

## FRUIT VARIETIES BREEDING IN ROMANIA: FROM THE BEGINNING TO PRESENT

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**Abstract.** The paper presents objectives and results of Romanian breeding program, developed at the main fruit species. Based on a valuable tradition with old practical results, on different biological material, collected and preserved over the years in genetic resources, breeding of fruit varieties continues to improve the production and fruit quality, having regard to demands of fruit market and processing.

**Key words:** breeding, quality, consumer demand.

In Romania, fruit species breeding program initiated in 1948 by professor Nicolae Constantinescu, has three distinct periods: 1950 to 1970, 1971 to 1999 and 2000 to present [6].

The period I (1950 – 1970) began with organization of Research Stations Voinesti, Bistrita and Cluj, where some collections and field trials of the main fruit species were established. In this period, the assortment included old foreign varieties and local selections. The objectives were: introducing the world valuable varieties to establish the most suitable ones for the ecological conditions throughout the country; breeding new autochthonous cvs. to be competitive with the best ones spread all over the world, both for productivity and fruit quality; clonal selection of autochthonous and foreign varieties recently or formerly spread in various growing areas, in order to maintain their productive and biological potential [3].

The Research Institute for Fruit Growing Pitesti, established in 1967 has represented an important step in the development of breeding programs for all fruit species, including berries [7].

A special importance was granted to enrich fruit collections with local varieties, wild species and foreign varieties, to be able to supply the gene sources for the breeding program [1].

The results of the breeding program occurred beginning with 1970, by introduction in the “Romanian official list for propagation” of the first varieties (Table 1):

- apple: ‘Aromat de vara’, ‘Rosu de Cluj’, ‘Frumos de Voinesti’, ‘Declicios de Voinesti’;

- pear: ‘Aromata de Bistrita’, ‘Timpurii de Dambovita’, ‘Napoca’, ‘Untoasa de Geoagiu’, ‘Aniversare’, ‘Republica’;

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- plum: ‘Tuleu timpuriu’, ‘Superb’, ‘Tuleu dulce’, ‘Gras ameliorat’, ‘Vinete romanesti 300’;
- sweet cherry: ‘Negre de Bistrita’ and ‘Uriase de Bistrita’
- sour cherry: ‘Timpurii de Cluj’, ‘Crisana 2’, ‘Mocanesti 16’;
- peach: ‘Frumos de Baneasa’, ‘Miorita’, ‘Bucuresti’, ‘Delicios’, ‘Flacăra’.

During the period II (1971 – 1999) the breeding work was mainly emphasized on studying the varieties in the field trials for comparison of new Romanian varieties and promising selections with the best foreign varieties, extension in production of the best cvs. and zoning of the fruit species and varieties, depending on environmental factors and fruit destination.

For the apple breeding, RSFG Voinesti, RSFG Bistrita and RIFG Pitesti, started to collaborate with Rutgers University (USA) using as genitors *Malus floribunda* 821 and ‘Prima’ for scab resistance, *M. Kaido*, *M. zumi* for mildew resistance and for quality ‘Golden Delicious’, ‘Parmain d'or’, ‘Jonathan’, ‘Cretesc’, ‘Patul’, ‘Starking Delicious’. Beginning 1983, new Romanian varieties with disease resistance and quality were registered and introduced in production [1].

For pear, the breeding work carried on RIFG Pitesti, RSFG Cluj and RSFG Voinesti, and 11 varieties were obtained having different ripening season [5].

For breeding quince, clonal selection of Bereczki cv. was used, and ‘Aurii’, ‘Aromate’ and ‘Moldovenesti’ cvs., with high production have been obtained.

The plum breeding work started at RIFG Pitesti, RSFG Valcea and RSFG Voinesti having as major objective improving of the old autochthonous cultivars ‘Tuleu gras’, ‘Grase romanesti’ and ‘Vinete romanesti’ cvs., and 18 new plum autochthonous varieties were registered [2].

Peach and apricot, breeding held at RSFG Constanta and RSFG Baneasa having as main goals the late blooming and fruit quality, resulting 18 new apricot varieties and 8 peach varieties.

