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Stone Fruit Cultivars and Breeding in Hungary

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Abstract

Selection of stone fruits has a long tradition in Hungary. The proportion of Hungarian cultivars is high among cherries and apricots. The local selection and controlled hybridization of sweet cherry, tart cherry and apricot have improved dramatically the cultivar choice for the last two decades. The wide choice of Hungarian local cultivars and hybrids is a considerable source of breeding not only in Hungary but in other countries as well. The characteristics of the best selections are summarized.

Testing and evaluating of foreign peaches, nectarines and plums is necessary. Starting of their controlled hybridization is important in order to realize cultivars most adaptable to the Hungarian environmental conditions and most suitable to the market.

Introduction

Prior to the 1970's, Hungarian fruit cultivars had changed little from earlier times. Important reasons for this were as follows: fruit research was not well financed, cultivar evaluation was restricted and not well organized, state farms and cooperatives were not interested in changing cultivars, home gardeners did not have access to enough information, fruit markets were conservative and lacked adequate grade standards.

These factors resulted in reliance on outdated fruit cultivars which had already disappeared from the Western-European and American orchards. However, since the 1970's, there has been growing interest in new cultivars as the fruit industry strives to become more competitive in export markets and to improve the quality and variety of fruits available for domestic markets.

Many of the stone fruit cultivars permitted for propagation are of Hungarian origin (Table 1). The majority of them are derived from local cultivars and clonal selections of main cultivars. Some important stone fruit cultivars grown in Hungary such as

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Table 1. Number and proportion of stone fruit cultivars permitted for propagation in Hungary (Source: Harsányi and Mády, 1989).

Crop	Number of cultivars permitted for propagation	Proportion of cultivars according to their origin (%)	
		Hungary	U.S.A. and Canada
Sweet cherry	25	56	20
Tart cherry	21	100	0
Plum	25	36	8
Apricot	22	86	5
Peach and nectarine	49	18	65
—fresh market type	33	27	58
—processing clingstone	11	0	72
—nectarine	5	0	100

'Germersdorfer' sweet cherry, 'Pándy meggy' ('Köröser') tart cherry, 'Besztercei szilva' ('Pozegaca') plum, 'Magyar kajszi' ('Hungarian Best') apricot, etc. are more than 100 years old. Their vegetative and seed propagation through the centuries have resulted in numerous types being developed.

The selected local cultivars are well adapted to the environment and are suitable as parents for breeding or direct planting in orchards. The collection of cultivated types and their selection were begun in the 1930's and 1940's all over Europe. Since that time, hundreds of local selections of stone fruit species have been collected and evaluated in Hungary. This work has resulted in the introduction of the most widely grown Hungarian cultivars (3).

Sweet Cherry

'Germersdorfer' (considered to be equivalent to 'Schneiders späte Knorpelkirsche') is the most widely grown sweet cherry cultivar in Hungary. Production of the other foreign cultivars such as 'Bigarreau Burlat,' 'Jaboulay,' 'Van' and 'Hedelfingen' is also important. 'Stella' is the only self-fertile cultivar found in the commercial orchards.

Among the cultivars derived from local selection 'Pomázi hosszuszáru' and 'Solymári gömbölyü' have some role in supplying the fresh market and the fruit of 'Szomolyai fekete' are very suitable for freezing.

Controlled hybridization of sweet cherry led to S. Brozik located at the Enterprise for Extension and Research in Fruit Growing and Ornamentals, Budapest was begun more than 30 years ago. Testing of the hybrids conducted by S. Brózik and E. Apostol resulted in introduction of 'Margit,' 'Linda' and 'Katalin' cultivars and some advanced selections in recent years.

'Margit' ('Germersdorfer' open pollinated) has similar fruit quality to 'Germersdorfer,' but ripens two weeks earlier and is characterized by earlier bearing and higher productivity than 'Germersdorfer.'

The fruit of 'Linda' (Hedelfingen' x 'Germersdorfer') ripen in the same season as 'Germersdorfer.' They are large-sized, good quality, bright red, highly pigmented and suitable for fresh market and processing. It is a more productive cultivar than 'Germersdorfer.'

