., & Gairola, S. (2020). Morphological characterization of wild *Rosa* L. germplasm from the Western Himalaya, India. *Euphytica*, *216*(3), 1-24.

Šindrak, Z., Jemrić, T., Baričević, L., Dovedan, I. H., & Fruk, G. (2012). Fruit quality of dog rose seedlings (*Rosa canina* L). *Journal of Central European Agriculture*, *13*(2), 321-330.

Soare, R., Iancu, P., Soare, M., Bonea, D., Mandrila, G., & Ovidiu, P. (2014). Morphological and biochemical issues to some *Rosa canina* L. populations from the spontaneous flora from south-west Romania. In *14th International Multidisciplinary Scientific Geoconference SGEM 2014*, 435-442.

Soare, R., Bonea, D., Iancu, P., & Niculescu, M. (2015). Biochemical and technological properties of *Rosa canina* L. fruits from spontaneous flora of Oltenia, Romania. *Bulletin UASVM Horticulture*, *72*(1), 182-186.

Stoenescu, A. M. & Cosmulescu, S. N. (2020). Variability of morphological characteristics in hawthorn (*Crataegus monogyna* L.) fruit genotypes. *South-Western Journal of Horticulture, Biology & Environment*, *11*(1), 15-26.