

‘Effie’ Nectarine

Margaret Worthington¹ and John R. Clark

Department of Horticulture, University of Arkansas, Fayetteville, AR 72701

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‘Effie’ is the sixth nectarine released from the University of Arkansas System Division of Agriculture (UA) peach and nectarine [*Prunus persica* (L.) Batsch] breeding program. Prior nectarine releases include ‘Arrington’, ‘Bradley’, ‘Westbrook’, ‘Bowden’, and ‘Amoore Sweet’ (Clark and Sandefur, 2013; Clark et al., 2001). The UA peach and nectarine program was established in the 1960s (Worthington and Clark, 2018) with the goal of combining novel flesh textures with a range of flesh colors, flavors, and acidity levels in adapted nectarine and peach germplasm to expand options for growers beyond standard-acid, melting, yellow-fleshed peaches. ‘Effie’ is the first mid-acid, white-fleshed nectarine release from the UA breeding program. It is also the latest ripening nectarine release from UA, ripening about a week after ‘Amoore Sweet’ and ‘Bowden’ and 2 weeks after ‘Bradley’. ‘Effie’ has firm, nonmelting flesh and excellent white nectarine flavor. It has very good resistance to bacterial spot [incited by *Xanthomonas arboricola* pv. *pruni* (Smith, 1903) Vauterin et al., 1995] and should provide a high-quality option for growers in areas where bacterial spot disease is a concern. Overall, ‘Effie’ is an excellent midseason white nectarine that is well adapted to the mid- to upper-southern United States and other areas of the world with similar climatic conditions.

Origin

‘Effie’ resulted from a cross of Ark. 720 nectarine × Ark. 747 peach (Fig. 1) made in 2004. The female parent, Ark. 720, was a standard-acid, yellow-fleshed nectarine selection with clingstone, melting-flesh texture. The pollen parent, Ark. 747, was a low-acid, white-fleshed peach selection with clingstone, nonmelting flesh. The progeny of this cross consisted of 60 seedlings segregating for acidity, flesh color, texture, and pubescence. ‘Effie’ was selected in 2008 and designated as Ark. 805. One other selection

was made from this population in the same year, but it was discarded in 2016. ‘Effie’ is named in honor of Mrs. Effie Gilmore, who made major contributions to the UA fruit breeding program during her 32 years of service on the staff of the Fruit Research Station (FRS), Clarksville, AR.

Primary testing of ‘Effie’ and the comparison cultivars was conducted at FRS, Clarksville, AR [west-central Arkansas, lat. 35°31′58″N and long. 93°24′12″W; U.S. Dept. of Agriculture (USDA) hardiness zone 7a; soil type Linker fine sandy loam (Typic Hapludult)]. Located on a ridge in the foothills of the Ozark Mountains, the FRS is a high-chill (1000 or more hours below 7 °C in the dormant season) environment with midwinter low temperatures reaching –15 °C and high annual rainfall (1100 mm). In all testing, trees were either open-center trained and spaced 5.5 m between trees and rows or trained to a perpendicular-V system with trees spaced 1.9 m and rows spaced 5.5 m. Trees were dormant-pruned and fertilized annually with either complete or nitrogen-only fertilizers, and irrigated as needed. Perpendicular-V trees also received one summer pruning, consisting of removing inward-growing shoots, in mid-June of each year. Pests were managed using a program typical for commercial orchards of the area. No bactericides were applied to plantings during testing. Fruits were thinned to a distance of 12–15 cm between fruit after shuck split but before pit hardening each year.

A trial consisting of open-center-trained, two-tree, nonreplicated observational plots of Effie and comparison cultivars Amoore Sweet, Arrington, Bowden, Bradley, and Westbrook, all on ‘Lovell’ rootstock, was maintained at FRS. Data were collected from these trees or the original selection (own-root) trees from 2009 to 2017. Dates for 10% and full bloom (90% of flowers/tree open) and first harvest were recorded. Fruit ratings of firmness and flavor at first harvest were taken from these trees each year. Trees were also rated for vigor, crop, and health, with an emphasis on bacterial spot severity on leaves, fruit, or both. The rating scale for these fruit and tree variables was one to 10 with 10 being most desirable. One exception was that a rating of seven to eight was most desirable for vigor, whereas a rating of 10 indicated excessive vigor. Average fruit weight, percent blush on fruit skin, and soluble solids content (SSC) were calculated from a five-fruit sample per cultivar each year. Soluble solids content was determined using a refractometer

(Sper Scientific 300035 digital refractometer; Sper Scientific, Scottsdale, AZ).

