

GENETIC RESOURCES FOR SWEET AND SOUR CHERRY BREEDING *EX SITU* COLLECTED

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Abstract

The aim of this paper were to evaluated of some autochthonous sweet and sour cherry genotypes in the Romanian North Eastern area conditions. In period 2016-2017 studies were done, having as research material that eight sweet cherry ('Amar Adamache', 'Amar 15 Iași', 'Crăiești de Camarna', 'Perișoare de Comarna', 'Pletos de Camarna', 'Iosifan', 'Bălăi timpurii' and 'Amar Mărculești') and seven sour cherry genotypes ('Mocănești 104/24', 'Mocănești 32/20', 'Focșani 3', 'Suraia', 'Crișane 11/6', 'Bizighești' and 'Selecția Cotea') which were in *ex situ* collected. The climate factors, frost resistance expressed in percent from total sectional buds, phenological stages, fruit, peduncle and stone features were analyzed. In the climate conditions of the studied years, the smallest fruit of the sweet cherry genotypes showed 'Amar Mărculești' (1.87 g) while the largest one was 'Iosifan' (7.85 g). Smallest fruit of the sour cherry genotypes showed 'Mocănești 32/20' (4.51 g) while the largest one was 'Mocănești 104/24' (6.72 g). Stone range between 0.24 g ('Amar Adamache') to 0.37 g ('Amar Mărculești') at studied sweet cherry genotypes while at sour cherry genotypes range between 0.28 g ('Mocănești 104/24' and 'Crișane') to 0.38 g ('Mocănești 32/20').

Keywords: cultivar, frost, fruit, phenology, pit.

1. INTRODUCTION

Sweet and sour cherry tree are fruit-growing species with great economic importance, given by the nutraceutical features as antioxidant capacity, sugars and vitamins content (Webster and Looney, 1996; Do et al., 2005; Melicháčová et al., 2010; Hallmann and Rozpara, 2017; Quero-García et al., 2017) but also for technological and commercial features of the fruits (Grădinariu and Istrate, 2003; Tănăsescu, 2005). Autochthonous genotypes of sweet and sour cherry tree are important source of genetic variability and valuable material for breeding work (Demisoy and Demirsoy, 2004; Pérez-Sánchez et al., 2008; Radičević et al., 2012; Bostan and Turan, 2015). At RSFG Iasi sweet and sour cherry collections was established in 1980 and respectively 2000, Iasi area being very suitable in terms of climate and soil conditions to maintain cherry genotypes. The collections from RSFG Iasi consists of 560 sweet cherry and 112 sour cherry genotypes from autochthonous or foreign assortment being carefully improve with new achievements year by year.

The aim of this paper was to evaluate of some autochthonous sweet and sour cherry genotypes in the Romanian North Eastern area conditions.

1. MATERIALS AND METHODS

Research was conducted during 2016-2017 eight sweet cherry ('Amar Adamache', 'Amar 15 Iași', 'Crăiești de Comarna', 'Perișoare de Comarna', 'Pletos de Comarna', 'Iosifan', 'Bălăi timpurii' and 'Amar Mărculești') and seven sour cherry genotypes ('Mocănești 104/24', 'Mocănești 32/20', 'Focșani 3', 'Suraia', 'Crișane 11/6', 'Bizighești' and 'Selecția Cotea') which were in *ex situ* collected.. The fruit growing trees can be found in the experimental plot, grafted on *P. avium* L. as seedlings rootstock and planted at a distance of 5 x 4 m, with free flattened palmette crown on the direction of the trees row, with sustaining system but no irrigation system. On the row with trees, the soil was worked with the lateral disk with feeler and between the trees rows the grass was mown several times during summer.

