

‘Whitewater’ Peach

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Keywords. bacterial spot, fruit breeding, *Prunus persica*, *Xanthomonas arboricola* pv. *pruni*

‘Whitewater’ is the seventh fresh-market peach released from the University of Arkansas System Division of Agriculture (UADA) peach and nectarine (*Prunus persica*) breeding program. Prior peach releases include ‘White River’, ‘White County’, ‘White Rock’, ‘White Cloud’, ‘White Diamond’, and ‘Souvenirs’ (Clark et al. 2005; Clark and Moore 2003, 2011; Clark and Sandefur 2013). The UADA peach and nectarine program was established in the 1960s 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 (Worthington and Clark 2021). ‘Whitewater’ is a low-acid freestone peach with white, slow-melting flesh that is crisp at early ripening and softens when fully ripe. ‘Whitewater’ is also the earliest ripening peach to be released from the UADA peach and nectarine program, ripening 5 to 10 d before ‘White Rock’, 1 to 2 weeks before ‘Souvenirs’ and ‘White Cloud’, 3 to 4 weeks before ‘White County’ and ‘White River’, and 4 to 5 weeks before ‘White Diamond’. It has very good resistance to bacterial spot (*Xanthomonas arboricola* pv. *pruni*) and should provide a high-quality option for growers in areas where bacterial spot disease is a concern. Overall, ‘Whitewater’ expands early-season white peach options for growers in the mid- to upper-southern United States and other areas of the world with similar climatic conditions.

Origin and Development

‘Whitewater’ resulted from a cross of ‘White County’ × ‘Souvenirs’ made in 2008. The female parent, ‘White County’, is a white-

Received for publication 24 May 2023. Accepted for publication 19 Sep 2023.

Published online 13 Nov 2023.

This research was supported by Hatch Project ARK02600.

We thank Taunya Ernst, David Gilmore, Kay Buck, Dan Chapman, Jackie Lee, Andrew Jecmen, Terrence Frett, Maxwell VonKreuzhof, Carmen Johns, and Lacy Nelson for assistance in data collection during the evaluation of ‘Whitewater’ peach. Thanks to Ksenija Gasic and the Clemson University peach breeding team for providing Ppe.CR.1 DNA test results.

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fleshed peach cultivar released in 2004 (Clark et al. 2005), and the pollen parent, ‘Souvenirs’, is a yellow-fleshed peach cultivar released in 2012 (Clark and Sandefur 2013). Both parents have low acidity and freestone, slow-melting flesh. The progeny of this cross consisted of 395 seedlings segregating for flesh color, ripening date, and pubescence. ‘Whitewater’ was selected in 2012 and designated as Ark. 856. Twelve other selections were made from this population between 2011 and 2013, and one of these selections is still being used as a parent and considered for possible cultivar release.

Primary testing of ‘Whitewater’ and comparison cultivars was conducted at the UADA Fruit Research Station (FRS), Clarksville, AR [west-central Arkansas, lat. 35°31′58″N and long. 93°24′12″W; US Department of Agriculture plant hardiness zone 7b (US Department of Agriculture, Agricultural Research Service 2012); soil type Linker fine sandy loam (Typic Hapludult)]. Located on a ridge in the foothills of the Ozark Mountains, FRS is a high-chill (1000 h or more below 7°C in the dormant season) environment with typical 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 before Fall 2018. Beginning in Fall 2018, copper was applied twice annually during dormancy and delayed dormancy to reduce inoculum of bacterial canker (*Pseudomonas syringae* pv. *persicae*) and bacterial spot (*Xanthomonas arboricola* pv. *pruni*). Fruits were thinned to a distance of 12 to 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 ‘Whitewater’ and comparison cultivars White River, White County, White Rock, White Cloud, White Diamond, and Souvenirs, all on Guardian® rootstock, was maintained at FRS. Data were collected from these trees or the original selection (own-root) trees from 2013 to 2020. Dates for 10% and full bloom (90% of flowers/tree open) and first harvest were