The fruit of 'Katalin' ('Germersdorfer' x 'Podjebrad') ripen 3-4 days after 'Hedelfingen.' They are large-sized, dark red, firm and dark fleshed and are suitable for fresh consumption and processing, especially for freezing. The trees are productive.

In recent years self-fertility is one of the principal objectives of sweet cherry breeding.

Table 2. Main fruit characteristics of the important tart cherry cultivars and advance selections grown in Hungary.

Cultivar	Origin	Time of maturity	Average diameter (mm)	Juice color	Firmness of flesh	Use
IV-3/48	Meteor Korai x Érdi bötermö	May 20-22	20-22	dark red	intermediate	early fresh market
Meteor Korai	Pándy meggy x Nagy angol	June 3-5	20-22	dark red	intermediate	early fresh market
Csengödi	local selection	June 10-12	21-23	dark red	intermediate	food coloring
Érdi jubileum	Pándy meggy x Eugenia	June 12-30	21-23	dark red	firm	fresh market and processing
Favorit	Pándy meggy x Montreuili	June 12	23-25	pink	soft	fresh market
Korai pipacsmeggy	Pándy meggy x Császármeggy	June 12-15	21-22	pink	intermediate	candies
Érdi bötermö	Pándy meggy x Nagy angol	June 18-20	22-24	red	intermediate	fresh market and processing
Cigánymeggy cultivars	local selection	June 18-30	14-20	dark red	intermediate	juice
Clones of Pády meggy	clonal selection	June 25-30	22-25	red	intermediate	fresh market and processing
M 172	Pándy meggy x Eugenia	June 25-30	23-25	red	intermediate	fresh market
Debreceni bötermö	local selection	July 1-5	18-24	red	intermediate	fresh market and processing
Újfehértói ftös						
Kántorjánosi						

Tart Cherry

Currently only tart cherry cultivars of Hungarian origin are grown. The cultivar assortment is considered to be unique because of the long picking season and minority of 'Montmorency' type cherries. The tart cherry season is relatively long, extending from June 5th to July 10th. About 99% of the annual yield is represented by dark colored cultivars.

'Pándy meggy' was the most widely grown cultivar due to its excellent fruit quality. In the last two decades new self-fertile, productive tart cherries derived from local selections and controlled hybridization have replaced the self-sterile, unproductive 'Pándy meggy.' The proportion of tart cherry cultivars grown in commercial orchards is as follows: 'Érdi bõtermõ' (35%), 'Ujfehértói fürtös' (35%), clones of 'Pándy meggy' (7%), 'Cigánymeggy' types (5%), 'Meteor koria' (3%), 'Érdi jubileum' (3%), others (12%). The choice and fruit characteristics of Hungarian tart cherries are shown in Table 2.

The tart cherry breeding program conducted by P. Maliga and J. Apostol at the Enterprise for Extension and Research in Fruit Growing and Ornamentals, Budapest was begun in the 1940's. Their principal objective was to develop cultivars characterized by: self-fertility, regular bearing and high productivity, ripening sequence from early June to mid July, suitability of fruit for fresh market and processing, resistance to the important diseases and pests.

Crosses were based on 'Pándy meggy' in order to transfer its excellent fruit quality. Cultivars developed from this hybridization ('Érdi bõtermõ,' 'Meteor korai,' 'Érdi jubileum,' etc.) have been widely planted in Hungary. At present 2,500 seedlings are under observation by J. Apostol.

Plum

Although plum (European type) is the dominant stone fruit based on annual yield, there have not been any successful controlled hybridization efforts. In the last 30 years E. Tóth, located at the Enterprise for Extension and Research in Fruit Growing and Ornamentals, Research Station in Cegléd, has improved the choice of plums by clonal selection of 'Besztercei szilva' and by introduction of foreign cultivars (7).

Clones of 'Besztercei szilva' and recently 'Stanley' are the most commonly planted plums. Presently the new Yugoslavian cultivars ('Cacanska rana,' 'C. lepotica,' 'C. rodna'), 'Bluefre' and 'President' are gaining importance. The major factor limiting plum culture is the susceptibility of many cultivars to Plum pox virus (sharka). Cultivars and clones differ widely in their susceptibility to sharka therefore selection of the most tolerant ones should be possible in further cultivar improvement (2).