Some parameters related to phenological stages, tree and fruit characteristics were determined. Phenological data were determined through the Fleckinger system (Fleckinger, 1960; Baggiolini, 1980): C - the top of the bud has opened and the individual flower buds are visible; E - the beginning of the flowering: the flowers are open for 5%; G - the end of the flowering: the petals of flowers have fallen for 90%. Characteristics of fruit, stone and stalk were determined on a sample of 100 fruits for each cultivar using a digital calliper (Loomytools type) for dimensions determinations and an high precision balance (Radwag, 0.01 sensivity) for weight determinations. Soluble solids content was determined using a refractometer Zeiss on samples of 15 fruits in three repetitions.

The statistical analysis was performed with the XLSTAT programme, the differences between cultivars being determined by the average of samples, standard deviation and coefficient of variation.

2. RESULTS AND DISCUSSIONS

Phenological data of sweet cherry genotypes *ex situ* collected as average for period 2016 – 2017 at RSFG Iasi, Romania are presented in table 1. Bud burst since March 28th ('Amar 15 Iași') and continue till March 30th ('Amar Adamache', 'Crăiești de Comarna', 'Iosifan' and 'Bălăi timpurii'). Beginning of blossom started at April 4th ('Amar 15 Iași', 'Perișoare de Comarna', 'Iosifan' and 'Amar Mărculești') and continue till April 7th ('Bălăi timpurii') but end of blossom was register between April 11th – 19th. Blossom period for studied sweet cherry genotypes register 7-16 days as average for two years (table 1). Anyway, period of blossom is strong influenced by climate and that made so different percentage of pollination of every year (Radičević et al., 2011; Tooke and Battey, 2010). Ripening time started from June 9th ('Bălăi timpurii') and was ended at June 16th ('Perișoare de Comarna', 'Iosifan' and 'Amar de Mărculești'), all studied sweet cherry genotypes being from medium season maturation. Period from bud burst to ripening time range between 71 days ('Bălăi timpurii') to 80 days ('Amar 15Iași', 'Perișoare de Comarna' and 'Amar Mărculești') with an average of 78 days but non-significant coefficient of variation (3.84) (table 1).

For sour cherry genotypes bud burst since March 27th ('Selecția Cotea') and during till April 1st ('Mocănești 32/20') but beginning of blossom during between April 5th ('Suraia') to April 8th ('Focșani 3' and 'Bizighești') (table 1). End of blossom range between April 11th ('Mocănești 104/24') to 24th ('Selecția Cotea').

Blossom period of studied sour cherry genotypes range between 6 to 19 days with an average of 13 days and a medium variability (coefficient of variation 35.23%) (table 1). Ripening time was in early season between June 12th ('Focșani 3') to June 16th ('Mocănești 32/20' and 'Mocănești 104/24'). Period from bud burst to ripening time of sour cherry genotypes registered an average of 78 days (table 1).

Analyses of frost showed a good resistance of all studied sweet and sour cherry genotypes (table 2) but climate of 2016 and 2017 winter was quite warmly with minimum temperatures -21°C just for two days in February 2017 and some problem of snowing in April 2017 but no significant damages registered.

Table 1. Phenological data of sweet and sour cherry genotypes ex situ collected (average 2016 – 2017, RSFG Iasi, Romania)

Cultivar	Phenologie					Bud burst-ripening time (days)
	Data of bud burst Stage C*	Date of beginning of blossom Stage E	Date of end of blossom Stage G	Blossom period (days)	Ripening time	
Sweet cherry genotypes						
Amar Adamache	30.03	6.04	12.04	7	15.06	78
Amar 15 Iași	28.03	4.04	11.04	8	14.06	80
Crăiești de Comarna	30.03	6.04	12.04	7	15.06	78
Perișoare de Comarna	29.03	4.04	15.04	12	16.06	80
Pletos de Comarna	29.03	6.04	15.04	10	14.06	79
Iosifan	30.03	4.04	19.04	16	16.06	79
Bălăi timpurii	30.03	7.04	17.04	11	9.06	71
Amar Mărculești	29.03	4.04	15.04	12	16.06	80
Average				10.38	-	78.13
STDEV				3.07	-	2.99
Coefficient of variation (%)				29.57	-	3.84
Sour cherry genotypes						
Focșani 3	30.03	8.04	20.04	13	12.06	74
Mocănești 32/20	1.04	8.04	15.04	8	16.06	77
Suraia	29.03	5.04	19.04	15	14.06	78
Mocănești 104/24	28.03	6.04	11.04	6	16.06	81
Crișane 11/6	29.03	5.04	20.04	16	14.06	78
Bizighești	30.03	8.04	23.04	16	15.06	78
Selecția Cotea	27.03	6.04	24.04	19	13.06	78
Average				13.29	-	77.71
STDEV				4.68	-	2.059
Coefficient of variation (%)				35.23	-	2.65