For sweet cherry the breeding work were carried on at RSFG Bistrita, RSFG Iasi and RIFG Pitesti, aiming to earliness of the varieties, fruit firmness, low vigour and resistance to *Blumeriella jaapii*. Some varieties registered were scored for low vigor (‘Cerna’), disease resistance (‘Colina’, ‘Izverna’) and high nutritional content [6].

Breeding of sour cherry based on clonal selection carried on old ‘Mocănești’ and ‘Crisana’ cvs. and crossings for self fertility and high productivity, resistance to *Monilia* sp. and *Blumeriella jaapii*, fruit size and mechanical harvesting. 13 varieties were registered. Clonal selection of walnut carried on at RSFG Geoagiu, RSFG Tg. Jiu, RSFG Iasi and RSFG Valcea and a significant contributions have been made by recording a number of 21 varieties [9].

Clonal selection of chestnut was the concern of RSFG Baia Mare, by selection done in the wild populations, resulting seven genotypes, with appropriate quality for consumers requirements [9].

Hazelnut breeding has been made exclusively to RSFG Valcea, using the inter-specific hybridization, and recording 3 new varieties [9].

Berries breeding have been made at RSFG Cluj and RIFG Pitesti, paying attention to establish of genetic resources, using intra and interspecific hybridization, and clonal selection among the local biotypes. They were introduced 8 currant, 3 goosberry, 2 raspberry, 3 blueberry, 4 elderberry, 2 rosehip, 1 seabuckthorn and 6 strawberry cvs. [8].

**Table 1.** Fruit varieties released during 1971-1999

Species	No. of registered cvs.	Spread in production
Apple	22	Pionier, Generos, Romus 3, Romus 4, Ciprian, Auriu de Bistrita
Pear	11	Napoca, Trivale, Daciana, Monica, Euras
Quince	3	Aromate, Auriu, Moldovenesti
Plum	18	Centenar, Silvia, Carpatin, Tita, Record, Pescarus
Apricot	18	Rosii de Baneasa, Favorit, Dacia, Excelsior, Comandor, Mamaia, Selena
Peach	8	Victoria, Congres, Triumf, Superba de toamna
Sweet cherry	24	Cerna, Izverna, Ponoare, Daria, Amar de Maxut
Sour cherry	13	Tarina, Dropia, Nana, Ilva, Timpurii de Pitesti, Timpurii de Osoi
Walnut	21	Jupanesti, Sibisel, Geoagiu 65
Chestnut	7	Iza, Mara, Hobita
Almond	2	Marculesti
Hazelnut	3	Cozia, Valcea 22
Currant	8	Record, Rosu timpuriu, Perla neagra
Gooseberry	3	Somes, Zenit
Raspberry	2	Citria, Ruvi
Elderberry	4	Ina, Bradet, Flora
Seabuckthorn	1	Moldova
Blueberry	3	Azur, Augusta, Safir
Strawberry	6	Premial, Coral, Magic
Total	167	

The objectives of the fruit breeding in the last 10 years were similar to the ones from other European countries, and aiming at: releasing new varieties with fruit quality (texture, flavour, size and commercial aspects), good storage capacity, resistance to diseases and pests, by use of the genetic resources collected and preserved in collections, and by improving the selection technology of hybrid material, in addition to shorten the period for obtaining a new variety (Table 2 and Table 3).