Apricot

Between 1951 and 1960 more than 500 local seedlings and clones of apricot were collected and evaluated by F. Nyujtó at the Enterprise for Extension and Research in Fruit Growing and Ornamentals, Research Station in Cegléd. This work has improved the cultivar choice but none of the collected material had all the desired production and market characteristics. The main features of cultivated Hungarian apricot cultivars are summarized in Table 3. For further improvement between 1967 and 1969, controlled hybridizations were made using 13 parental cultivars (5).

Cultivars belonging to the 'Kései rózsa' and 'Mandulakajszi' groups transmitted their winter hardiness and spring frost tolerance in a dominant way when used either as seed or pollen parents. Average fruit size of progenies usually were intermediate the parental cultivars. Certain cultivars used as parents (e.g. 'Ceglédi óriás,' 'Ceglédi biborkajszi,' 'Mandulakajszi C.712') were able to improve productivity.

Table 3. Some production and market characteristics of principal Hungarian apricot cultivar groups (source Nyujtó et al. 1982).

Cultivar groups	Favorable characteristics	Unfavorable characteristics
Óriás kajszi (Giant apricot)	early-midseason large fruit size good eating quality early bearing	early blooming selfsterility susceptibility of flowers and fruitlets to springfrost soft flesh inflexible branches susceptibility to Gnomonia leaf spot and brown rot
Biborkajszi (Scarlet apricot)	large and attractive exellent fruit quality high productivity	short dormant period frost tender flowerbuds susceptibility to canker Gnomonia leaf spot and brown rot
Magyar Kajszi (Hungarian Best)	favorable shape and flesh color excellent quality high productivity good adaptability	short dormant period long ripening period irregular bearing susceptibility to Gnomonia leaf spot and brown rot
Mandulakajszi (Almond apricot)	long dormant period large and attractive fruit firm flesh suitability for shaking	almond-shaped fruit susceptibility to canker
Rózsakajszi (Rose apricot)	firm flesh suitability for shaking good shipping ability excellent winter hardiness high productivity	small fruit size pale and dry flesh late bearing susceptibility to Gnomonia leaf spot and brown rot

Large fruit size was more effectively transmitted when large fruited apricots such as 'Ceglédi óriás' and 'Ceglédi biborkajszi' were used as a seed than as pollen parents. Progenies of 'Kései rózsa' group had small fruit size. Characteristics of the advanced apricot hybrids are tabulated (Table 4).

Peach

Hungarian cultivars derived from controlled hybridization such as 'Aranycsillag' and 'Remény' and local selections such as 'Mariska,' 'Piroska' and 'Julian' make up a small percent of the production. The major peaches are American ones such as: 'Dixired,' 'Starking Delicious,' 'Jerseyland,' '*Sunbeam*,' '*Redhaven*,' '*Ford*,' '*Suncrest*,' '*Champion*' and '*Elberta*.' The italicized cultivars are widely planted in all regions because of their good productivity and cropping consistency. In growing areas where winter injury occurs more often, planting of some hardy cultivars of unknown origin (e.g. 'Piroska,' 'Nektár H.,' 'Jubileum') is also suggested.

Processing clingstone and nectarine cultivars are increasing in importance. 'Loadel,' 'Vesuvio,' 'Babygold 5, 6, and 7' predominate. Nectarines such as 'Red June,' 'Harko,' 'Nectared 4,' 'Inde-

Table 4. Main characteristics of advanced apricot selections[x] (Cegléd, 1980-1988).

