

PEAR VARIETY EVALUATION IN THE SACRAMENTO RIVER DISTRICT

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ABSTRACT

This trial was planted in Walnut Grove in Feb. 2010 using 10 varieties (Andy, Bartlett, Blake's Pride, Carmen, Cinnamon, Norma, Santa Maria, Sunrise, Tosca, and Turandot) on two rootstocks (OHxF 87 and Winter Nelis). Fire blight severely damaged or killed most trees of Santa Maria (2012), Carmen (2014), and Bartlett, Cinnamon, and Norma (2015). The greatest growth was produced by Carmen, followed by Turandot, Andy, and Norma, whereas Blake's Pride, Cinnamon, and Sunrise grew the least. Trees on OHxF 87 generally had greater yield, fruit size, and vegetative growth than trees on Winter Nelis. Tosca consistently produced the greatest number of fruit per tree, which were very small. Yields were generally lower in 2015, likely due to low chill and an unusually warm early spring. Fruit size was excellent, especially for Blake's Pride and Bartlett, with Sunrise fruit slightly smaller. Four new blight-resistant varieties were planted in the same block in spring 2013. One numbered variety produced four fruit per tree in 2014 and 23 fruit per tree in 2015.

INTRODUCTION

The variety Blake's Pride combines blight resistance with aromatic, juicy fruit and consistent yield (Ingels, 2007). It was created by a cross in 1965. The fruit is shaped like Bartlett and the skin is golden to light yellow, with some light tan russetting; it was very russeted in a North Coast trial (Elkins, 2006). It requires pollination and it ripens 2 weeks after Bartlett in the Pacific Northwest but closer to Bartlett in California (USA Pears, 2011).

Cinnamon is a russeted pear that was discovered as a limb mutation in a Bartlett tree near Hood River in 1979; however it is a winter pear that ripens with Anjou (Ingels et al., 2007). Cinnamon is a very late-harvested variety that was found to fully russet (similar to Noble Russet) in a North Coast trial (Elkins, 2006). It ranked high in taste tests, scoring as well as Bartlett for overall liking and purchase intent (Elkins, 2007).

Sunrise is a blight-resistant that ripens before Bartlett, close to Starkrimson. It has a yellow skin with a slight pink blush and little russetting. The fruit has a sweet pleasant flavor. Evaluations by USDA-ARS researchers have shown excellent overall consumer acceptance in comparison with existing commercial varieties (Scorza et al., 2008).

Italian Varieties

Carmen is currently the most widely sold new variety in Italy (Fresh Plaza, 2012). It is a consistent bearer and although it flowers with Bartlett, it ripens about 2 weeks earlier. The fruit has a good appearance, as it has attractive yellow and red color that is accentuated during refrigeration. It also has a long shelf life, and is very tolerant of handling and transportation (Mazzoni Group, 2012).

Norma is used for high-density orchards because of its medium-low vigor. Fruits are attractive and have a slight rust on a portion of the surface. Fruit size is large with yellow-green skin and some light red.

Turandot fruit are slightly red-colored, although red color increases during cold storage. Fruit are medium sized with yellow-green skin with some red.

Santa Maria has very large fruit, which mature early, with good quality. The skin is yellow green and sun-exposed areas are pink to red. It was found to be one of the most sensitive varieties to fire blight (Ristevski and Ristevska, 1996), and all trees in this trial died from blight by 2013.

Tosca fruit are similar to Bartlett. It is grown extensively in Italy where it is one of the earliest maturing varieties. It has greenish-yellow skin with an occasional red blush.

OBJECTIVE

The objective of this study was to evaluate the characteristics of selected pear varieties and the suitability for potential production.

PROCEDURES

The trial was planted in Feb. 2010 in a new orchard adjacent to Walnut Grove. The soil type is Laugenour loam. Trees were propagated by Fowler Nursery. Ten varieties were planted, including Bartlett. The goal was to plant five trees each of 10 varieties on two rootstocks (Winter Nelis and OHxF 87) (100 trees total). However, 14 of the trees did not survive in the nursery. In 2011-12, 11 additional trees died from fire blight. Most of the Santa Maria trees were severely damaged or killed by blight and were eliminated from harvest data collection. Evaluations include tree growth, measured by trunk cross-sectional area (TCSA), period of flowering, and fruit number, weight, and yield.