**Table 2.** Present objectives of fruit breeding

Species	Objectives
Apple	<ul style="list-style-type: none"> <li>• fruit quality</li> <li>• <i>Venturia inaequalis</i> resistance</li> <li>• spur fructification</li> </ul>
Pear	<ul style="list-style-type: none"> <li>• <i>Erwinia amylovora</i> and <i>Psylla</i> sp. tolerance</li> <li>• winter cultivars and quality</li> </ul>
Plum	<ul style="list-style-type: none"> <li>• fruit quality</li> <li>• tolerance/resistance to PPV</li> <li>• self-fertility</li> </ul>
Sweet and sour cherry	<ul style="list-style-type: none"> <li>• fruit size</li> <li>• low vigour</li> <li>• self-fertility; tolerance to diseases (<i>Blumeriella jaapii</i>, <i>Monilia</i> sp.)</li> </ul>
Apricot	<ul style="list-style-type: none"> <li>• frost resistance</li> <li>• early and late ripening</li> </ul>
Peach and nectarin	<ul style="list-style-type: none"> <li>• fruit quality</li> <li>• <i>Taphrina deformans</i> tolerance</li> </ul>
Walnut	<ul style="list-style-type: none"> <li>• lateral fructification</li> <li>• precocity</li> <li>• low vigour</li> </ul>
Currant	<ul style="list-style-type: none"> <li>• disease resistance</li> <li>• large fruit; high content in C vitamin</li> <li>• simultaneous ripening</li> </ul>
Raspberry and blackberry	<ul style="list-style-type: none"> <li>• resistance to frost and diseases</li> <li>• fruit size</li> <li>• resistance to transport</li> </ul>
Blueberry	<ul style="list-style-type: none"> <li>• fruit quality</li> <li>• early and late ripening</li> </ul>
Strawberry	<ul style="list-style-type: none"> <li>• <i>Botrytis</i> sp. and <i>Phytophthora</i> sp. tolerance</li> <li>• fruit size, firmness and flavour</li> </ul>

**Table 3.** Fruit cvs. registered during 2000 to present

No.	Cultivar	Genitors	Year of registration	Maintainer
<b>Apple</b>				
1	Starkprim	Prima x Starkrimson	2000	RSFG Bistrița
2	Jonaprim	Prima x Jonathan	2000	RSFG Bistrița
3	Bistrițean	Starkrimson x Prima	2002	RSFG Bistrița
4	Salva	Golden Delicious x Prima	2002	RSFG Bistrița
5	Goldprim	Golden Delicious x Prima	2003	RSFG Bistrița
6	Romus 5	Romus 3 x Prima	2003	RIFG Pitești
7	Rebra	Florina x Idared	2003	RIFG Pitești
8	Redix	Goldspur x Prima o.p.	2004	RSFG Voinești
9	Auriu de Cluj	Cj X-5-52 x Mutsu	2005	RSFG Cluj
10	Estival	NJR 55 X Sir Prize	2005	RSFG Cluj
11	Precoce de Ardeal	X-5-71 (Feleac x Sir Prize) x Prima	2005	RSFG Cluj
12	Productiv de Cluj	Cluj III-VI-5-26 x NJ 46	2005	RSFG Cluj
13	Iris	Prima o.pol., gamma irradiation of seeds	2005	RSFG Voinești
14	Dany	Jonathan iradiat P32 x Prima	2005	RSFG Bistrița
15	Alex	Golden D. x BN 33/39	2005	RSFG Bistrița
16	Doina	Jonathan x Prima	2005	RSFG Bistrița
17	Nicol	Wijcik X Pionier	2005	RIFG Pitești
18	Luca	Champion x Prima	2006	RSFG Voinești
19	Irisem	gamma irradiation pepins Prima o.p.	2006	RSFG Voinești
20	Colmar	Mc Intosh Wijcik x Florina	2006	RIFG Pitești
21	Colonade	Pionier x Mc Intosh Wijcik	2007	RIFG Pitești
22	Real	Prima o.pol., gamma irradiation of seeds	2007	RSFG Voinești
23	Remar	-	2008	RSFG Voinești
24	Rustic	Florina x Pionier	2009	RIFG Pitești
25	Inedit	-	2009	RSFG Voinești
26	Voinicel	-	2009	RSFG Voinești
27	Dacian	-	2009	RSFG Voinești
28	Silvan	Clar alb x Richared	2010	RSFG Cluj
29	Somesan (Aurapple)	Clar alb x Richared	2010	RSFG Cluj
30	Stefano	London Pepping o.p	2010	RSFG Cluj
<b>Pear</b>				
31	Virgiliu hibernal	Passe Crasanne x Comtesse de Paris	2000	RSFG Cluj
32	Jubileu 50	Napoca x Beurre precoce Morettini	2003	RSFG Cluj