*- Phenological stages: C - the top of the bud has opened and the individual flower buds are visible; E - the beginning of the flowering: the flowers are open for 5%; G - the end of the flowering: the petals of flowers have fallen for 90%.

In table 3 are presented characteristics as average of 2016 and 2017 of fruit, peduncle and kernel of *ex situ* collected sweet cherry autochthonous genotypes at RSFG Iași.

Dimension features of fruit at sweet cherry as average of all eight studied genotypes were 17.92 mm width, 15.93 mm thickness and 17.39 mm as length, besides at sour cherry of all seven genotypes were 20.99 mm width, 19.98 mm thickness and 17.29 mm as length (table 3) with a low coefficient of variation (range between 5.25% to 16.03%). But fruit mass (g) of sweet cherry genotypes range between 1.87 g ('Amar Mărculești') to 7.85 g ('Iosifan') with large variability (coefficient of

variation 57.56%). Our results were according with other similar studies at sweet cherry genotypes (Bardhosh et. al., 2010; Vokurka et al., 2014).

Table 2. Frost resistance at sweet and sour cherry genotypes ex situ collected (average 2016 – 2017, RSFG Iasi, Romania)

Genotypes	Position in collection	Number trees existent	Buds analyzed	Frost damaged	
				Buds	%
Sweet cherry genotypes					
Amar Adamache	R49PIP2-5	4	52	1	1.92
Amar 15 Iași	R1PIIP10	1	36	1	2.78
Crăiești de Comarna	R44PIIP9-10	2	56	0	0
Perișoare de Comarna	R44PIIP1-3	3	45	0	0
Pletos de Comarna	R46PIIP1-3	3	32	0	0
Iosifan	CSR24P12	1	50	0	0
Bălăi timpurii	R4PIIP1-3	3	50	0	0
Amar Mărculești	R6PIIP1-3	3	50	0	0
Sour cherry genotypes					
Focșani 3	R10PIILP2	1	46	0	0
Mocănești 32/20	R3PISP12-14	3	54	0	0
Suraia	R6PIILP4-6	3	48	0	0
Mocănești 104/24	R7PIILP9-11	3	52	1	1.92
Crișane 11/6	R11PIILP4-6	3	50	0	0
Bizighești	R7PIILSP16-20	5	50	0	0
Selecția Cotea	CCCR6P1-30	30	50	0	0

Table 3. Characteristics of fruit, peduncle and kernel of ex situ collected sweet cherry autochthonous genotypes (RSFG Iasi, 2016-2017)