In addition to the varieties discussed above, three to four trees each of five new blight-resistant varieties developed by Richard Bell at the Appalachian Fruit Research Laboratory in West Virginia are being evaluated in the same block. Parentage of the trees is dominated by Bartlett, and also includes Seckel and Comice. The trees were planted in April 2013 and Bartlett trees were included for comparison.

RESULTS

Severe fire blight conditions in 2015 resulted in the death or severe cutting back of all or nearly all Norma and Bartlett trees (Table 1). Nearly all Carmen trees were killed by blight in 2014. Several Cinnamon trees also died, and the rest lost large portions of the canopy. Andy, Blake's Pride, Sunrise, and Turandot trees had 100% survival, and 90% of Tosca trees survived.

In a May 22, 2015 fire blight evaluation, Bartlett, Cinnamon, Norma, and the surviving Carmen trees had about 6 to 8 strikes per tree (Fig. 1). Andy and Tosca had less than 0.5 strikes per tree, whereas Blake's Pride, Sunrise, and Turandot trees had none.

Tree growth, as measured by trunk cross-sectional area (TCSA), was greatest in Carmen trees from the start (Fig. 2). This vigor, along with extreme numbers of secondary blooms, likely contributed to extreme susceptibility to fire blight. Next highest in TCSA was Turandot, followed by Andy, Norma, and Tosca, while Blake's Pride, Cinnamon, and Sunrise had the least growth. Excluding Carmen, Turandot had the greatest percent TCSA increase from 2014 to 2015, but Andy grew the most from 2011 to 2015 (Table 2). Sunrise produced the least growth between 2011 and 2015. Most trees on OHxF 87 appeared healthier than those on Winter Nelis, which was reflected in increased average TCSA of trees on OHxF 87 from 2012 to 2014 (Fig. 3). In 2015, fire blight damage on some trees likely affected the OHxF 87 vs. Winter Nelis TCSA values.

Turandot had the earliest average full bloom over the 3 year period of 2013-15 (approx. March 16), and Tosca, Blake's Pride, and Sunrise were about 2, 3, and 4 days later, respectively (Fig. 4). Norma was latest to bloom, at March 23.

Turandot produced the greatest number of flower clusters, followed by Bartlett (Fig. 5). Andy and Sunrise trees produced very few clusters. However, Tosca consistently produced the greatest number of fruit per tree, and 2015 was no exception (Fig. 6). Bartlett and Turandot produced only 50 fruit per tree, and Blake's Pride only produced about half of that. Fruit size was greatest for Blake's Pride and Bartlett trees, and as usual Tosca fruit were very small (Fig. 7). Total yield per tree was greatest for Tosca, followed by Bartlett (Fig. 8). Harvest data from Andy trees are not available, however very few fruit were produced.

As in past years, trees on OHxF 87 rootstock produced more fruit per tree, greater yield, and larger fruit than trees on Winter Nelis (Table 3). OHxF 87 trees produced 6% more fruit, 36% larger fruit, and 42% greater total yield than Winter Nelis trees in 2015.

For the new blight-resistant selections, most or all 84907-069 and 84907-166 trees produced fruit, and -166 produced an average of about 23 fruit per tree (Table 4). Yield efficiency of -166 trees was double that of -069 trees. At an average of 0.36 lb./fruit, fruit size of both selections was not large. The fruit were picked July 15, 2015, and could have been picked earlier. Selection 84907-166 had the greatest trunk cross-sectional area and -069 had the lowest.

DISCUSSION

After 6 years, several varieties proved to be unacceptable for commercial adoption in the Sacramento Delta. Santa Maria is known for being highly susceptible to fire blight, and all trees were removed in 2013 due to blight. Carmen developed large numbers of secondary blooms and suffered severe blight in 2014, while Bartlett, Cinnamon, and Norma had severe blight in 2015. Tosca fruit are consistently small and would require fruit thinning. Andy, Blake's Pride, Sunrise, and Turandot had little or no blight damage.

It is unknown why most varieties (other than Tosca) produced so few fruit in 2015, but winter chill and spring weather were likely factors. It is also unknown why OHxF 87 trees performed so much better than trees on Winter Nelis, although the heavy clay soil may have played a role. Sunrise had been a promising variety in past years, based on yield and fruit size (as well as blight resistance), but 2015 yields were low. Blake's Pride trees produced little fruit, but good fruit size.