A replicated trial that included ‘Effie’ and the comparison cultivars Amoore Sweet and Bowden was established at FRS in 2014. The trial was organized in a randomized complete block design with four replications consisting of single trees. The trees were perpendicular-V-trained and budded on ‘Guardian’ rootstock. Data collected in this planting included date of full bloom and first harvest, yield, and fruit weight. Each tree was harvested one to three times during the fruiting season, and fruit weight was calculated as a weighted mean based on the total fruit weight harvested on each date. Soluble solids content, pH, and titratable acidity (TA) were determined from a five-fruit sample from each replicate tree at each harvest date. Soluble solids content was calculated using a refractometer. Titratable acidity and pH were measured by Metrohm 800 Dosino 862 compact titrosampler and electrode standardized to pH 2.00, 4.00, 7.00, and 10.00 buffers (Metrohm AG, Herisau, Switzerland). Titratable acidity was determined from 6 g of juice diluted with 50 mL of deionized, degassed water by titration of 0.1 N sodium hydroxide to an end point of pH 8.2 and expressed as percentage of malic acid. Bacterial spot severity ratings of leaves (diseased leaves and defoliation) were taken on a 6-point scale, with 0 = no bacterial spot and 5 = severe infection twice each year, in late spring and late summer. Trees were not rated for leaf resistance in Spring 2016. Percent of fruit with bacterial spot was assessed following each harvest and severity of symptoms on diseased fruit was expressed on a 6-point scale, with 0 = no bacterial spot and 5 = severe infection, with more than 50% of fruit surface covered in lesions. Data were collected during 2015, 2016, and 2017 seasons. The data were analyzed by analysis of variance as a split plot in time with cultivar as the main plot and year as the subplot. Mean separation was performed with Tukey’s honestly significant difference (SAS Institute, 2012).

A second replicated yield trial including Effie and the comparison cultivars Amoore Sweet and Bowden was established in 2014 at the Southwest Arkansas Research and Extension Center (SWREC), Hope [southwest Arkansas lat. 33°42′30″N, long. 93°33′0″W; USDA hardiness zone 8a; soil type Bowie fine sandy loam (Fragic Palendult)]. As at FRS, the replicated trial was organized in a randomized complete block design with four replications consisting of single trees and the trees were all budded on ‘Guardian’ rootstock. However, the trees were open-center-trained in the SWREC replicated trial. Data included yield and date of 10% bloom, 50% bloom, and first harvest. Bloom data were recorded in 2015, 2016, and 2017, whereas yield was only measured in 2016 and 2017. No yield data were recorded for two replicate trees of ‘Effie’ in 2016 and one replicate of ‘Effie’ in 2017 as most of the fruit was consumed by animal pests before harvest. Data were analyzed as previously described for the FRS replicated trial.

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¹Corresponding author. E-mail: mlworthi@uark.edu.

