ANNALS OF THE UNIVERSITY OF CRAIOVA

Series: ✓*Biology*
✓*Horticulture*
✓*Food products processing technology*
✓*Environmental engineering*

Vol. XXX (LXVI) - 2025

ADVANCES IN CHERRY BREEDING AT UASVM BUCHAREST

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Keywords*: sweet cherry, breeding, variety, hybrid, colection*

ABSTRACT

Research on cherry assortment, the quality of the varieties and avoiding the market bottleneck with fresh cherries for a short period are few important objectives for sweet cherry improvement. In order to meet some of these objectives, starting with 2013, at the UASVM Bucharest, in the S-E part of Romania, hybridizations and hybrid selections were carried out, ending with a series of promising hybrid selections. At the Didactic Research and Development Station for Viticulture and Fruit Growing Pietroasa-Istrița (DRDSVFG Pietroasa-Istrita), as well as in the Experimental Field of the Faculty of Horticulture (EFFH), starting from 1994 Romanian and foreign cherry varieties, provided on the basis of bilateral agreements for the exchange of genetic material, were preserved and evaluated.

INTRODUCTION

The genetic improvement of cherry trees began much later than in other fruit species, although the 17th-century selections obtained in central Europe indicate some concerns in this regard. After the Second World War, the first significant selection and hybridization work took place. Currently, there are programs in all countries interested in cherry cultivation, either to obtain new varieties, the objectives being practically the same (Cociu et al.1999; Sansavini &Luigi 2008).

Romanian fruit research has generated and continues to generate new biological creations that possess valuable characteristics of productivity and quality in constantly changing environmental conditions and new technologies for cultivation, preservation, and processing of fruits to increase the added value of primary production (Budan & Grădinariu 2000; Budan et al. 2013)

The cherry breeding program began in 1951 at the Bistriţa Station, expanded in 1968 to the ICDP Piteşti, and then to the Iaşi Station starting in 1978 (Iurea et al, 2021). Due to ongoing efforts to renew and expand the varietal offerings, the cherry assortment has continuously and significantly changed, now including 60 varieties that fulfill the objectives set in the breeding program and particularly meet the needs of both consumers and growers (Sturzeanu et al. 2021).

After 2000, the cherry assortment in Romania was enriched with a number of 32 varieties, such as 'Gloria,' 'Ivona,' 'Bucium,' 'Cătălina,' 'Golia,' 'Iaşirom,' 'Marina,' 'Ştefan,' 'Tereza,' 'Oana,' 'Radu,' 'Lucia,' 'George,' 'Superb,' 'Sublim,' 'Spectral,' 'Cociuvaș,' 'Alexus,' 'Andante,' 'Margonia,' 'Andreiaș,' 'Mihailis,' 'Iosifan,' 'Ludovan,' 'Paulică,' 'Special,' 'Aurea,' 'Teodora,' 'Amaris,' 'Croma,' 'Elaiași,' and 'Mușatini' (Budan & Grădinariu 2000; Budan et al. 2013).

In addition to high productivity, which is a common characteristic of all new varieties and a mandatory condition for being approved or authorized by ISTIS, the quality of the fruits has undergone a clear improvement, especially in varieties with early and semi-early ripening periods (Cociu et al. 1999). Reducing the size of the trees and increasing yields along with ease in maintenance and harvesting work was achieved by promoting varieties with wide branching angles and dwarf types, creating, in addition, the possibility of establishing plantations with increased tree densities and shortening the investment recovery period. Of course, the replacement process is continuous and is determined by permanent technological, economic, and social changes. In this context, the importance of variety as a factor of renewal and ongoing progress becomes increasingly greater in relation to new cultivation techniques and ways of valorizing production, the latter being closely linked to the taste and demands of consumers in perpetual change and refinement.