In an earlier variety trial in the North Coast, Sunrise scored at least as well as Bartlett in taste preference and purchase intent, but Blake's Pride was behind Bartlett (Elkins, 2007). The skin of Blake's Pride fruit again had brown freckles, usually giving a partially russeted appearance. For this reason, it is questionable if Blake's Pride could become a commercially acceptable variety. Although Sunrise is highly blight resistant, it is not a unique enough variety to make it competitive with Bartlett. Also, like other varieties, it does not lend itself to canning so it may never become a widely planted variety.

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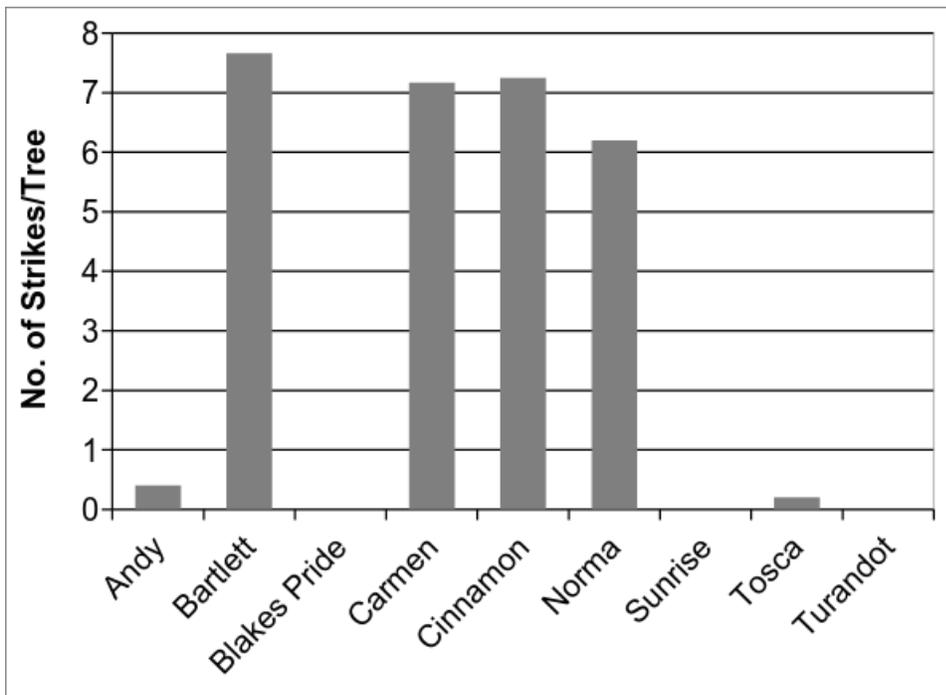


Figure 1. Average number of blight strikes per tree, evaluated May 22, 2015.

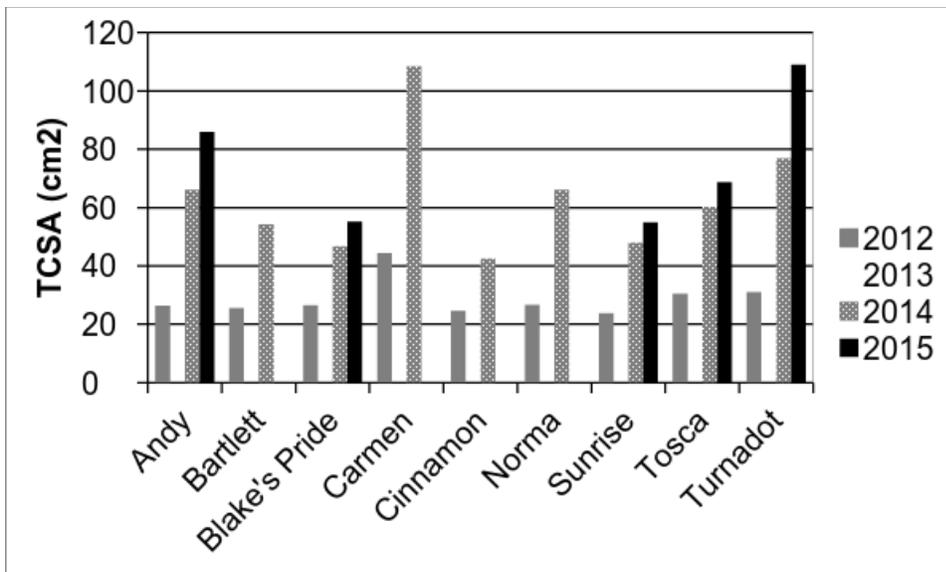


Figure 2. Average trunk cross-sectional area (TCSA) of trees in December, including surviving Carmen trees in 2014. Bartlett, Carmen, Cinnamon, and Norma trees were not included due to fire blight in 2015.

