

EVALUATION OF SWEET AND SOUR CHERRY CULTIVARS USEFUL IN GENETIC IMPROVEMENT

EVALUAREA UNOR SOIURI DE CIREȘ ȘI VIȘIN UTILE ÎN AMELIORAREA GENETICĂ

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Abstract. During 1999-2014 at RSFG Iasi were approved 28 new sweet cherry cultivars from which 25 with sweet taste and three with bitter taste. The sour cherry have been approved and patented three cultivars in the period 1978-1994. The methods used to obtain new cultivars of cherry were selection of local cultivated flora, artificial hybridization, mass selections obtained by free pollination. As genetic resources were used sweet cherry collection (established and continuous collected during 1980-2006) with 550 genotypes and sour cherry collection (established and collected during 2000-2002) with 130 genotypes. The paper aims to assess six sweet cherry cultivars and four sour cherry cultivars that can be used as genitors in improving these both fruit tree species.

Key words: phenologie, trunk section, fruit, diameter, skin color

Rezumat. În perioada 1999-2014 la SCDP Iași s-au omologat ca soiuri noi de cireș 28 de creații din care 25 de cireș dulce și 3 de cireș amar. La vișin au fost omologate și brevetate 3 soiuri în perioada 1978-1994. Metodele utilizate pentru obținerea de noi soiuri de cireș și vișin au fost selecția din flora locală cultivată, hibridarea artificială, selecții în masă obținute prin polenizarea liberă. Ca resurse genetice au fost folosite colecția decireș (perioada de înființare și colectare continuă 1980-2006) cu 550 genotipuri și colecția devišin (înființare și colectare 2000-2002) cu 130 genotipuri. Lucrarea are ca scop evaluarea a șase soiuri de cireș și patru de vișin care pot fi utilizate ca genitori în ameliorarea celor două specii pomicele.

Cuvinte cheie: fenologie, secțiunea trunchiului, fruct, diametru, culoare pieluță.

INTRODUCTION

Sweet cherry (*Prunus avium* L.) is a wild, semi-wild or cultivated species while sour cherry (*Prunus cerasus* L.) is just semi-wild or cultivated in Romania (Sîrbu, 2011; Sîrbu and Paraschiv, 2005). In the last thirty years new sweet and sour cherry cultivars with high fruit quality (Sansavini and Lugli, 2005; Kask *et al.*, 2010; Schuster *et al.*, 2014) was approved. Pérez-Sánchez, 2008 evaluated 25 sweet cherry, four duke and one sour cherry from traditional Spanish cultivars which showed distinctive and interesting agronomical characters such as low

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susceptibility to fruit cracking, high levels of soluble solids, early fruit maturity and great rusticity. The growers from Romania are very interested by newest sweet and sour cherry cultivars due to a program for renewing local fruit growing which at present is ongoing. The paper aims to assess six sweet cherry and four sour cherry cultivars that can be used as genitors in improving these both fruit tree species.

MATERIAL AND METHOD

In this study during 2013-2014 six Romanian cultivars: 'Cătălina', 'Ludovic', 'Cociu', 'Boambe de Coțnari', 'Galata' and 'Maxut' and four sour cherry cultivars 'Pitic', 'Selecția Cotea', 'De Botoșani' and 'Ilva' were evaluated. All cultivars were grown on *P. mahaleb* L. seedlings rootstock. Three trees presented each cultivar and were planted at spacing of 4 x 5 m, with free palmette crown shape with support system. The orchard was located on a medium sandy clay loam with medium (6%) humus content. Herbicide spraying were maintained along trees rows and grass was cut three times during summer in alleyways. No irrigation, rainfull, frost or birds protection system provided.

Some parameters related to phenological stages, tree and fruit characteristics were determined. Phenological data were determined through the Fleckinger system (Fleckinger, 1960): B₁ - the bud swelling: the bud rounds delicate and gains a green light at the top; G- the end of the flowering: the petal of flowers have fallen for 90%. The data of the fruit ripening was established in the time of marketing quality traits (colour, the content of dry matter) specific to each cultivar.

The climatic data were recorded with the AgroExpert system by the station located on the perimeter of the experimental polygon of the Fruit Growing Research Station, Iași - Romania. The active thermal balance ($\Sigma t^{\circ}a$) is provided by the sum of average daily temperature grades, which exceeds the biological limit characteristic to the sweet and sour cherry tree, considered to be 5°C (Istrate, 2007).

$\Sigma t^{\circ}a = \Sigma T \text{ atd} - BL$, in which:

$\Sigma T \text{ atd}$ = sum of average temperature of days between two subsequent phenological stages;

BL = the biological limit of fruit tree species (Istrate, 2007).