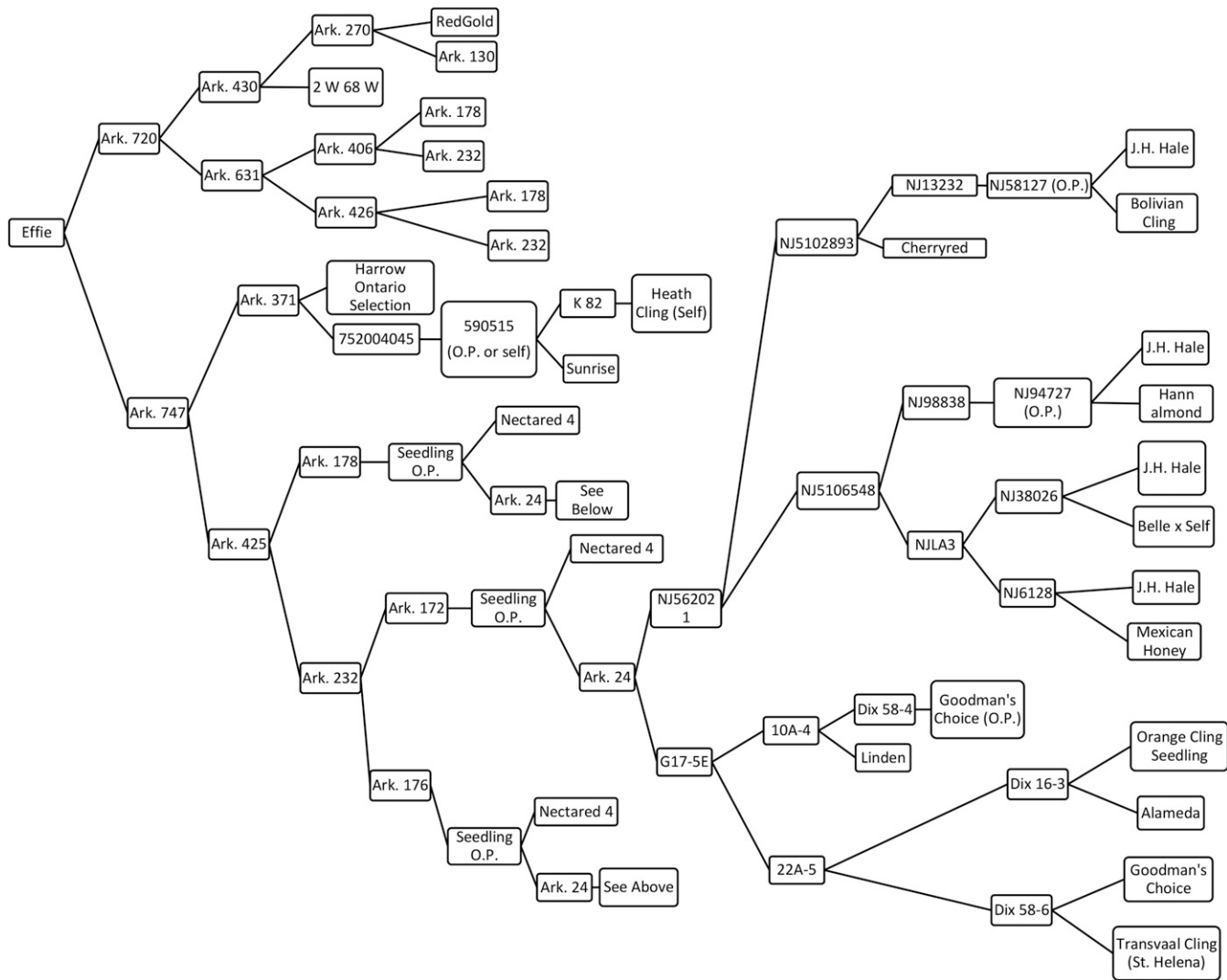


Fig. 1. 'Effie' nectarine pedigree.

Evaluation of postharvest storage performance of 'Effie' and comparison cultivars Amore Sweet and Bowden was conducted for 4 years (2013–16). Twenty fruit from each of two replicate trees per genotype were harvested at commercial ripeness for postharvest trials. Fruit maturity was determined by skin color (less than 5% green ground color) and a slight decrease in firmness based on finger-feel. All fruit were hand-harvested directly into 0.24 L corrugated trays (FormTex Plastics Corp., Houston, TX). Only undamaged fruit, lacking insect or disease symptoms, were included in postharvest evaluation. After harvest, all fruit were preconditioned in room temperature storage ($\approx 20^\circ\text{C}$) for 24 h and then placed in a walk-in cooler for cold storage. Storage temperature was maintained between 1 and 4°C . After 1, 2, and 3 weeks of cold storage, five randomly selected fruit from each replication were removed from storage and held at room temperature ($\approx 20^\circ\text{C}$) for ≈ 24 h. Skin and flesh quality, skin and flesh color, juiciness, browning, mealiness, and taste were subjectively rated on a scale

from 0 (worst) to 10 (best). The overall storage performance score for each genotype was based on the sum of the eight subjective ratings. An overall rating for each genotype on a 6-point scale was also determined based on the performance score [0 (0.00–40.99), 1 (41.00–50.99), 2 (51.00–60.99), 3 (61.00–70.99), 4 (71.00–75.99), and 5 (76.00–80.00), with 0 being unacceptable and 5 being exceptional storage performance].

