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‘Vilmos’ Peach: A New and Improved “Stay-ripe” Processing Clingstone Peach Ripening in the ‘Andross’ Maturity Season

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‘Vilmos’ peach [*Prunus persica* (L.) Batsch] produces a clingstone fruit with nonmelting flesh and is suitable for processing or fresh market. Fruit can maintain quality and firmness for up to 4 weeks after the initial tree-ripe stage. This ‘‘stay-ripe’’ trait allows delayed harvest, including once-over and mechanical harvest when all fruit on the tree have achieved commercial tree-ripe quality. Evaluated as selection UCD-91,9-161, it was derived from a cross between ‘Loadel’ and breeding selection UCD-F10E,6-27. Ripening time is during the commercially important ‘Andross’ period, ≈4 d after ‘Fay Elberta’. Long-term commercial evaluations have shown that fruit demonstrated very good harvest, postharvest, and processing quality with low susceptibility to fruit brown rot, pit fragmentation, and associated red anthocyanin staining. Fruit possess good size and color that are similar to the commercially important ‘Andross’ and ‘Ross’. Trees have proven to be consistently productive during more than 14 years of commercial evaluation. Tree form is semi-upright, with vigor and branch architecture similar to those of ‘Andross’. Flowers are pink and nonshowy. Leaves are medium to dark green with globose glands.

Origin

A main objective of the University of California at Davis (UCD) Processing Peach Breeding Program is the development of replacements for the early maturity season cultivars Dixon and Andross. Recently, the Kader cultivar has been released as a commercially proven candidate for the current harvest gap between the processor extra-early and early harvest seasons. This harvest gap resulted from the removal of cultivars from the list approved by processors of the Dixon cultivar because of problems with splitting and red anthocyanin staining of fruit pits (Gradziel and Marchand, 2019). ‘Andross’ has become the most heavily planted cultivar for the early maturity season because of its potential to produce abundant firm fruit of good commercial size. Introduced in 1964, ‘Andross’ originated from a cross with ‘Dixon’ as a grandparent; therefore, it shares a common germplasm and processing problems. Fruit flesh color is a desirable yellow–gold and possesses good fresh and processed quality, but the fruit pit cavity often develops a red color from the formation of anthocyanins. The anthocyanins oxidize to brown when heat-processed, staining both the processed fruit and syrup. The ‘Andross’ fruit endocarp or pit is susceptible to breakage, resulting in undesirable pit fragments in the processed product. A harvest gap also exists between ‘Andross’ as the last commercially important early harvest season cultivar and ‘Ross’, the first commercially important late season cultivar.

The cultivar Vilmos resulted from a cross between ‘Loadel’ and F10E,6-27 (Fig. 1) which represents traditional germplasm, with the exception of UCD11,5-61, whose origins remain uncertain (Gradziel et al., 1993). Molecular marker analysis suggests that UCD11,5-61 represents a distinct germplasm lineage, possibly originating in South Africa (Fresnedo-Ramírez et al., 2015). Although too small for commercial production, UCD11,5-61 fruit are unique because they maintain good processing firmness and on-tree quality for up to 10 d after tree-ripe. This trait, which is referred to as stay-ripe because the ripening process is normal but fruit do not deteriorate rapidly after the tree-ripe stage, is highly desirable for processing peaches because it allows greater flexibility and efficiency during harvest. ‘Vilmos’ is a product of a breeding effort to combine the desirable field production traits of ‘Loadel’ and ‘Carson’ with the processing firmness and stay-ripe quality of UCD11,5-61. Originally designated as seedling 91,9-161, it was selected based on its good fruit and tree qualities, its freedom from red staining of the pit, the low frequency of pit fragments in processed fruit, and its desirable ripening time that is the same as or 1 d after that of ‘Andross’. Regional evaluation plots for 91,9-161 were established in 2001 at Winters and Davis in the Sacramento Valley area of California, in 2001 at the Kearney Agricultural Center in Parlier in the San Joaquin Valley area of California, and in 2004 at multiple grower evaluation plots in the Sacramento and San Joaquin Valleys under the designation ‘UCD-Early#5’. Based on its positive evaluations over 14 years, selection 91,9-161 has been released as the processing peach cultivar Vilmos. The name ‘Vilmos’ was chosen to acknowledge the extensive contributions to the genetic improvement of peach by Dr. Vilmos Beres during his long career in the Department of Pomology at UCD.

