fruit rot susceptibility in strawberries, but selecting for berries with raised necks, reflexed calyxes, and greater flesh firmness should help provide some rot resistance as well as qualities needed for shipping or processing.

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Fruit Varieties Journal 49(1):19-21 1995

Stone Fruit Breeding in Lithuania

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Abstract

European plum *(Prunus domestica)*, sour cherry *(Prunus cerasus)*, sweet cherry *(Prunus avium)*, apricot *(Prunus armeniaca)* — in that order — are widely grown in Lithuania, but varieties are restricted due to cyclical cold winters (-35°C) every 11-12 years. Varieties introduced from more southern regions are injured by cold, but they have high quality fruit. Local selections or varieties from colder regions are hardy, but have medium quality fruit. In 1952 a breeding program was begun at the Vytėnai Experimental Station (reorganized 1987 as Lithuanian Institute of Horticulture) to develop reasonably hardy, disease resistant, high yielding, high quality varieties. The following varieties of European plum, sour cherry, and sweet cherry have been released.

European Plum

'Štaro Vengrinė' ('Ankstyvoji Vengrinė' op) introduced in 1962 by I. Štaras and A. Lukoševičius. Ripens mid-August. Fruit elliptical, 30-35 g, attractive, tasty, sweet, aromatic. Skin violet with bluish-grey bloom, flesh yellowish, firm, juicy. Stone, 1.2g, easily removed. Tree moderate grower, medium hardy, medium resistant to fungal diseases such as *Sclerotinia laxa, Clasterosporium carpophilum* and bears in the orchard within three or four years.

'Orija' ('Renklod Kolchoznyj' op) introduced in 1972 by A. Lukoševičius and G. Šviriené. Ripens end of August. Fruit round, 40-50g, freestone, attractive, very tasty, sweet, aromatic. Skin reddish-blue, flesh yellowish-green, medium firm, juicy. Stone averages 1.6g. Tree moderately hardy, medium vigor and bears fourth year in the orchard. 'Orija' equals in taste to 'Kirke's Plum,' but is more cold hardy.

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Performance of *Prunus domestica* 'Staro Vengrinė,' 'Orija,' 'Rausvė,' and 'Gyné' as compared to 'Stanley' at the Lithuanian Institute of Horticulture at Babtai, Lithuania.

	'Stanley'	'Staro Vengrinė'	'Orija'	'Rausvė'	'Gyné'
Understock	*P. cerasifera*	*P. cerasifera*	*P. cerasifera*	*P. cerasifera*	*P. cerasifera*
Growth	moderate	moderate	moderate	moderate	moderate
Hardiness	not hardy	average	average	average	average
Disease resist.	average	average	average	average	resistant
Bearing age	4 years	3-4 years	4 years	4 years	4 years
Production	productive	very productive	productive	productive	productive
Fruit appear.	attractive	attractive	attractive	very attractive	attractive
Fruit quality	good	good	excellent	good	good
Fruit weight	30-35g	30-35g	40-50g	50-60g	20-30g
Stone weight	1.4g	1.2g	1.6g	1.8g	1.3g
Stone separat.	moder. freestone	freestone	freestone	very freestone	freestone
Ripening time	early September	mid-September	late September	lte Aug./erly Sept.	early September

'Rausvė' (No. 109-26 plum seedling op) introduced by A. Lukoševičius in 1972. Ripens end of August-beginning September. Fruit round, 50-60g, very attractive, tasty, sweet aromatic and sprightly. Skin greenish-yellow, on the sunny side reddish, covered with grey-reddish bloom. Flesh yellow, medium firm, juicy. Stone 1.8g, easily removed. Best used fresh. Tree of medium vigor, medium hardy and medium disease resistant. Bears fourth year in orchard. Fruit quality and taste superior to 'Emma Leppermann.'

'Gyné' ('Italian Prune' x 'Stanley') cross made 1974 and introduced 1985 by A. Lukoševičius. Ripens end of August through beginning September. Fruit elliptical, 23-30g, attractive, tasty, aromatic, when picked, can be stored for 15-20 days. Stone 1.3g, removes easily. Skin dark blue with grey-bluish bloom. Output of dried fruit 27.5% ('Sweet Common Prune' — 22.5%). Tree of medium vigor, moderately hardy, disease resistant. Bears fourth year in orchard. 'Gyné' equals 'Stanley' in taste, but is hardier and more disease resistant.