33	Milenium	(Josephine de Malines x Dr. Lucius) x Comtesse de Paris	2003	RSFG Cluj
34	Corina	Passe Crassane x (B.C. <i>P. serotina</i> x Olivier de Serres) x D. du Comice	2003	RSFG Voinești
35	Orizont	[( <i>P. serotina</i> x Olivier de Serres) x O. de Serres] x Josephine de Malines	2003	RSFG Voinești
36	Ervina	( <i>P. serotina</i> x Williams) x Napoca	2003	RIFG Pitești
37	Roșioară de Cluj	Max Red Bartlet x Beurre Giffard	2005	RSFG Cluj
38	Tudor	[( <i>P. serotina</i> x Doyenne d'hiver) x Passe Crassane] x TN 30-44 Angers	2007	RSFG Voinești
39	Arvena	Triomphe de Vienne o.p.	2007	RSFG Cluj
40	Paramis	Monica x Passe Crassane	2008	RIFG Pitești
41	Meda	Elita Voinești 53-15-3 x Contesa de Paris	2009	RSFG Cluj
42	Latina	Elita Cj 20-4-3 x Contesa de Paris	2009	RSFG Cluj
43	Romcor	[Passe Crasane x ( <i>P. serotina</i> x O. de Serres)] x D. du Comice	2009	RSFG Voinești
44	Cristal	[(Roșior pietros x D. d'hiver) x D. d'hiver] x Beurre Hardy	2009	RSFG Voinești
45	Paradise	H 26-67-73 P x Păstrăvioare	2010	RIFG Pitești
46	Paradox	Monica x Păstrăvioare	2010	RIFG Pitești
47	Capriciosa	Cj 16-2-9 x Napoca	2010	RSFG Cluj
48	Primadona	Napoca x Red Williams	2010	RSFG Cluj
49	Adria	Clapp's Favorite x Napoca	2010	RSFG Cluj
<b>Plum</b>				
50	Andreea	-	2000	RSFG Vâlcea
51	Iulia	Tuleu Gras X R. Althan	2002	RSFG Bistrița
52	Delia	Vânăț de Italia X Anna Spath	2002	RSFG Bistrița
53	Ivan	Tuleu Gras X Vânăț de Italia	2003	RSFG Bistrița,
54	Jubileu 50	Tuleu Gras X De Bistrița	2003	RSFG Bistrița,
55	Agent	-	2004	RIFG Pitsti
56	Roman	Tuleu Gras X Early Rivers	2004	RIFG Pitești
57	Doina	Anna Spath X Renclod Althan	2004	RSFG Bistrița
58	Dani	Tuleu Gras X Grase românești	2004	RSFG Bistrița
59	Geta	-	2004	RSFG Bistrița
60	Matilda	Anna Spath X Agen irradiation Co <sup>60</sup>	2004	RSFG Bistrița