recorded. Fruit ratings of firmness, finish, and flavor at first harvest were taken from these trees each year. Trees were also rated for vigor, crop, and health. The rating scale for these fruit and tree variables was 1 to 10 with 10 being most desirable. One exception was that a rating of 7 to 8 was most desirable for vigor, whereas a rating of 10 indicated excessive vigor. Bacterial spot severity ratings of leaves and fruit (diseased leavings and defoliation) were taken on a 6-point scale, with 0 = no bacterial spot and 5 = severe infection, in 2013, 2017, 2018, 2019, and 2020 following Yang (2012). Bacterial spot severity on leaves was rated once each year in early June and fruit severity of each genotype was evaluated at first harvest. Average fruit weight, percent blush on fruit skin and soluble solids concentration (SSC) were calculated from a five-fruit sample per cultivar each year. Soluble solids concentration was determined using a refractometer (Sper Scientific 300035 digital refractometer; Sper Scientific, Scottsdale, AZ, USA).

A replicated trial that included ‘Whitewater’ and the comparison cultivars Souvenirs, White County, and White Diamond was established at FRS in 2015. 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 four 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 concentration, pH, and titratable acidity were determined from a five-fruit sample from each replicate tree at each harvest date. Soluble solids concentration 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 endpoint of pH 8.2 and expressed as percentage of malic acid. Data were collected during the 2016–19 seasons. The data were first analyzed by analysis of variance as a split-plot in time with cultivar as the main plot and year as the subplot. Significant genotype * year interactions were observed for most traits and ‘White Diamond’ was missing data for all fruit traits in 2017, so data were analyzed separately for each year. Mean separation was performed with Tukey’s honestly significant difference (SAS Institute, Cary, NC).

Evaluation of postharvest storage performance of ‘Whitewater’ and the comparison cultivars Souvenirs and White County were conducted for three years (2017, 2018, and 2020). 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 evaluations. After harvest, all fruit were pre-conditioned in room temperature storage (~20°C) for 24 h and then placed in a walk-in cooler for cold storage. Storage temperature was maintained between 1 to 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 (~20°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].

The chilling requirement for ‘Whitewater’ and comparison cultivars Souvenirs, White County, and White Diamond was estimated using the Ppe.CR.1 DNA test (Demirel et al. 2023). Young leaves were collected from each tree and sent to Clemson University Department of Plant and Environmental Sciences where DNA was extracted and PCR reactions were performed for Ppe.CR.1–1, Ppe.CR.1–2, Ppe.CR.1–3, and Ppe.CR.1–4 KASP assays following Demirel et al. (2023).

Description

Flowers of ‘Whitewater’ are self-fertile and showy. Average 10% bloom date was 12 Mar and the average full bloom date was 16 Mar for 2013–20 (Table 1). Bloom occurred with or near ‘Souvenirs’, whereas the other comparison cultivars bloomed 3 to 7 d later most years. The full bloom date of ‘Whitewater’ in the replicated trial at FRS ranged from 6 Mar to 24 Mar between 2016–20 (Table 2). There was no significant difference in bloom date between ‘Whitewater’ and ‘Souvenirs’ in any year. ‘White County’ bloomed 1 to 4 days after ‘Whitewater’ and the difference in bloom date was only significant in 2016. ‘White Diamond’

bloomed an average of 7 d after ‘Whitewater’ and was significantly later in all 4 years.

The results of the Ppe.CR.1 DNA test for predicting chilling requirement indicate that ‘Whitewater’ has a moderate chilling requirement between 600 and 850 below 7°C. The chilling requirement of ‘Souvenirs’ was also predicted to be 600 to 850 h, whereas ‘White County’ and ‘White Diamond’ were predicted to have chilling requirements of greater than 750 h and greater than 850 h, respectively. Although, FRS regularly experiences more than 1000 h below 7°C, the DNA test results are supported by observations of budbreak and bloom in comparative plantings with test cultivars of known chill requirement. Good flower bud survival occurred with January midwinter lows of –15°C in 2014, –16°C in 2015 and 2017, and –17°C in 2018. However, significant bud kill occurred in 2021, when midwinter temperatures reached –26°C. Thus, ultimate midwinter bud hardness is likely between –17°C and –25°C.