Sour Cherry

'Vytėnų Žvaigždė' ('Žagarvyšné' x 'Minister von Podbielski' cherry seedling No. 100-1) cross made in 1973 by A. Lukoševičius. Ripens beginning of July. Fruit medium, 4.5-5g, round, dark red skin, attractive, tasty. Stone 0.25g, freestone. Suitable for dessert and processing. Tree of moderate size, hardy, medium resistant to cherry leaf spot *(Coccomyces hiemalis)*. Bears third year in the orchard and thereafter annually and consistently. Crown is round with drooping branches. Has tendency to bear on one year wood. 'Vytėnų Žvaigždė' is better in fruit quality than the local and widely grown 'Žagarvyšné.'

Sweet Cherry

'Vytėnų Juodoji' ('Žemaičių Raudonoji' x 'Dnieprovka') cross made 1973, seedling number 4603 selected, named and introduced in 1983 by A. Lukoševičius. Ripens early July. Fruit round, 6g, attractive, tasty. Skin dark red, almost black when fully ripe. Flesh firm, sweet, juice red. Stone 0.4g, easily removed. Tree vigorous, hardy, resistant to cherry leaf spot *(Coccomyces hiemalis)*. Produces heavy crops yearly.

'Vytėnų Rožinė ('Geante de Hedelfingen' x 'Rozine') cross made 1968, seedling number 4501 selected, named and introduced in 1983 by A.

Lukoševičius. Ripens early July. Fruit round, 6g, attractive, very tasty. Skin yellowish with a red blush. Flesh medium firm, juicy, sweet. Stone 0.3g, easily removed. Tree moderately vigorous, resistant to cherry leaf spot (*Coccomyces hiemalis*). Produces heavy crops yearly.

Fruit Varieties Journal 49(1):21-30 1995

Cross Protection Against Virus Diseases in Fruit Trees

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Abstract

Fruit trees are commonly infected with plant viruses. Several methods have been used to eradicate viruses from plant tissues including chemotherapy, thermotherapy, *in vitro* propagation, and a combination of some of these protocols. Recent advances in molecular techniques have provided a new approach for developing virus resistant genotypes. Genetic engineering of virus resistance into plants has been accomplished using several strategies including satellite-RNA-mediated resistance, antisense RNA-mediated resistance, and coat protein-mediated resistance, among others. Current advances in using coat protein-mediated resistance have proven promising in protecting several agronomic crops against virus infection. More recently, a number of fruit crop species have been transformed with coat protein genes of important plant viruses and promising results have been obtained. This is a general review of cross protection strategies used in combatting virus diseases and the current advances made in genetic engineering of virus resistance in fruit trees.

Most fruit crops are susceptible to virus diseases; in most cases, viruses cause reductions in yield and/or fruit quality resulting in small, deformed fruits. Viruses multiply in plant cells or tissues and spread throughout the whole tree, producing disease symptoms. Some genotypes are tolerant to virus infection and the virus may spread after it multiplies without causing disease symptoms. Viruses are transported from cell-to-cell and within vascular tissues, and therefore nuclei, chloroplasts, and mitochondria are easily infected (52). Most viruses, such as cowpea mosaic virus and turnip yellow mosaic virus, attach themselves to certain membranes in the cytoplasm (52).

Viruses contain the genetic information specifying the symptoms produced, therefore different viruses induce different symptoms on a species or in different varieties or cultivars of a single species. This diversity can be used for selection and breeding for resistance (52). Backcrossing to cultivated and wild varieties of a plant can lead to an improved variety selected for a desired combination of characters. By identifying resistant genotypes and crossing them with commercially important cultivars, breeders working with agronomic crops were able to develop disease resistant plants. Some plant breeders transferred genes from a non-cultivated plant species to a crop variety in a related species via interspecific hybridization. This approach was later extended for transferring genes from wild species to cultivated relatives in the same genus via intergeneric hybridization (15).

McKinney (31) reported that when a tobacco plant was infected with a mild strain of tobacco mosaic virus (TMV), it did not develop severe disease symptoms upon superinfection with a highly virulent strain of TMV. The strategy of purposely infecting plants with a mild virus strain to protect against a severe strain is called

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