61	Romaner	Tuleu Gras X Renclod Althan	2005	RIFG Pitești
62	Zamfira	Anna Spath X Renclod Althan	2005	RSFG Bistrița
63	Elena	Tuleu Gras X Stanley	2005	RSFG Bistrița
64	Alutus	-	2010	RSFG Vâlcea,
<b>Apricot</b>				
65	Rareș	Băneasa 12P6 X NJA 13	2002	RSFG Băneasa
66	Carmela	Farmigdale X NJA 20	2002	RSFG Băneasa
67	Viorica	Băneasa 3/9 X NJA 20	2002	RSFG Băneasa
68	Valeria	Tivoli X Timpurii de Chișinău	2003	RSFG Băneasa
69	Nicușor	B21/38 X C4R8T122	2003	RSFG Băneasa
70	Adina	S. pol. Umberto	2003	RSFG Băneasa
71	Auraș	Sam nr.1 X Mari de Cenad	2003	RSFG Constanța
72	Cristal	Sam nr.1 X Mari de Cenad	2003	RSFG Constanța
73	Danubiu	Sam nr.1 X Mari de Cenad	2003	RSFG Constanța
74	Fortuna	Sam nr. 1 x Mari de Cenad	2004	RSFG Constanța
75	Amiral	Mari de Cenad x CR 24-12	2004	RSFG Constanța
76	Orizont	Mari de Cenad X CR 24-12	2004	RSFG Constanța
77	Augustin	Mărculești 9/5 X 18/4	2004	RSFG Constanța
78	Andrei	-	2006	RSFG Băneasa
79	Alexandru	-	2006	RSFG Băneasa
80	Monica	Băneasa 11-13 x Trandafiriu	2006	RSFG Bihor
81	Bihoreana	Băneasa 11-13 x Skana	2006	RSFG Bihor
82	Iulia	-	2006	RSFG Bihor
83	Ioana	-	2006	RSFG Bihor
84	Ceres	NJA 17 x R9P53	2007	RSFG Constanța
85	Euxin	R30P62 x R41P62	2007	RSFG Constanța
86	Histria	Worley's peach x Sulmona	2007	RSFG Constanța
<b>Peach</b>				
87	Cecilia	2,44-5P3 x Silver Prolific	2000	RSFG Constanța
88	Puiu	S. pol. R.18P4-P	2000	RSFG Constanța,
89	Liviu (N)	6,65-120P12 X 25.11.68P1	2000	RSFG Constanța
90	Melania (N)	1,47-13P7 X H2511-68P3	2000	RSFG Constanța
91	Catherine	S. pol. Catherine	2001	RSFG Constanța
92	Raluca	F2 hybrid	2001	RSFG Constanța
93	Costin (N)	-	2002	RSFG Constanța
94	Florin	Stark Saturn sel. VT	2002	RSFG Constanța
95	Filip	C2R6T178 x NJF2	2002	RSFG Constanța
96	Alexia	Flacăra x Marygold	2002	RSFG Băneasa
97	Amalia	Roubidoux X Flacăra	2002	RSFG Băneasa
98	Antonia	Elberta X I. H. Halle	2002	RSFG Băneasa
99	Tina (N)	Crimsongold X NJN21	2003	RSFG Băneasa
100	Mihaela (N)	Crimsongold X Ark125	2003	RSFG Băneasa
101	Eugen	I.H. Halle X Mayflower	2003	RSFG Băneasa
102	Dida	Flacăra X HB9-35	2003	RSFG Băneasa
103	Năică (N)	H1.47 – 13 P6 x H251168 P3	2003	RSFG Constanța

104	Valerica	-	2003	RSFG Constanța
105	Oradea 11 (N)	Stark sumburst dwarf x Colins	2006	RSFG Bihor
106	Oradea 19	Stark sumburst dwarf x Fillette	2006	RSFG Bihor
107	Oradea 34	Stark sumburst dwarf x Redhaven	2006	RSFG Bihor
108	Oradea 40	Stark sumburst dwarf x Colins	2006	RSFG Bihor
109	Alex	-	2006	RSFG Băneasa
110	Herăstrău	-	2006	RSFG Băneasa
<b>Almond</b>				
111	Sandi	Primorski x Tuono	2006	RSFG Bihor
112	Ana	Ardechoise x H1/9 – 1fa	2006	RSFG Bihor
113	Sabina	Ardechoise x Pomorie	2006	RSFG Bihor
114	Viola	Ardechoise x Pomorie	2006	RSFG Bihor
115	April	Primorski x [(Preanai x Crâmsky)]	2006	RSFG Bihor
<b>Sweet cherry</b>				
116	Cătălina	Van X Boambe de Cotnari	2001	RSFG Iași
117	Golia	Van X Boambe de Cotnari	2001	RSFG Iași
118	Marina	Boambe de Cotnari X HC 23/31	2001	RSFG Iași
119	Superb	Boambe de Cotnari X Thurn Taxis	2002	RIFG Pitești
120	Bucium	Van x Boambe de Cotnari	2006	RSFG Iași
121	Iașirom	Van x Boambe de Cotnari	2006	RSFG Iași
122	Ștefan	Van x Boambe de Cotnari	2006	RSFG Iași
123	Tereza	Van x Ebony	2006	RSFG Iași
124	Sublim	Muncheberger fruhe X Big. Moreau	2006	RIFG Pitești
125	George	Cireșe de Octombrie x Fromm	2007	RSFG Iași
126	Gloria	-	2009	RSFG Bistrita
127	Spectral	-	2009	RIFG Pitești
128	Ivona	-	2009	RSFG Bistrita
<b>Sour cherry</b>				
129	Rival	Griot Moscovski x Nana	2004	RIFG Pitești
130	Amanda	-	2005	RSFG Fălticeni
131	Stelar	-	2008	RIFG Pitești
<b>Walnut</b>				
132	Valmit	Local population selection	2000	RSFG Vâlcea
133	Ovidiu	Local population selection	2001	RSFG Iași
134	Claudia	G4 X 44-430	2003	RSFG Geoagiu
135	Sibișel 252	Local population selection	2003	RSFG Geoagiu
136	Geoagiu 86	Local population selection	2003	RSFG Geoagiu
137	Ciprian	Sibișel 44 X Sibișel 4	2003	RSFG Geoagiu
138	Valstar	-	2010	RSFG Vâlcea