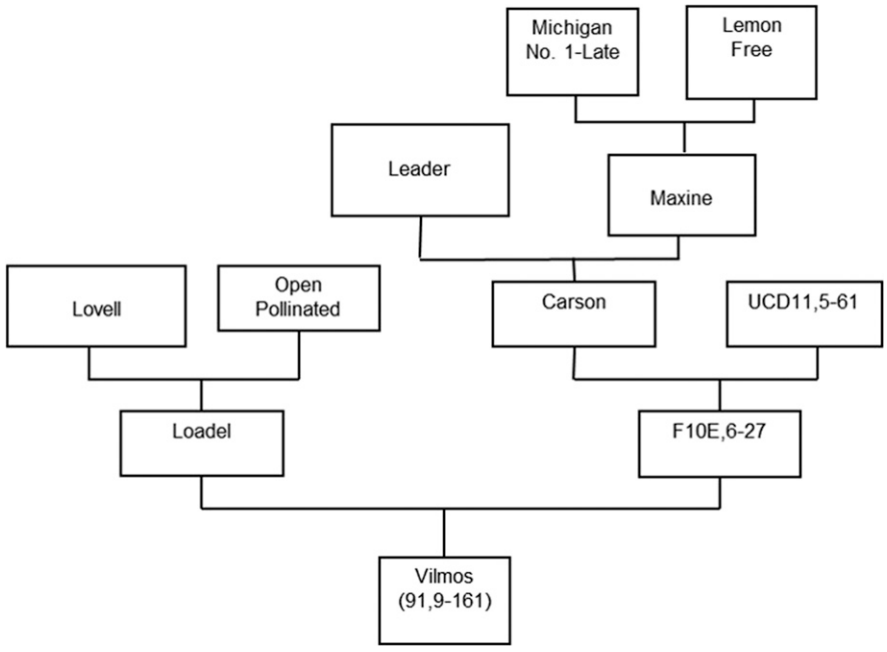

Fig. 1. Pedigree of the ‘Vilmos’ peach. Seed parent is presented on the left. The origin of the pollen grandparent UCD11,5-61 is unknown.

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Description

The 'Vilmos' peach ripens at the same time or just after the commercially important 'Andross'. In addition to the desirable ripening period, the fruit show a low incidence of the undesirable pit splitting and red anthocyanin staining of pit cavities that occur in Andross and other less extensively planted cultivars for this harvest time. The fruit are large and round, with a slight tip, although they are free from the elongated tip found on several clingstone peach cultivars following mild winter and warm spring weather (Fig. 2). The flesh is bright yellow to yellow–gold and shows improved resistance to fruit brown rot caused by *Monilinia fructicola* under both field and controlled laboratory conditions (Table 1). Fruit skin is slightly less pubescent than that of 'Andross', with ≈30% red blush. The pit has a medium size and has remained free from the red staining and extensive pit fragmentation of 'Andross', even in environments promoting these conditions. The tree is upright to semi-upright, with vigor similar to that of 'Andross'. Branch architecture is similar to that of 'Andross', although often with a denser canopy. Flowers are pink, nonshowy, and large, with two flowers commonly present per node. Leaves are medium to dark green, with globose leaf glands, and are similar to 'Andross' in size and shape.