The average first harvest date for ‘Whitewater’ was 27 Jun at FRS (102 d after full bloom) in the nonreplicated observational plots (Table 3). Ripening date varied widely across years for all cultivars, with the first harvest date of ‘Whitewater’ ranging from 22 Jun in 2017 to 11 Jul in 2018. ‘Whitewater’ usually ripened 5–10 d before ‘White Rock’, 1 to 2 weeks before ‘Souvenirs’ and ‘White Cloud’, 3 to 4 weeks before ‘White County’ and ‘White River’, and 4 to 5 weeks before ‘White Diamond’. An exception to these ripening date patterns occurred in 2018. Bloom and harvest were both later than usual in 2018 and early season peaches ‘Whitewater’, ‘Souvenirs’, ‘White Cloud’, and ‘White Rock’ all had the same date of first harvest on 11 Jul. In the replicated trial at FRS, the date of first harvest for ‘Whitewater’ ranged from 17 Jun in 2017 to 6 Jul in 2018 (Table 2). ‘Whitewater’ was significantly earlier ripening than all comparison cultivars in 2016 and 2018, but there was no significant difference between the date of first harvest for ‘Whitewater’ and ‘Souvenirs’ in 2017 and 2019.

Tree vigor ratings on observational trees averaged 6.8 for ‘Whitewater’, slightly lower than the comparison cultivars in the trial (Table 1). Tree health ratings for ‘Whitewater’ averaged 7.4 (Table 1), lower than most comparison cultivars, but higher than ‘White Cloud’. The lower than ideal vigor and health

ratings can likely be attributed to peach tree short life (PTSL) in one of the observational trees. ‘Whitewater’ trees were budded on ‘Guardian®’ rootstock in Sep 2012 and planted in the breeding observation field at FRS in Spring 2014. By Summer 2016 one of the two trees was beginning to show symptoms of PTSL and bacterial canker and this tree was ultimately weakened and blown over during a windstorm in Jul 2018. Many observation trees budded on ‘Guardian®’ rootstock established during the same period also exhibited PTSL and bacterial canker symptoms, which are most pronounced in 3- to 7-year-old trees (Ritchie and Clayton 1981). The increase in PTSL among new observation trees budded and planted in this period could be due in part to the discontinuation of soil fumigants in the nursery and replanting of peaches in the same breeding observation field over many years. ‘Whitewater’ is not anticipated to be different in susceptibility to PTSL or bacterial canker compared with most peach cultivars.

Another major component of the tree health rating is resistance to bacterial spot, a disease that can be severe at FRS. Bacterial spot severity varied widely over years, with particularly high disease pressure in the 2017 and 2019 seasons. The average severity rating for leaf symptoms on ‘Whitewater’ observational trees was 2.0 out of 5 (Table 1), which was comparable to ‘Souvenirs’ and better than the other five comparison cultivars. ‘Whitewater’ seldom had fruit lesions due to bacterial spot, although it was not fully immune and developed moderate (6% to 10% of the fruit surface) lesions during 2019 (data not shown). Overall, ‘Whitewater’ had the least severe bacterial spot symptoms on fruit of the comparison cultivars in the observation trial (Table 3). All six comparison cultivars are relatively resistant to bacterial spot because they were selected and evaluated over many years under heavy disease pressure without bactericides.