139	Valcris	-	2010	RSFG Vâlcea
140	Timval	-	2010	RSFG Vâlcea
141	Unival	-	2010	RSFG Vâlcea
<b>Chestnut</b>				
142	Romval	-	2010	RSFG Vâlcea
<b>Currant</b>				
143	Ronix	Tsema X Kantata 50	2000	RIFG Pitești
144	Deea	Tsema X Kantata 50	2000	RIFG Pitești
145	Record 35		2001	RSFG Fălțiceni
146	Padina	5/24-77 X 2/50-79	2003	RIFG Pitești
147	Geo	Tsema X Kantata 50	2003	RIFG Pitești
<b>Gooseberry</b>				
148	Polin		2010	RIFG Pitești
149	Virens	Malahit o.pol.	2007	RIFG Pitești
150	Verda	Malahit o.pol.	2007	RIFG Pitești
<b>Raspberry</b>				
151	Star	Citria x Orss Seedling	2000	RIFG Pitesti
152	Opal	Babie Leta x Lylin	2003	RIFG Pitesti
153	Gustar	Heritage x Zewa H.	2003	RIFG Pitesti
<b>Blackberry</b>				
154	Felix	Willson x Early Thornfree	2001	RSFG Fălțiceni
155	Orest	-	2005	RSFG Fălțiceni
156	Dar 8	Darow o.pol.	2006	RIFG Pitești
157	Dar 24	Darow o.pol.	2006	RIFG Pitești
<b>Blueberry</b>				
158	Simultan	Spartan o.pol.	2001	RIFG Pitești
159	Delicia	Patriot o.pol.	2001	RIFG Pitești
160	Lax	Spartan o.pol.	2002	RIFG Pitești
161	Compact	Spartan o.pol.	2002	RIFG Pitești
<b>Seabuckthorn</b>				
162	Pitești 1	Wild population selection	2006	RIFG Pitesti
163	Pitești 2	Wild population selection	2006	RIFG Pitesti
<b>Strawberry</b>				
164	Roxana	Gorella X Red Gauntlet	2003	RSFG Satu Mare
165	Safir	Sunrise X Premial	2003	RSFG Satu Mare
166	Ralu	Pajaro X Premial	2003	RSFG Satu Mare
167	Delicios	Dana X Red Gauntlet	2003	RSFG Satu Mare
168	Viva	Addie X Red Gauntlet	2003	RSFG Satu Mare
169	Mara	Pajaro X Red Gauntlet	2003	RSFG Satu Mare
170	Floral	Red Gauntlet x Irvine	2004	RIFG Pitesti

For the next periode, the fruit breeding in Romania should go on taking into account of:

- old and valuable tradition in the field; large variability of wild and cultivated genotypes existing;
- relation quality – consumer demand, as a new concept;
- pollution reducing;
- consumer protection.

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