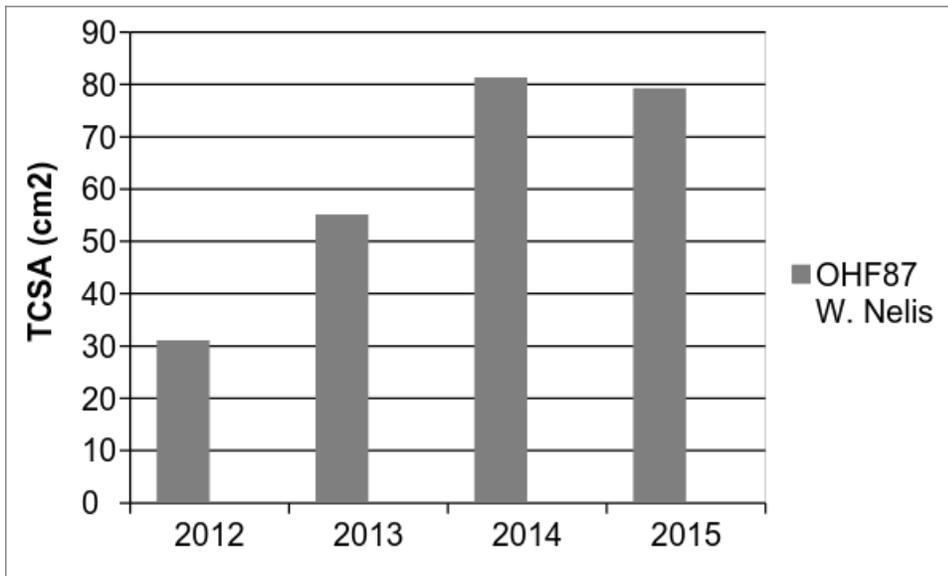


Figure 3. Average trunk cross-sectional area of all trees on OHF 87 vs. Winter Nelis rootstocks.

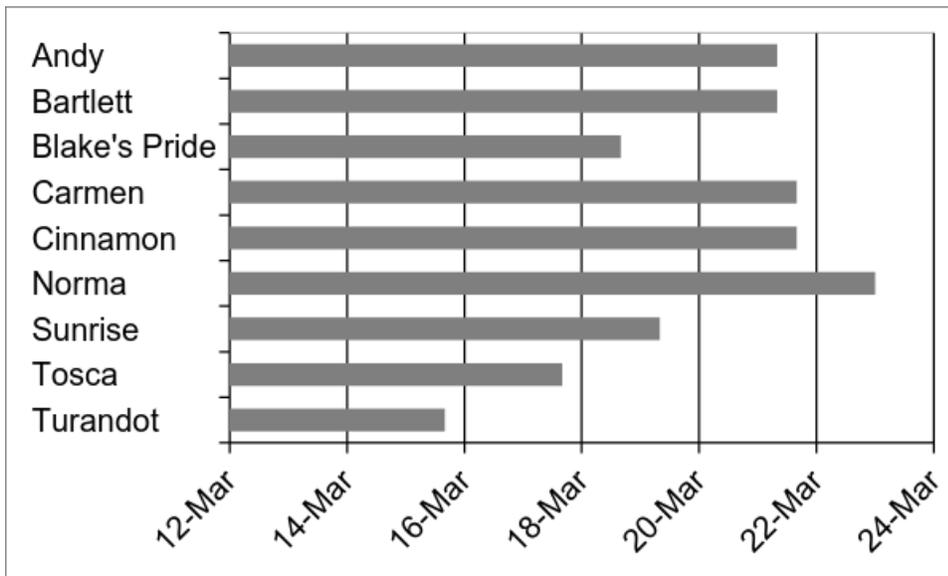


Figure 4. Average date of full bloom, 2013-2015.