The statistical interpretation of data was calculated with the variation coefficient (s%) for which are allowed arbitrary the next values: 0 – 10% - low variation coefficient; 10 – 20% - medium variation coefficient; 20 – 30% - great variation coefficient. The statistical analysis was performed with the XLSTAT programme.

RESULTS AND DISCUSSIONS

During 2013 - 2014 it has been observed a great variability of the number of days and the sum of active degrees of temperature according to the sweet and sour cherry tree cultivars and climatic conditions of the year. Therefore, the period from the swelling of the mixed buds until the fall leaves, the studied cultivars showed large variations in vegetation period and the active thermal balance.

Phenological data and active thermal balance necessary during the vegetation of sweet and sour cherry cultivars (average 2013-2014)

Cultivar	Phenological data				Vegetation period (days)	Active thermal balance (°C)
	Swollen bud (B ₁)	End of flowering (G)	Fruit ripening	Fall leaves		
Sweet cherry						
Cătălina	21.03	29.04	25.05	20.10	214	3.370,2
Ludovic	31.03	29.04	11.06	21.10	205	3.352,5
Cociu	1.04	30.04	12.06	19.10	202	3.332,7
Boambe de Cotnari	19.03	29.04	22.06	22.10	218	3.341,2
Galata	4.04	30.04	22.06	21.10	201	3.314,3
Maxut	1.04	29.04	14.06	22.10	205	3.356,1
Average					207,5	3.344,5
STDEV*					6,89	19,60
COVAR S%**					0,0332	0,0059
Sour cherry						
Pitic	30.03	2.05	25.07	24.10	209	3.346,8
Selecția Cotea	29.03	28.04	24.06	20.10	206	3.346,8
De Botoșani	27.03	29.04	28.06	20.10	208	3.346,8
Ilva	29.03	2.05	1.07	22.10	208	3.371,7
Average					207,75	3.353,03
STDEV*					1,26	12,45
COVAR S%**					0,0061	0,0037

*STDEV- standard deviation; **COVAR S% - coefficient of variation %

During the study the values ranged between 201 days with 3.314,3°C as active thermal balance at 'Galata' and 218 days with 3.341,2°C as active thermal balance at 'Boambe de Cotnari' for sweet cherry cultivars. At sour cherry cultivars the values ranged between 206 days with 3.346,8°C as active thermal balance at 'Selecția Cotea' and 209 days with the same active thermal balance at 'Pitic' (table 1). Some tree characteristics are presented in table 2.

Number of young shoots of studied sweet cherry cultivars ranged between 84 at 'Ludovic' and 155 at 'Cătălina' as average for period 2013-2014. Length of young shoots ranged between 25,5 cm at 'Maxut' and 36,9 cm at 'Cociu'. At sour cherry cultivars the number and the length of young shoots ranged between 79 ('Pitic') to 138 ('De Botoșani'), respectively 21 to 37 cm. Trunk cross-sectional area (TCSA) is a parameter which show the vegetative growth of the trees for each cultivar (Radunić *et al.*, 2011; Kurlus, 2004). From this point the view 'Ludovic' for sweet cherry and 'Pitic' for sour cherry cultivars showed smaller vegetative growth (table 2).

Table 2

Tree characteristics of sweet and sour cherry cultivars (average 2013-2014)

Cultivar	Young shoots		TCSA(cm ²)
	Number	Length (cm)	
Sweet cherry			
Cătălina	155	29,8	334,5
Ludovic	84	35	224,8
Cociu	123	36,9	272,6
Boambe de Cotnari	126	32,3	299,5
Galata	120	34,6	426,5
Maxut	118	25,5	497,8
Average	121	32,35	342,62
STDEV*	22,65	4,15	101,81
COVAR S%**	0,1871	0,1284	0,2972
Sour cherry			
Pitic	79	21	54
Selecția Cotea	125	36	244,6
De Botoșani	138	37	232,2
Ilva	123	36	101
Average	116	32,5	157,95
STDEV*	22,26	6,65	82,27
COVAR S%**	0,1915	0,2047	0,5208

*STDEV- standard deviation; **COVAR S% - coefficient of variation %; *** TCSA - Trunk cross-sectional area

As fruit size 'Ludovic' registered the greatest values that mean 11,4 g as weight with 26,4 mm as fruit diameter (table 3) being a very good size according with other studies about sweet cherry (Sîrbu *et al.*, 2012; Lichev *et al.*, 2004; Girard and Kopp, 1998).