Brown rot (*Monilinia fructicola*) was rarely observed on ‘Whitewater’ (data not shown). However, ‘Whitewater’ is not anticipated to be different in susceptibility to brown rot compared with most peach cultivars. The low incidence of brown rot on ‘Whitewater’ is likely due to its early ripening date. Brown rot usually increases during the season at FRS as inoculum builds up. A commercial fungicide program is required for disease control on

Table 1. Plant characteristics of ‘Whitewater’ peach compared with six other peach cultivars from two-tree observational plots all on Guardian® rootstock, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2013–20.¹

	Souvenirs	White Cloud	White County	White Diamond	White River	White Rock	Whitewater
10% bloom date ⁱⁱ	13 Mar ± 8	15 Mar ± 10	16 Mar ± 10	17 Mar ± 8	19 Mar ± 9	19 Mar ± 9	12 Mar ± 10
Full bloom date	18 Mar ± 9	20 Mar ± 10	20 Mar ± 10	21 Mar ± 8	22 Mar ± 8	23 Mar ± 9	16 Mar ± 10
Vigor ⁱⁱⁱ	7.4 ± 0.5	7.0 ± 0.8	7.6 ± 0.5	7.4 ± 0.5	7.5 ± 0.5	7.1 ± 0.4	6.8 ± 0.7
Health	8.1 ± 0.9	7.0 ± 1.3	7.9 ± 0.8	7.8 ± 1.0	7.7 ± 1.4	7.6 ± 1.5	7.4 ± 1.4
Bacterial spot (leaves) ^{iv}	1.9 ± 1.4	2.6 ± 1.8	3.0 ± 1.8	2.5 ± 1.7	2.9 ± 1.7	3.2 ± 2.5	2.0 ± 1.7
Crop	8.4 ± 0.9	7.4 ± 0.9	7.7 ± 1.3	7.0 ± 2.0	6.3 ± 2.3	7.7 ± 2.3	7.6 ± 1.2

¹ Data are mean values ± the SD.

ⁱⁱ Ten percent and full bloom were not recorded for ‘Whitewater’ in 2014.

ⁱⁱⁱ Vigor, health, and crop were rated annually on a 1 to 10 scale, with 10 being most desirable for health and crop. A rating of 7 to 8 was most desirable for vigor, and a rating of 10 indicated excessive vigor.

^{iv} Rated in 2013, 2017, 2018, 2019, and 2020 on a scale of 0 to 5, with 0 = no bacterial spot lesions observed on leaves; 5 = severe infection.

Table 2. Dates of full bloom and first harvest of replicated ‘Whitewater’, ‘Souvenirs’, ‘White County’, and ‘White Diamond’ peach cultivars, all on ‘Guardian[®]’ rootstock, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2016–19.ⁱ

Cultivar	Full bloom date				First harvest date			
	2016	2017	2018	2019	2016	2017	2018	2019
Whitewater	16 Mar a ⁱⁱ	6 Mar a	24 Mar a	20 Mar a	24 Jun a	17 Jun a	6 Jul a	23 Jun a
Souvenirs	15 Mar a	8 Mar a	26 Mar a	19 Mar a	30 Jun b	17 Jun a	11 Jul b	25 Jun a
White County	18 Mar b	10 Mar a	27 Mar a	21 Mar a	14 Jul c	4 Jul b	25 Jul c	9 Jul b
White Diamond	20 Mar b	18 Mar b	1 Apr b	25 Mar b	8 Aug d	ND ⁱⁱⁱ	11 Aug d	23 Jul c

ⁱ Planting established in 2014 and budded on Guardian[®] rootstock.

ⁱⁱ Mean separation within columns by Tukey’s honestly significant difference, $P \leq 0.05$.

ⁱⁱⁱ ND = no data. No fruit was harvested from ‘White Diamond’ in 2017 due to severe brown rot late in the season.