Description and Performance

Flowers of 'Effie' are self-fertile and non-showy. Average 10% bloom date was 17 Mar. and the average full bloom date was 20 Mar. for 2009–17 (Table 1). Bloom occurred with or near all comparison nectarine cultivars. Although there was significant variation in bloom date from year to year, no significant genotype by year interaction was found in the replicated trial at FRS during the 2015–17 seasons. The average full bloom date in the replicated trial at FRS was 15 Mar., which was comparable to the standard cultivars Amore Sweet and Bowden

(Table 2). Bloom dates for all three cultivars were similar at SWREC trial at Hope, AR. The average 10% bloom date for 'Effie' was 12 Mar. and for 50% bloom was 16 Mar. (Table 3). No significant difference was found between 'Effie' and the comparison cultivars.

Tree vigor ratings on observational trees averaged 6.7 for 'Effie', slightly lower than that of the comparison cultivars in the trial (data not shown). This lower than ideal vigor rating can be attributed to the weak original selection tree of 'Effie'. Vigor ratings during the first 3 years (2009–11) when data were taken on the original tree only averaged 5.7. However, the average vigor rating for the 6 years of data (2012–17) on observational trees of Effie budded on Lovell rootstock was 8.2, comparable to or better than the vigor ratings of comparison cultivars. The budded tree rating is more reflective of the true vigor rating in routine peach culture. Tree health ratings for 'Effie' averaged 8.3 (data not shown). As with tree vigor ratings, the ratings of tree health were substantially higher (8.8) in the 6 years of data with

Table 1. Fruit and plant characteristics of 'Effie' nectarine compared with five other nectarine cultivars from two-tree observational plots, University of Arkansas System Division of Agriculture Fruit Research Station, 2009–17.^z

	Effie	Amoore Sweet	Arrington	Bowden	Bradley	Westbrook
Fruit						
First harvest date	16 July ± 9	6 July ± 10	27 June ± 10	4 July ± 9	30 June ± 8	16 June ± 7
Days bloom to harvest	118 ± 8	110 ± 6	100 ± 9	105 ± 6	101 ± 5	87 ± 6
Fruit weight (g)	143 ± 52	172 ± 39	118 ± 33	166 ± 39	166 ± 38	107 ± 46
Soluble solids (%)	16.1 ± 3.2	14.4 ± 2.7	14.8 ± 2.6	13.1 ± 2.8	12.5 ± 2.3	10.2 ± 3.5
Firmness rating ^y	8.7 ± 0.4	8.9 ± 0.6	8.5 ± 0.5	8.2 ± 0.4	8.7 ± 0.5	5.9 ± 0.3
Percent blush (%)	84 ± 7	72 ± 11	67 ± 14	66 ± 9	69 ± 7	91 ± 3
Plant						
10% bloom date	17 Mar. ± 10	14 Mar. ± 10	16 Mar. ± 10	16 Mar. ± 10	18 Mar. ± 10	17 Mar. ± 10
Full bloom date	20 Mar. ± 10	18 Mar. ± 10	19 Mar. ± 11	20 Mar. ± 10	21 Mar. ± 11	21 Mar. ± 9

^zData for fruit weight, soluble solids, firmness, and percent blush based on a five-fruit sample collected at first harvest date. Data are mean values ± the sd.

^yFirmness rating based on a 1 to 10 scale with 10 being very firm.

Table 2. Production characteristics of replicated 'Effie', 'Amoore Sweet', and 'Bowden' nectarine cultivars, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2015–17.^z

Cultivar	Full bloom date	First harvest date			Yield/tree (kg)	Fruit wt (g)	Bacterial spot rating			
		2015	2016	2017			Fruit		Leaves	
							(%) ^x	Severity ^{xw}	Spring ^{wv}	Summer ^w
Effie	15 Mar. ab ^u	7 July	8 July	27 June	6.03 a	177 a	1.56 b	3.13 ab	2.25 a	3.58 a
Amoore Sweet	14 Mar. b	1 July	28 June	20 June	8.85 a	173 a	1.88 b	2.5 b	2.13 a	2.83 a
Bowden	16 Mar. a	1 July	24 June	23 June	8.60 a	173 a	3.52 a	4.28 a	1.75 a	2.58 a

^zPlanting established in 2014.

^yPercent of harvested fruit with bacterial spot symptoms.