Table 3

Fruit size and skin colour of sweet and sour cherry cultivars (average 2013-2014)

Cultivar	Fruit size		Skin colour
	Weight (g)	Diameter (mm)	
Sweet cherry			
Cătălina	7,8	22,5	Dark red
Ludovic	11,4	26,4	Dark red
Cociu	8,5	23,5	Dark red
Boambe de Cotnari	8	22,8	Bicolour
Galata	4,5	18,7	Bicolour
Maxut	4,3	13	Dark red
Average	5,60	18,17	-
STDEV*	2,08	4,92	-
COVAR S%**	0,3716	0,2709	-

Sour cherry			
Pitic	4,2	17	Dark purple
Selectia Cotea	6,3	17,2	Red purple
De Botoșani	7,7	22,1	Dark red
Ilva	5,2	18,3	Dark red
Average	5,85	18,65	-
STDEV*	1,50	2,37	-
COVAR S%**	0,2568	0,1271	-

‘De Botoșani’ registered the greatest values as fruit size with 7,7 g as fruit weight and 22,1 mm as fruit diameter, that being a very good size for sour cherry cultivars according with Grafe and Schuster, 2014. ‘Maxut’ and ‘Galata’ are cherry cultivars with bitter taste fruits being a row material for processing as traditional products in Romania (Budan, 2014).

CONCLUSIONS

1. The climate change from recent years have influenced the duration of the phenological phases of different cultivars of sweet and sour cherry.
2. ‘Ludovic’ showed great fruit size and low vigor of trees being a good genitor for sweet cherry breeding.
3. ‘De Botoșani’ showed great fruit size while ‘Pitic’ showed the smaller vegetative growth being a very good genitors for sour cherry breeding.

REFERENCES

1. Budan S., 2014 - *Traditional and Commercial Uses of Romanian Bitter Cherry Cultivars*, Acta Hort. 1032: 25-28.
2. Fleckinger J., 1960 - *Phenologie et arboriculture fruitiere*, Bon Jardinier. Tome 1: 362-372.
3. Girard B., Kopp T.G., 1998 - *Physicochemical Characteristics of Selected Sweet Cherry Cultivars*, J. Agric. Food Chem., 46: 471-476.
4. Grafe C., Schuster M., 2014 - *Physicochemical characterization of fruit quality traits in a Germansour cherry collection*, Scientia Horticulturae 180: 24–31.
5. Istrate M., 2007 - *Pomicultură generală*, Edit. Ion Ionescu de la Brad, Iași, 296 pp.
6. Kask K., Jänes H., Libek A., Arus L., Kikas A., Kaldmäe H., Univer N., Univer T. 2010 - *New cultivars and future perspectives in professional fruit breeding in Estonia*, Agronomy Research 8 (Special Issue III): 603–614.
7. Kurlus R., 2004 - *Growth, yield and fruit quality in sweetsweet cherry cultivars grafted on ‘Tabel Edabriz’ rootstock*, Journal of Fruit and Ornamental Plant Research, Vol. 12: 35-39.
8. Lichev V., Govedarov G., Tabakov S., Yordanov A., 2004 - *Evaluation of Sweet Cherry Cultivars Recently Introduced into Bulgaria Compared with Two Bulgarian Cultivars*, J. Fruit Ornam. Plant Res. Special ed. Vol. 12: 281-286.
9. Pérez-Sánchez R., Gómez-Sánchez M. A., Morales-Corts R., 2008- *Agromorphological characterization of traditional Spanish sweet cherry (Prunus avium L.), sour cherry (Prunus cerasus L.) and duke cherry (Prunus × gondouinii Rehd.) cultivars*, Spanish Journal of Agricultural Research, 6(1): 42-55.

10. **Radunić M., Jazbec A., Pecina M., Čosić T., Pavičić N., 2011** - *Growth and yield of the sweet cherry (Prunus avium L.) as affected by training system*, African Journal of Biotechnology, 10(24): 4901-4906.
11. **Șirbu Sorina, Niculaua M., Chiriță Otilia, 2012** - *Physico-chemical and antioxidant properties of new sweet cherry cultivars from Iași, Romania*, Agronomy Research 10(1–2): 341–350.
12. **Șirbu C., Oprea A., 2011** - *Plante adventive în flora României*, Editura Ion Ionescu de la Brad, Iași, 733 pp.
13. **Șirbu C., Paraschiv Nicoleta Luminita, 2005** - *Botanică sistematică*, Editura Ion Ionescu de la Brad, Iași, Romania, 386 pp.
14. **Sansavini S., Lugli S. 2005** - *New Sweet Cherry Cultivars Developed at the University of Bologna*, Proc.4th ISI on Cherry. Acta Hort. 667: 45-51.
15. **Schuster M., Grafe C., Wolfram B., Schmidt H. , 2014** -*Cultivars Resulting From Cherry Breeding in Germany*,Erwerbsobstbau. Band: 56. Heft: 2: 67-72.