MATERIAL AND METHODS

Objectives of the cherry breeding program at UASVM Bucharest

In order to create new cherry varieties, with characteristics corresponding to the requirements of a modern and performant technology for the grower, the breeder has wider possibilities of choosing the parents, due to the variability of the characteristics and traits of the different species and varieties known worldwide. The observations and determinations made over the years by the researchers and teachers at UASVM Bucharest have highlighted potential parents with characteristics of great importance for achieving the objectives of the genetic improvement programe. Some of these genitors are already the basis of new Romanian or foreign varieties, others are included in the selections under study, and others consist in germplasm stock for future posibble varieties.

The sweet cherry breeding program goal is to create early, productive, self-compatible, low-vigor varieties with high quality fruits, especially according to the latest requirements for size, firmness, taste, color and ripening times at the edges of the ripening season, using a wide range of parents (Asănică et.al 2014; Asănică et al. 2018). A target for breeding in this species is to find sources of genes for resistance to anthracnose (*Blumeriella jaapii*), *Monilinia* sp. and fruit cracking.

The achievement of any goal in the short term depends, to a large extent, on the existence and correct use of gene sources.

Gene sources for feeding goals

At the DRDSVFG Pietroasa - Istrita, within the Istrita Station and Fruit Nursery (ISFN) (Table 1), as well as in the EFFH (Tables 2 and 3), starting from 1994, Romanian and foreign sweet cherry varieties, provided on the basis of bilateral agreements for the exchange of genetic material, have been preserved in the germplasm fund. These have been grafted on different rootstocks, planted and studied in experimental fields.

Table 1

The germplasm collection with cherry varieties of the ISFN

Cultivar	Rootstock
‘Celeste’	Mahaleb
‘Celeste’	PHLC
‘Durona’	PHLC
‘Early Red’	PHLC

‘Early Red’	CAB11E
‘Ferrovia’	PHLC
‘Firm Red’	CAB11E
‘Firm Red’	CAB6P
‘Giant Red’	CAB6P
‘Kordia’	Colt
‘Kordia’	PHLC
‘Kordia’	Gisela 6
‘Lapins’	PHLC
‘New Star’	PHLC
‘Regina’	PHLC
‘Skeena’	PHLC
‘Sweethart’	PHLC
‘Van’	PHLC

Table 2

Germplasm collection grafted on rootstocks from the EFFH – UASVM at Bucharest

Rootstocks						
Colt	PHLC	Gisela 6	Gisela 5		CAB11E	CAB6P
Cultivar						
‘Burlat’	‘Ferrovia’	‘Sweet Aryana’	‘Sweet Aryana’	Royal Tioga	‘Early Red’	‘Firm Red’
‘Ferrovia’	‘Kordia’	‘Sweet Gabriel’	‘Sweet Gabriel’	Nimba	‘Giant Red’	‘Giant Red’
‘Giorgia’	‘Lapins’	‘Kordia’	‘Kordia’	Red Pacific		
‘Kordia’	‘New Star’	‘Sweet Lorenz’	‘Sweet Lorenz’			
‘Mora di Vignola’	‘Rubin’	‘Regina’	‘Regina’	Rocket		
‘Regina’	‘Severin’	‘Sweet Saretta’	‘Sweet Saretta’			
‘Skeena’	‘Skeena’	‘Sweet Valina’	‘Sweet Valina’	Frisco		
‘Van’	‘Van’					

Table 3

Germplasm collection grafted on rootstock from EFFH – UASVM at Bucharest

Mahaleb Rootstock/Cultivar		
‘Aida’	‘George’	‘Regina’
‘Alex’	‘Germersdorf’	‘Rita’
‘Andrei’	‘Iasirom’	‘Rivan’
‘Annus’	‘Iosif’	‘Sam’
‘Bigareau Burlat’	‘Katalin’	‘Sandor’
‘Bitter’	‘Kordia’	‘Skeena’
‘Burlat’	‘Lucia’	‘Stefan’
‘Boambe de Cotnari’	‘Ludovic’	‘Summit’
‘Bucium’	‘Maria’	‘Tardiva’
‘Carmen’	‘Margo’	‘Tunde’
‘Celeste’	‘Mora di Vignola’	‘Ulster’

'Cetatuia'	'Paul'	'Vega'
'Cociu'	'Paulus'	'Vera'
'Early Red'	'Petrus'	'Van'

RESULTS AND DISCUSSIONS

The main characteristics taken into account were: ripening time, fruit size, fruit appearance, organoleptic qualities, resistance or tolerance to diseases and pests, self-fertility, flowering time, vigor, type of fruiting branches and productivity (Asănică et al. 2014).