Table 3. Fruit characteristics of ‘Whitewater’ peach compared with six other peach cultivars from two-tree observational plots budded on Guardian[®] rootstock, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2013–20.ⁱ

	Souvenirs	White Cloud	White County	White Diamond	White River	White Rock	Whitewater
First harvest date	7 Jul ± 9	5 Jul ± 9	20 Jul ± 9	1 Aug ± 10	24 Jul ± 9	2 Jul ± 10	27 Jun ± 9
Days bloom to harvest	111 ± 4	106 ± 5	122 ± 7	133 ± 4	124 ± 5	101 ± 5	102 ± 8
Fruit weight (g) ⁱⁱ	175 ± 33	221 ± 51	271 ± 38	267 ± 34	280 ± 55	169 ± 37	170 ± 26
SSC (%) ⁱⁱⁱ	11.9 ± 1.6	12.0 ± 2.3	12.6 ± 2.2	13.5 ± 1.8	12.6 ± 2.0	12.2 ± 2.0	12.7 ± 2.0
Flavor ^{iv}	6.6 ± 0.7	7.6 ± 0.5	7.5 ± 0.8	6.5 ± 0.9	7.5 ± 0.9	6.4 ± 1.6	7.3 ± 1.0
Acidity	Low	Standard	Low	Low	Standard	Low	Low
Pit adherence	Freestone	Clingstone	Freestone	Freestone	Freestone	Clingstone	Freestone
Flesh type	Slow-melting	Nonmelting	Slow-melting	Slow-melting	Melting	Nonmelting	Slow-melting
Firmness rating ^v	8.4 ± 0.5	8.3 ± 0.5	8.0 ± 0.0	8.2 ± 0.4	7.4 ± 0.9	8.5 ± 1.2	8.3 ± 0.5
Percent blush (%)	85 ± 5	70 ± 9	78 ± 5	80 ± 8	72 ± 12	53 ± 7	86 ± 6
Finish	8.0 ± 1.3	7.3 ± 1.6	8.1 ± 0.4	7.1 ± 0.8	6.9 ± 1.1	7.0 ± 1.2	8.5 ± 0.8
Bacterial spot fruit ^{vi}	1.4 ± 1.7	1.4 ± 2.2	1.0 ± 1.2	1.6 ± 2.2	1.8 ± 2.5	2.0 ± 2.3	0.4 ± 0.9

ⁱ Data are mean values ± the SD.

ⁱⁱ Data for fruit weight, soluble solids concentration (SSC), and percent blush based on a five-fruit sample collected at first harvest date. No fruit weight or SSC data available for ‘Whitewater’ in 2019.

ⁱⁱⁱ SSC = soluble solids concentration.

^{iv} Flavor and finish ratings based on a 1 to 10 scale with 10 being desirable.

^v Firmness rating based on a 1 to 10 scale with 10 being very firm. No firmness data available for ‘White River’ in 2014, ‘White County’ in 2017, and ‘Whitewater’ in 2019.

^{vi} Rated in 2013, 2017, 2018, 2019, and 2020 on a scale of 0 to 5, with 0 = no bacterial spot lesions observed on fruit; 5 = severe infection.

all Arkansas peach cultivars in areas where brown rot occurs.

Crop load ratings on a 10-point scale on observational trees for ‘Whitewater’ averaged 7.6 for the 8 years of observation. These ratings were comparable to or higher than those for ‘White River’, ‘White Diamond’, ‘White Cloud’, ‘White County’, and ‘White Rock’, although slightly lower than ‘Souvenirs’ (8.4) (Table 1). Crop load was rated as a 7 or higher each year with the exception of 2019. Daily low temperatures were below -6 °C for four consecutive nights between 4 Mar and 7 Mar 2019, falling as low as -12 °C on 4 Mar and 5 Mar 2019. These extreme low temperatures during delayed dormancy in Mar 2019 resulted in reduced bloom across most trees in the peach observation trial, though bloom was more affected in some genotypes than others.

The fruit yield of ‘Whitewater’ in the FRS replicated trial was not significantly different from ‘Souvenirs’ in any of the four years (Table 4). ‘Whitewater’ yield was equal to ‘White County’ in 2016–18, but less than ‘White County’ in 2019. No 2017 replicated trial yield or fruit data were available for ‘White Diamond’, the latest ripening comparison cultivar, because the crop was lost to brown rot. In 2018 ‘Whitewater’ had significantly higher yield than ‘White Diamond’ but there was no difference in yield in the 2016 and 2019 seasons. The same late freeze event that resulted in reduced crop ratings in the observational trial in 2019 also affected yield in the replicated trials. The yield of ‘Whitewater’ in 2019 was only half of its yield in 2018.