^xMissing 2017 data.

^wScale of 0 to 5, with 0 = no bacterial spot lesions observed on leaves or fruit; 5 = severe infection.

^vMissing 2016 data.

^uMean separation within columns by Tukey's honestly significant difference, $P \leq 0.05$.

Table 3. Production characteristics of replicated 'Effie', 'Amoore Sweet', and 'Bowden' nectarine cultivars, University of Arkansas System Division of Agriculture Southwest Research and Extension Center, Hope, AR, 2015–17.^z

Cultivar	10% bloom date	50% bloom date	First harvest date		Yield/tree (kg)
	2015–17	2015–17	2016	2017	2016–17
Effie	12 Mar. a ^y	16 Mar. a	27 June	20 June	15.6 ab
Amoore Sweet	10 Mar. a	13 Mar. a	20 June	7 June	13.8 b
Bowden	12 Mar. a	16 Mar. a	16 June	7 June	24.73 a

^zPlanting established in 2014.

^yMean separation within columns by Tukey's honestly significant difference, $P \leq 0.05$.

Table 4. Fruit chemistry data including soluble solids content (SSC), pH, and titratable acidity (% malic acid) of 'Effie', 'Amoore Sweet', and 'Bowden' cultivars measured in a replicated trial, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2015–17.^z

Cultivar	SSC (%)		pH			% acid		
	2015–17	2015	2016	2017	2015	2016	2017	
Effie	12.6 a ^y	4.23 b	3.73 b	3.75 b	0.30 ab	0.45 b	0.58 a	
Amoore Sweet	12.0 a	4.85 a	4.28 a	4.68 a	0.18 b	0.20 c	0.28 b	
Bowden	12.7 a	3.98 c	3.63 b	3.73 b	0.53 a	0.70 a	0.68 a	

^zPlanting established in 2014.

^yMean separation within columns by Tukey's honestly significant difference, $P \leq 0.05$.

observational trees of 'Effie' budded on 'Lovell' rootstock.

A major component of the tree health rating is resistance to bacterial spot, a disease which can be severe at FRS. 'Effie' seldom had leaf or fruit lesions due to bacterial spot, although it was not fully immune and developed moderate leaf symptoms during 2017, a year with extremely high bacterial spot disease pressure. Only 1.6% of harvested fruit from 'Effie' showed bacterial spot lesions in the pooled analysis of 2015–16 FRS replicated trial data and the severity of diseased fruit was rated 3.1 of 5 (Table 2). The incidence and severity of fruit disease were comparable to 'Amoore Sweet' and lower than that of 'Bowden'. The average

bacterial spot leaf ratings for 'Effie' were 2.3 in the spring and 3.6 by late summer (Table 2). No significant differences were found between 'Amoore Sweet', 'Bowden', and 'Effie' for leaf resistance to bacterial spot. All three cultivars are relatively resistant to bacterial spot as they have selected and evaluated over many years under heavy disease pressure without bactericides. Occasional brown rot [incited by *Monilinia fructicola* (G. Wint.) Honey] was also observed on 'Effie'. 'Effie' is not anticipated to be different in susceptibility to brown rot compared with most nectarine cultivars. A commercial fungicide program is required for disease control on all Arkansas nectarine cultivars in areas where brown rot occurs.

The chilling requirement of Effie has not been determined but is probably near 800 h below 7 °C based on observations of bud-break and bloom in comparative plantings with test cultivars of known chill requirement. This cultivar has not been tested in colder locations than Arkansas; thus, ultimate bud hardiness has not been determined. However, good flower bud survival occurred with midwinter lows of –16 and –17 °C in 2010 and 2011, respectively. 'Effie', 'Amoore Sweet', and 'Bowden' performed well at the SWREC site in southwest Arkansas, which usually experiences lower chilling than the Clarksville location.

The average first harvest date for 'Effie' was 16 July at FRS (118 d after full bloom) in the unreplicated observational plots (Table 1). Although ripening date varied widely across years for all cultivars, 'Effie' consistently ripened 7–10 d after 'Amoore Sweet' and 'Bowden', 2 weeks after 'Arrington' and 'Bradley', and about a month after 'Westbrook'. The peach season was earlier than usual in all years of the replicated trials at FRS and SWREC (2015–17). The first harvest dates for 'Effie' were 7 July 2015, 8 July 2016, and 27 June 2017 at FRS (Table 2). The first harvest date at SWREC was ≈1 week earlier than FRS each year (Table 3).