The spring of 2013, in the conditions of the Istriţa area, was a favorable one for performing controlled hybridizations, but also for the setting, development and maturation of hybrid fruits in optimal conditions.

Twenty crossing combinations were performed that provided hybrid progeny from: ♀'New Star' x ♂'Burlat', ♀'New Star' x ♂'Early Red', ♀'Van' x ♂'New Star' and ♀'Giant Red' x ♂'Early Red' and 414 hybrid seeds were obtained. In all hybrid combinations in which the maternal parent 'New Star' was used, the most hybrid fruits were obtained, starting from 1908 pollinated flowers, resulting in 398 hybrid fruits, of which 193 hybrid seeds (Table 4), which were sown in the spring of 2014.

Table 4

Hybrid combinations used in hybridizations, 2013

The hybrid combination	No. of castrated and pollinated flowers	No. of hybrid fruits	% hybrid fruits	No. of stones sown 21.03. 2014
♀'Early Red' x ♂'Burlat'	726	35	4,8	2
♀'Early Red' x ♂'New Star'	623	21	3,3	0
♀'Early Red' x 'Giant Red'	334	13	3,8	0
♀'Early Red' x ♂'Kordia'	574	34	5,9	4
♀'Early Red' x ♂'Van'	430	6	1,4	0
Total	2687	109	4,0	6
♀'New Star' x ♂'Burlat'	456	95	20,8	64
♀'New Star' x ♂'Van'	303	59	19,5	36
♀'New Star' x ♂'Kordia'	299	79	26,4	27
♀'New Star' x ♂'Early Red'	354	98	27,6	50
♀'New Star' x ♂'Giant Red'	496	67	13,5	16
Total	1908	398	20,8	193
♀'Van' x ♂'Giant Red'	281	0	0	0
♀'Van' x ♂'Burlat'	226	27	12	24
♀'Van' x ♂'New Star'	108	55	50,9	52
♀'Van' x ♂'Early Red'	196	75	38,2	0
Total	811	147	18,1	76
♀'Giant Red' x ♂'Early Red'	177	77	43,5	49
♀'Giant Red' x ♂'Burlat'	168	33	19,6	0
♀'Giant Red' x ♂'New Star'	135	10	7,4	7
♀'Giant Red' x ♂'Van'	66	1	1,5	0
Total	546	121	22,1	56
♀'Firm Red' x ♂'Giant Red'	125	18	14,4	6
♀'Firm Red' x ♂'Burlat'	76	7	9,2	2

The hybrid combination	No. of castrated and pollinated flowers	No. of hybrid fruits	% hybrid fruits	No. of stones sown 21.03. 2014
Total	201	25	12,4	8
TOTAL	6153	800	13,0	414

The hybrid progeny obtained was studied in the hybrid plot established in 2015, with the first selection being made starting in year 3. In order to accelerate the fruiting of the hybrids and shorten the duration of the study stages (Figure 1), they were grafted onto the Gisela 5 rootstock.