Cultivar	Origin	Cold hardiness	Self-fertility (%)	Average yield MT/ha/yr	Average yield kg/cm² trunk cross section area	Maturity (days -/+ Magyar kajszi C.235)	Mean fruit weight g	Suitability of fruit for[z] fresh market	export	canning
Magyar kajszi C.235[y]	Clonal selection of Magyar kajszi	poor	17	8.7	0.71	July 9th	54	3	3	3
H-I. 5/47	Ceglédi óriás x Kései rózsa	good	0.5	12.0	0.72	-5	52	3	2	1
H-I. 5/33	Kései rózsa x Ceglédi óriás	good	16	26.6	0.90	+7	44	2	2	3
H-I. 5/29	Kései rózsa x Ceglédi biborkajszi	excellent	21	19.3	0.80	+9	44	2	2	3
H-II. 25/37	Kései kajszi x Ceglédi biborkajszi	good	24	22.0	1.50	+10	57	3	3	3
H-II. 20/6	Magyar kajszi x Ceglédi biborkajszi	good	35	21.0	0.85	+10	48	2	3	3
H-II. 36/26	Kecskeméti rózsa self pollination	excellent	23	15.3	0.9	+14	38	3	2	2

[x]Trees were planted at 5 X 3 m spacing.
[y]Commonly planted clone of 'Hungarian Best.'
[z]Ratings were made between 1 (least desirable) and 3 (most desirable).

pendence' and 'Flavortop' are grown only on a very limited scale.

In spite of the relatively wide cultivar choice, comparatively few cultivars have good market and production characteristics. Thus, testing and evaluating new high quality foreign peaches and nectarines is important.

Prunus Rootstocks

The majority of rootstocks used for tart cherry are seedlings of P. mahaleb, and for plum are seedlings of P. cerasifera. P. persica and p. dulcis seedling rootstocks are used for peach. Apricot cultivars are propagated on P. armeniaca and P. cerasifera seedlings. Wild P. avium and P. mahaleb seedlings are used for sweet cherry.

Selection of Prunus rootstocks was begun in 1951 based on the wide choice of the well-adapted local P. cerasus, P. insititia, P. cerasifera, P. armeniaca, P. persica, P. amygdalus cultivars and their forms grown wild and P. mahaleb and wild P. avium populations. In the last 20 years about 500 rootstock cultivars were collected and evaluated in nurseries. The best ones have been widely used in Hungarian nurseries (4).

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Stimulation of Lateral Branch Development on Tissue Culture-derived Apple Trees

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Abstract

Rooted tissue culture-derived (TCD) apple (*Malus Xdomestica* Borkh.) plants (15 cm tall) of 'Gala' and 'Royal Gala' were either pruned or left unpruned and treated with dikegulac at 5 levels (0, 500, 1000, 1500, 2000 mg/l). Controls were treated with water. Dikegulac-treated plants produced up to 6 branches per stem. Control plants did not branch. The longest branches were observed at the 500 mg/l treatment level. Branch length decreased as the dikegulac concentration increased. Following branch measurement all plants were pruned to soil level and regrowth was examined twenty weeks later. The regrowth length of dikegulac-treated plants was about twice that of control. Leaf area and stem diameter of dikegulac-treated plants were significantly larger than control. These results suggest that dikegulac can be used to obtain high quality multiple-branched apple trees.

Introduction

Dikegulac-sodium (PBI Gordon Corp., Kansas City, MO, USA) is a commercial systemic plant growth regulator that can be applied as a foliar spray to reduce or break apical dominance and to enhance lateral branching. It is absorbed by the leaves and translocated through the phloem to the shoot tips where it inhibits DNA synthesis (2, 3) and reportedly kills terminal buds and promotes branching of certain plants. including pecans (10), azaleas (5, 16), cane cuttings of *Draceana fragrans* (7), tomato (6), pepper (11), and asparagus (8, 9). Algerian ivy plants treated with dikegulac produced more new shoots per node than similar plants treated with GA_{4+7}, 6-BA, or Promalin (1).

The strong apical dominance exhibited by many young apple trees can result in delayed bearing and poor canopy development. Overcoming apical dominance and the promotion of lateral growth are major objectives in the cultural management of an intensive orchard system (12). The use of well-branched nursery trees for orchard planting can shorten the time required for commercial fruit production (4, 13).

This study was initiated to determine whether dikegulac could improve the growth and branching of tissue culture-derived (TCD) self-rooted apple shoots ex vitro.

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