Crop load ratings on a 10-point scale on observational trees for 'Effie' averaged 7.7 for the 9 years of observation (data not shown). These ratings were comparable to or higher than those for 'Arrington' (7.7), 'Bradley' (7.4), and 'Westbrook' (7.0), although slightly lower than those of 'Amoore Sweet' (8.4) and 'Bowden' (8.4) (data not shown). Although fruit yield varied

significantly from year to year in the replicated trials at FRS and SWREC, there was no significant genotype by year interaction in either location. ‘Effie’, ‘Amoore Sweet’, and ‘Bowden’ did not differ significantly in the pooled analysis of yield during the 3 years of the study at FRS (Table 2). In the pooled analysis of 2016 and 2017 yield data at SWREC, ‘Bowden’ yielded significantly more than ‘Amoore Sweet’. However, ‘Effie’ was intermediate between the two comparison cultivars and was not significantly different from either (Table 3).

Average fruit weight for ‘Effie’ was 143 g in five-fruit samples from observational trees taken over 9 years. This was smaller than ‘Amoore Sweet’, ‘Bowden’, and ‘Bradley’ but larger than ‘Arrington’ and ‘Westbrook’ (Table 1). In the replicated trial at FRS, the fruit weight of ‘Effie’ was 177 g, comparable to ‘Amoore Sweet’ (173 g) and ‘Bowden’ (173 g) (Table 2). The low estimate of fruit size for ‘Effie’ in the

observational plot data can be attributed to the poor health of the original (own-rooted) tree that was used for data collection from 2009 to 2012.

‘Effie’ fruit is clingstone with nonmelting flesh. Several other UA nectarine cultivars, including Amoore Sweet, Arrington, Bowden, and Bradley, also have nonmelting flesh. Although this flesh type is derived from processing peaches and can be associated with a rubbery texture, the flesh of ‘Effie’ is distinctly crisp. Over 9 years of observation in nonreplicated plots, the average fruit firmness rating of ‘Effie’ was 8.7 of 10 (Table 1). This rating is comparable with the other nonmelting-fleshed nectarine cultivars under observation.

‘Effie’ fruit has low to medium acidity with a distinct white nectarine flavor. The average flavor rating for ‘Effie’ was 7.7 in nonreplicated observational trees, comparable to or higher than that of comparison cultivars (data not shown). Soluble solids for ‘Effie’ averaged 16.1% in the observational tree

samples (Table 1). This was higher than any of the comparison nectarine cultivars; the cultivar with the closest SSC was ‘Arrington’ with 14.8%. However, no significant differences in SSC were found between ‘Effie’, ‘Amoore Sweet’, and ‘Bowden’ in the pooled analysis of 3 years of data in the replicated trial (Table 4). We found a significant interaction between cultivar and year in the analysis of juice pH and TA from the FRS replicated trial, but ‘Effie’ was intermediate between ‘Amoore Sweet’ and ‘Bowden’ in each year. The pH and TA of ‘Effie’ ranged from 3.8 and 0.58% in 2017 to 4.2 and 0.30% in 2015 (Table 4). ‘Effie’ had significantly lower pH than ‘Amoore Sweet’ in all 3 years and significantly higher TA in 2016 and 2017. The intermediate acidity of ‘Effie’ may appeal to a broad range of consumers who prefer standard-acid and low-acid peaches and nectarines.

‘Effie’ has attractive fruit with white flesh without red flecking or discoloration (Fig. 2). The average estimated blush for ‘Effie’ was 84% over 9 years of observation. This is higher than all other UA nectarine cultivars with the exception of Westbrook (91%) (Table 1). Attractive skin finish is an important trait for nectarines, as they are much more subject to skin defects and abrasions than peaches. The average finish rating of ‘Effie’ was 7.0, comparable to most other UA nectarines and higher than that of ‘Bowden’ (6.1), the only other white nectarine cultivar released from the program.