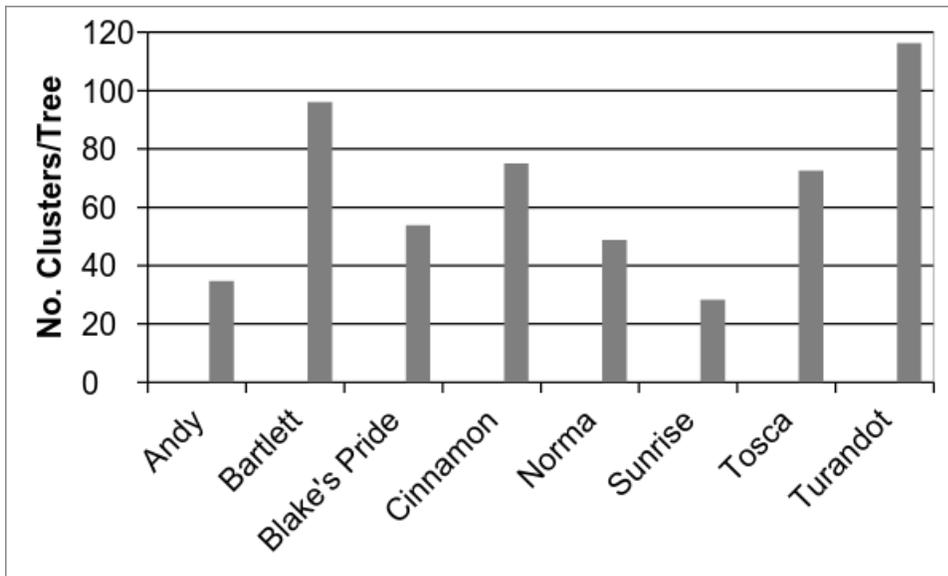


Figure 5. Average number of flower clusters per tree, 2015.

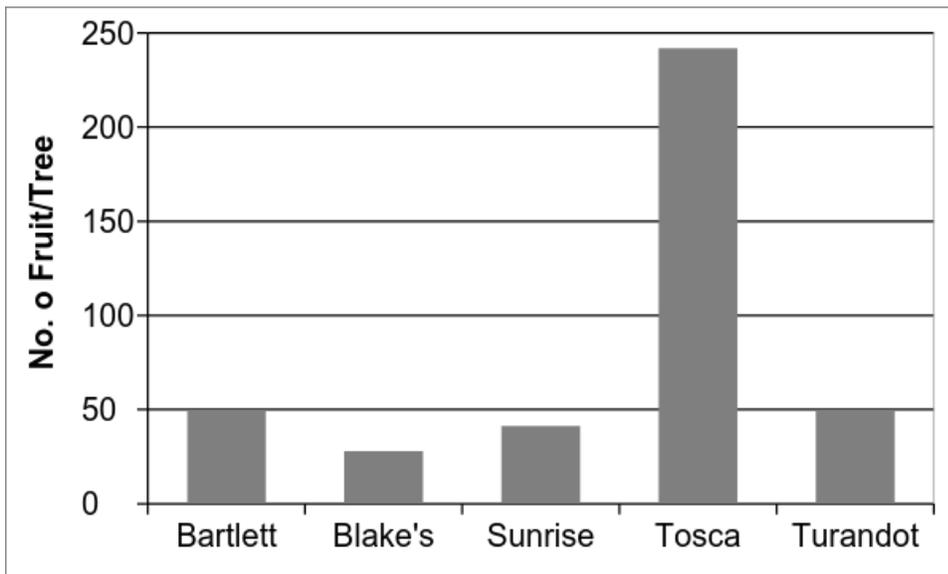


Figure 6. Average number of fruit per tree, 2015.

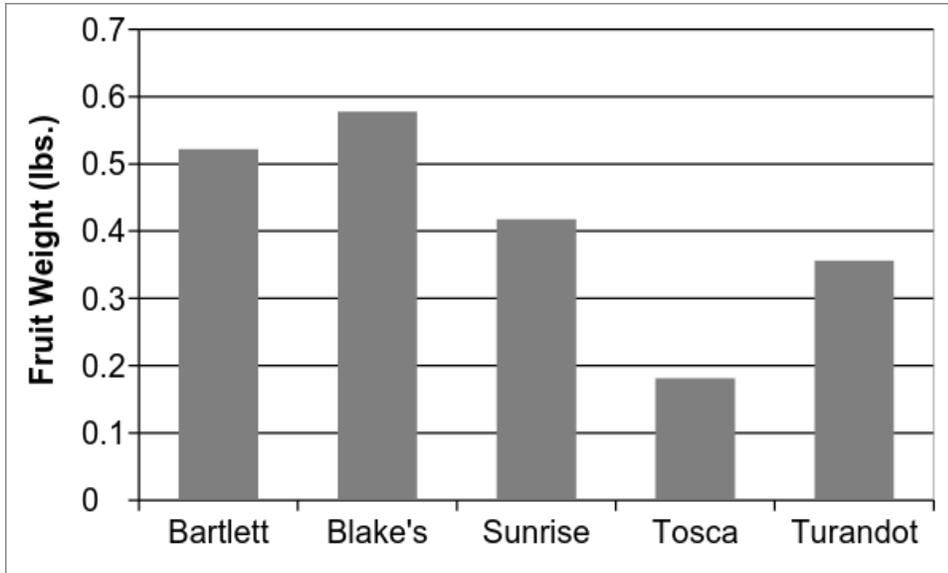


Figure 7. Average fruit weight, 2015.