Performance

Trees were evaluated from 2004 to 2018 under standard commercial conditions in the Sacramento and San Joaquin Valleys. Trees produced a medium to high crop comparable to that of 'Andross' (Table 2). 'Vilmos' bloom was uniform and abundant when chilling hours were >650 h using the Utah model (Byrne and Bacon, 1992), as occurred at all Central Valley test sites and years. Bloom time at Central Valley commercial production sites occurred midseason in relation to other commercial cling peach cultivars, similar to 'Kader' and 'Andross'. 'Vilmos' fruit were clingstone and nonmelting. Fully ripe fruit, as determined by a lack of visible green pigmentation on the fruit epidermis, showed an orange–yellow primary ground color with 10% to 40% red blush. Fruit skin had a fine, short, and netted pubescence, with no observed tendency to crack. Some split pits occur in low crop years, although at lower rates than that of 'Andross'. Fruit mass was similar to that of 'Andross' when thinned using recommendations developed for 'Andross' (California Canning Peach Association, 2017) to achieve commercial fruit diameters of ≥60 mm. Fruit size was similar to that of 'Ross' at the tree-ripe stage, with a firmer flesh more similar to that of 'Andross' (Table 1). Fruit shape (Fig. 2) and quality (Table 1) were similar to those of 'Andross', although with reduced polyphenol oxidase activity and associated flesh browning, similar to those of 'Ross'. Three-year average disease severity ratings for fruit brown rot were significantly lower for 'Vilmos' than for the standards 'Ross' and 'Andross'. Processed flesh color "a" and hue values were in the desirable range of yellow to yellow–gold (Gradziel, 1994; Tourjee et al., 1998), comparable to the 'Andross' cultivar (Table 1). Unlike 'Andross', however, 'Vilmos' showed a much lower tendency for the development of undesirable red anthocyanin staining of the fruit pit cavity and associated pit fragmentation. Fruit production according to regional grower evaluations was similar to 'Andross', but with fewer defects. In addition, fruit tend to maintain good processing firmness and quality for ≥14 d after ripening when compared with 'Andross' and 'Klampt' that also ripen at this time (Table 2). The stay-ripe trait allows growers and processors greater flexibility to provide raw product to the cannery during this critical harvest season. The additional ripening time made possible by this trait also allows more intensive cropping of trees than traditionally practiced. Commercial grower tests showed that 'Vilmos' was intentionally cropped with an unusually high fruit number by commercial thinning to only 80% of the levels recommended by the California Canning Peach Association (2017), resulting in a yield of 45,732 kg·ha^{-1} of fruit with the mandated commercial size ≥60 mm. This yield is comparable to 39,230 kg·ha^{-1} for standard thinned 'Vilmos' and 38,557 kg·ha^{-1} for standard thinned 'Andross'. The increased yield is a consequence of longer fruit-fill times allowed by the stay-ripe trait and the inherent increased genetic capacity of 'Vilmos' to continue mesocarp growth later in fruit development when adequate resources are available.

Fig. 2. Fruit and leaf morphology of 'Vilmos' peach (grid = 3 mm).

Table 1. Performance of 'Vilmos' clingstone processing peach compared with that of 'Andross' and 'Ross'.

	Andross	Vilmos	Ross
Raw fruit size (g FW)[z]	332.2 b	235.7 a	236.1 a
Raw fruit firmness (kg)[y]	3.4 b	3.3 b	3.7 a
Processed flesh color "a" value[x]	6.9 b	7.2 b	5.3 a
Processed flesh color "b" value[x]	45.9 a	46.1 a	43.3 b
Processed flesh color "L" value[x]	78.1 a	77.7 a	79.7 a
Flesh browning[x]	0.4 b	0.3 a	0.4 b
PPO activity (mL Abs/mi)[w]	383 b	135 a	193 a
Susceptibility to Monilinia fruit rot[v]	9.4 b	6.4 a	16.9 b
Proportion with red pit staining	0.7 b	0 a	0 a

[z]Mean separation performed within each row by Duncan's multiple range test, $P = 0.05$ from a sample size of 50 fruit randomly harvested from 12th leaf trees thinned to achieve a commercial size ≥60 mm.
[y]Fruit firmness was measured with a Magness-Taylor firmness tester using an 8-mm tip with the fruit epidermis removed as described by Gasic et al. (2011).
[x]CIELAB 1976 L*a*b* color space. Flesh browning was measured as the proportion of the 'L' value decrease 12 h after cutting as described by Techakanon et al. (2016).
[w]Polyphenol oxidase (PPO) values are from 10 fruit samples per genotype as described by Techakanon et al. (2016).
[v]Disease susceptibility values are from fruit samples replicated over 3 consecutive years as described by Gradziel (1994). Susceptibility was measured as the product of lesion incidence by average lesion diameter 48 h after controlled inoculation.

Table 2. Average fruit firmness for 'Andross', 'Vilmos', and 'Klampt' processing peaches when harvested at the tree-ripe stage and again at 2 weeks and 4 weeks after the tree-ripe date.

		Avg. fruit firmness, kg (SD)		
Cultivar	Ripe date	Tree-ripe	2 wk after Tree-ripe	4 wk after Tree-ripe
Andross	15 July 2015	2.6 (0 0.7)	1.1 (0.6)	<0.5
Vilmos	16 July 2015	2.9 (0.5)	2.5 (0.8)	2.1 (1.2)
Klampt	18 July 2015	2.9 (0.8)	<0.5	<0.5

Data are from 2015 trees grown under standard commercial conditions.

Availability

'Vilmos' is protected by U.S. Patent USPP29623, and licenses for propagation are available from the University of California Innovation Services, 1850 Research Park Drive, Suite 100, Davis, CA 95618-6134. Propagation material is distributed as registered virus-tested sources through the Foundation Plant Service, University of California, 1 Shields Avenue, Davis, CA 95616.

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