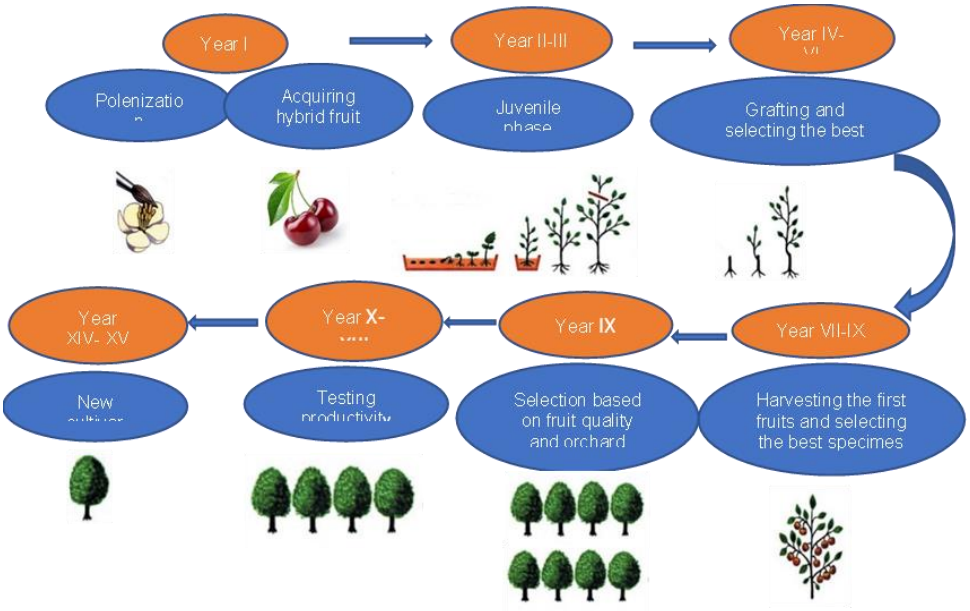

Figure 1. Diagram of obtaining new cherry cultivar (own processing)

In 2019, hybrids from the following crossings were introduced into the contest microculture: ♀'New Star' x ♂'Burlat', ♀'Van' x ♂'New Star', ♀'New Star' x ♂'Early Red' and ♀'Giant Red' x ♂'Early Red', grafted on Gisela 5.

Data were collected on the morpho-productive characters of the hybrids, following the characters of the fruits over several years, namely resistance to diseases and pests, adaptability and resilience to some climatic events and last but not least the evolution of the trees in terms of vigor, their reactions to pruning and the level of defoliation and/or branching. Phenological determinations were also carried out on each hybrid and their production capacity was measured.

The preliminary results of the hybrids study in the competition microculture showed:

- from the 10 hybrids of the hybrid combination ♀'Giant Red' x ♂'Early Red', the hybrid 13.6.56-IP showed the most attractive fruit characteristics along with the insertion angle of the fruiting branches;
- from the 24 hybrids of the hybrid combination ♀'Van' x ♂'New Star', the following hybrids stood out:

- 13.7.44-IP - attractive fruit characteristics, spur fruiting type and medium branches, low vigor;
- 13.7.11-IP - low vigour;
- 13.7.12-IP - large fruits 9-10g., high firmness, good taste, sensitive to moniliosis;

- from the 55 hybrids of the combination ♀'New Star' x 'Burlat' the following hybrids stood out:

- 13.7.23-IP (Figure 2) – low vigor, fruiting type on spurs and medium branches;
- 13.7.20-IP, 13.7.21-IP and 13.7.22-IP in terms of fruit characters, but none of them qualify for introduction into the competition field, still were kept as gene suppliers;
- 13.7.14-IP, 13.7.15-IP and 13.7.18-IP (Figure 3) - special organoleptic qualities, firmness, very sweet taste, very juicy, with intensely colored juice;
- 13.7.41-IP – reduced vigor, special appearance and organoleptic qualities (Figure 4).


Figure 2. Hybrid 13.7.23-IP


Figure 3. Hybrid 13.7.18-IP


Figure 4. Hybrid 13.7.41-IP

CONCLUSIONS

Among all the hybrid groups, within the hybrid combination ♀'New Star' x ♂'Burlat' the most hybrids with attractive characters were identified both in terms of fruit size and organoleptic properties.

The selected hybrids were introduced into the competition crop in the fall of 2024, following the latest observations on the DUS test and the proposal for patenting of at least one hybrid.

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