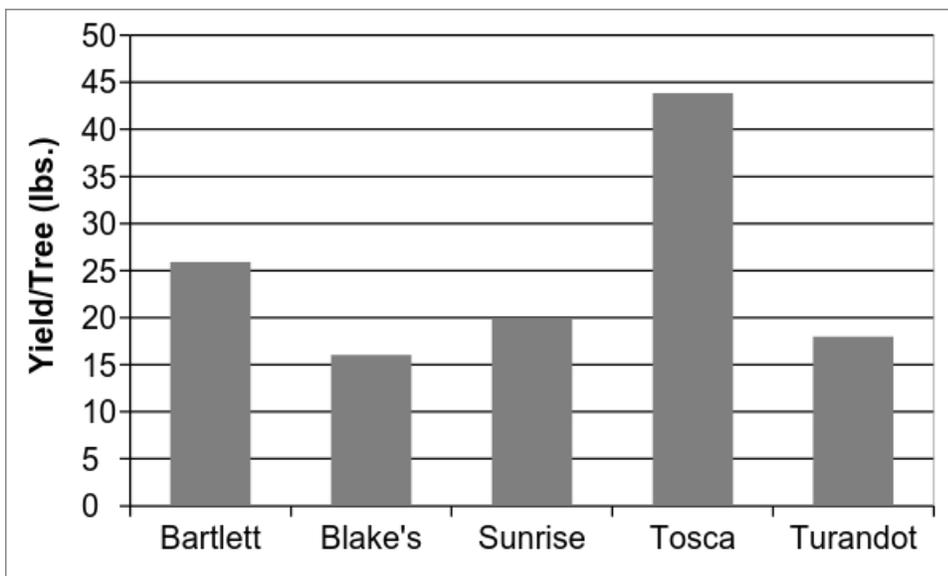


Figure 8. Average yield per tree, 2015.

Table 1. Survival of trees from planting through 2015. Nearly all trees that did not survive were killed by fire blight.

	No. Planted Feb. 2010	No. Alive Dec. 2015	% Survival
Andy	5	5	100
Bartlett	10	2	20
Blake's Pride	10	10	100
Carmen	9	0	0
Cinnamon	10	4	40
Norma	10	1	10
Sunrise	9	9	100
Tosca	10	9	90
Turandot	4	4	100

Table 2. Percent increase in trunk cross-sectional area of the varieties that survived fire blight in 2015.

Variety	% Increase over 2014	% Increase over 2011
Andy	30	617
Blake's Pride	18	233
Sunrise	15	341
Tosca	27	309
Turnadot	35	549

Table 3. Comparison of rootstocks in average number of fruit per tree, yield per tree, and weight per fruit of four varieties (Blake's Pride, Turandot, and Sunrise), 2015.

Rootstock	No. of Fruit/Tree	Yield/Tree (lbs.)	Fruit Weight (lbs.)
Winter Nelis	39.5	14.9	0.39
OHxF 87	42.0	21.1	0.53

Table 4. Average trunk cross-sectional area and yield and fruit quality parameters for tree selections from Richard Bell breeding program. Harvest date: July 15, 2015.

	No. of Trees	TCS A (cm ²)	No. Trees w/ Fruit	No. Fruit/ Tree	Yield / Tree (lbs.)	Yield Efficiency (kg/cm ²)	Weight/ Fruit (lbs.)	Fruit Pressure (psi)	Brix
69426-038	3 out of 3	10.1	0	--	--	--	--	--	--
84907-069	4 out of 4	6.0	3	4.7	1.7	0.13	0.36	12.6	14.0
84907-078	3 out of 4	9.2	0	--	--	--	--	--	--
84907-166	4 out of 4	13.8	4	22.8	8.3	0.27	0.36	13.3	13.5
Bartlett	3 out of 3	9.4	0	--	--	--	--	--	--