Genotypes	Fruit					Peduncle	Stone			
	D (mm) ¹	d (mm) ²	H (mm) ³	Mass (g)	SSC (%) ⁴	L (mm)	D (mm)	D (mm)	H (mm)	Mass (g)
Amar Adamache	16.97	15.31	14.85	2.6	21	44	7.85	6.26	8.5	0.24
Amar 15 Iași	18.64	15.44	18.19	3.29	16.8	40	8.08	6.82	11.16	0.33
Crăiești de Comarna	17.3	15.9	17.26	2.63	20	39	7.51	5.68	8.32	0.20
Perișoare de Comarna	17.8	16.1	17.1	2.56	19	41	7.8	5.91	8.78	0.28
Pletos de Comarna	16.8	15.26	16.25	2.56	18.5	40	7.52	5.86	8.24	0.21
Iosifan	23.93	20.72	23.62	7.85	19	42	9.14	7.02	10.23	0.29
Bălăi timpurii	18.21	16.06	17.06	2.88	22	42	8.21	6.29	9.69	0.26
Amar Mărculești	13.68	12.65	14.75	1.87	24	38	9.4	6.99	10.28	0.37
Average	17.92	15.93	17.39	3.28	20.04	40.75	8.19	6.35	9.4	0.27
STDEV ⁵	2.86	2.23	2.79	1.89	2.25	1.91	0.71	0.53	1.09	0.06
Coefficient of variation s%	15.96	14.00	16.03	57.56	11.24	4.68	8.71	8.37	11.62	21.29

¹- Width; ²- Thickness; ³- Length; ⁴- Soluble solids content; ⁵- Standard deviation.

Fruit mass (g) of sour cherry genotypes range between 4.11 g ('Suraia') to 6.72 g ('Mocănești 104/24') with less variability (coefficient of variation 18.64%) than studied sweet cherry genotypes (table 4). Peduncle length range between 38 mm ('Amar Mărculești') to 44 mm ('Amar

Adamache') at sweet cherry genotypes with a coefficient of variation 4.68% but range between 38 mm ('Mocănești 104/24') to 49 mm ('Selecția Cotea') with a coefficient of variation 8.18% (table 4). As stone dimensions we registered low variability at both sweet (8.37-11.62 %) and sour (5.72-6.23%) cherry genotypes (table 4). Mass of stone range between 0.2 g to 0.37 g at studied sweet cherry genotypes and 0.28 g to 0.38 g at sour cherry genotypes (table 4).

Table 4. Characteristics of fruit, peduncle and kernel of ex situ collected sour cherry autochthonous genotypes (RSFG Iași, 2016-2017)

Genotypes	Fruit					Peduncle	Stone			
	D (mm) ¹	d (mm) ²	H (mm) ³	Mass (g)	SSC (%) ⁴	L (mm)	D (mm)	d (mm)	H (mm)	Mass (g)
Focșani 3	19.75	18.21	15.72	4.22	14	41	8.32	6.81	10.1	0.32
Mocănești 32/20	20.08	18.55	16.84	4.51	15	42	8.95	7.32	10.7	0.38
Suraia	19.56	18.12	15.68	4.11	14	43	8.22	6.75	9.84	0.31
Mocănești 104/24	23.71	21.01	19.37	6.72	15.6	38	9.28	7.81	9.42	0.28
Crișane 11/6	21.08	18.7	17.77	5.2	20	46	8.47	6.7	9.23	0.28
Bizighești	21.03	18.83	17.76	4.91	16.6	44	8.56	6.72	9.42	0.31
Selecția Cotea	21.72	19.45	17.88	5.88	18.6	49	9.53	7.41	8.91	0.34
Average	20.99	18.98	17.29	5.08	16.26	43.29	8.76	7.07	9.66	0.32
STDEV ⁵	1.44	0.99	1.32	0.95	2.30	3.55	0.50	0.44	0.60	0.04
Coefficient of variation s%	6.84	5.25	7.61	18.64	14.17	8.19	5.72	6.20	6.23	11.03

¹- Width; ²- Thickness; ³- Length; ⁴- Soluble solids content; ⁵- Standard deviation.

4. CONCLUSIONS

The climate conditions have influenced the duration of the phenological stages of different genotypes of sweet and sour cherry. 'Iosifan' as sweet cherry genotype and 'Mocănești 104/24' as sour cherry genotype showed great fruit size being suitable for breeding works. 'Amar Mărculești' and 'Crișane 11/6' showed greatest values of soluble solids content being a very good choices for production fruits destined processing as compote but also for fresh consumption.

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