In 4 years of postharvest evaluations (2013–16), the overall ranking for ‘Effie’ was 4.0 on a 0 to 5 point scale, similar to that of ‘Amoore Sweet’ (3.8) and ‘Bradley’ (4.0) (Table 5). The overall ranking for ‘Effie’ was 5 during the first week but dropped down to a 4 after 1 week of storage and a 3 after 2 weeks of storage (Table 6). These results were comparable with the other comparison cultivars (data not shown). On a scale of 0 to 10, where 0 was the worst and 10 the best, ‘Effie’ received an average rating of 9 or higher for all postharvest attributes before cold storage. Even after 3 weeks of storage, ‘Effie’ still scored 8 or higher for all attributes including taste, skin color and quality, flesh color and quality, and lack of browning and mealiness throughout storage (Table 6) with an overall ranking of 4.0 (Table 5). These promising postharvest storage results indicate that ‘Effie’ has potential for storage or shipping and likely will have superior shelf life compared with melting-fleshed nectarine cultivars. This postharvest storage potential could have substantial value



Fig. 2. Ripe fruit of ‘Effie’ nectarine.

Table 5. Mean overall storage performance rating for ‘Effie’, ‘Bowden’, and ‘Amoore Sweet’ nectarines during 3 weeks of cold storage, 2013–16.^z

Cultivar	Wk 0	Wk 1	Wk 2	Wk 3	Avg rating
Effie	4.9	4.2	3.4	3.3	4.0
Amoore Sweet	4.5	4.0	3.6	3.1	3.8
Bowden	4.4	4.2	4.0	3.4	4.0

^zOverall rating is based on the grouping of total score on a scale of 0 (0.00–40.99), 1 (41.00–50.99), 2 (51.00–60.99), 3 (61.00–70.99), 4 (71.00–75.99), and 5 (76.00–80.00), with 0 being unacceptable and 5 being exceptional storage performance.

Table 6. Average postharvest performance ratings of ‘Effie’ during 3 weeks of cold storage over 4 years of testing, 2013–16.

Week	Skin color ^z	Skin quality	Flesh color	Flesh quality	Browning	Juiciness	Mealiness	Taste	Total score ^y	Overall rating ^x
0	9.4	9.6	9.5	9.9	10.0	9.2	10.0	9.7	77.56 ± 2.32	5.0
1	8.8	9.4	9.2	9.4	9.2	8.8	9.9	9.3	74.12 ± 2.64	4.0
2	8.7	8.9	9.0	9.1	8.8	8.2	9.4	8.7	70.69 ± 3.13	3.0
3	8.3	8.3	8.7	8.2	8.0	8.2	8.3	8.0	65.67 ± 4.27	3.0

^zRatings are on a scale from 0 (worst) to 10 (best).

^yTotal score is the sum of ratings of all variables (±SD).

^xOverall rating based on the grouping of total score on a scale of 0 (0.00–40.99), 1 (41.00–50.99), 2 (51.00–60.99), 3 (61.00–70.99), 4 (71.00–75.99), and 5 (76.00–80.00), with 0 being unacceptable and 5 being exceptional storage performance.

for the retail shipping market and local markets where the marketing season could be extended with stored fruit.

The outstanding characteristics of 'Effie' are attractive and flavorful white nectarine fruit, crisp texture and postharvest storage potential, and later ripening season compared with other nectarine releases from the UA breeding program. In addition, 'Effie' has adequate commercial bacterial spot resistance. 'Effie' is recommended for trial where

other medium- to high-chill peaches and nectarines developed in the eastern United States are grown.

Literature Cited

- Clark, J.R., J.N. Moore, and R.C. Rom. 2001. 'Westbrook', 'Bradley', and 'Arrington' nectarines. *HortScience* 36:1164–1167.
- Clark, J.R. and P.J. Sandefur. 2013. 'Bowden' and 'Amoore Sweet' nectarines. *HortScience* 48:804–807.
- SAS Institute. 2012. SAS/STAT user's guide® version 9.3. SAS Inst., Inc., Cary, NC.
- Smith, E.F. 1903. Observations on a hitherto unreported bacterial disease, the cause of which enters the plant through ordinary stomata. *Science* 17:456–457.
- Vauterin, L., B. Hoste, K. Kersters, and J. Swings. 1995. Reclassification of *Xanthomonas*. *Intl. J. Syst. Bacteriol.* 45:472–489.
- Worthington, M. and J.R. Clark. 2018. Peach breeding at the University of Arkansas. *Acta Hort.* (In press).