Average fruit weight for ‘Whitewater’ was 170 g in five-fruit samples from observational

trees taken over 8 years. This was similar to ‘Souvenirs’ and ‘White Rock’, which are also early ripening cultivars, but lower than ‘White Cloud’, ‘White County’, ‘White Diamond’, and ‘White River’ (Table 3). In the replicated trial at FRS, the average fruit weight of ‘Whitewater’ ranged from 150 g in 2018 to 285 g in 2017. There was no significant difference in fruit weight between ‘Whitewater’ and ‘Souvenirs’ in any of the 4 years of data collection in the replicated trial. ‘Whitewater’ was significantly smaller than ‘White County’ in all years except 2018 and smaller than ‘White Diamond’ in all years except 2019. Overall, ‘Whitewater’ had good size potential for an early season peach.

‘Whitewater’ fruit is freestone with flesh that is crisp at early ripening (which are of harvest quality) and softens when fully ripe. This texture has been referred to as ‘slow-softening’

Table 4. Yield and fruit weight of replicated ‘Whitewater’, ‘Souvenirs’, ‘White County’, and ‘White Diamond’ peach cultivars, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2016–19.ⁱ

Cultivar	Yield/tree (kg)				Fruit wt (g)			
	2016	2017	2018	2019	2016	2017	2018	2019
Whitewater	6.26 a ⁱⁱ	13.05 a	25.63 a	12.84 ab	186 b	285 b	150 b	264 bc
Souvenirs	3.60 a	17.06 a	22.60 a	17.68 ab	124 b	215 b	125 b	198 c
White County	8.38 a	11.60 a	26.73 a	23.62 a	255 a	398 a	224 b	368 a
White Diamond	4.14 a	ND ⁱⁱⁱ	10.97 b	7.73 b	274 a	ND	341 a	285 b

ⁱ Planting established in 2014 and budded on Guardian[®] rootstock.

ⁱⁱ Mean separation within columns by Tukey’s honestly significant difference, $P \leq 0.05$.

ⁱⁱⁱ ND = no data. No fruit was harvested from ‘White Diamond’ in 2017 due to severe brown rot late in the season.

Table 5. Soluble solids concentration (SSC) and titratable acidity (% malic acid) of 'Whitewater', 'Souvenirs', 'White County', and 'White Diamond' peach cultivars measured in a replicated trial, University of Arkansas System Division of Agriculture Fruit Research Station, Clarksville, AR, 2016–19.¹

Cultivar	SSC (%)				% Acid			
	2016	2017	2018	2019	2016	2017	2018	2019
Whitewater	11.4 a ⁱⁱ	10.8 a	14.2 a	10.8 b	0.21 c	0.16 b	0.19 b	0.17 b
Souvenirs	13.2 a	11.6 a	14.9 a	12.1 ab	0.22 bc	0.20 b	0.17 b	0.19 b
White County	12.6 a	11.0 a	14.9 a	11.9 ab	0.27 b	0.29 a	0.21 b	0.16 b
White Diamond	14.7 a	ND ⁱⁱⁱ	16.1 a	13.3 a	0.35 a	ND	0.37 a	0.37 a

ⁱ Planting established in 2014 and budded on Guardian[®] rootstock.

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

ⁱⁱⁱ ND = no data. No fruit was harvested from 'White Diamond' in 2017 due to severe brown rot late in the season.



Fig. 1. Ripe fruit of 'Whitewater' peach.

or 'slow-melting' (Sandefur et al. 2013). 'Souvenirs', 'White County', and 'White Diamond' also have slow-melting flesh (Clark et al. 2005; Clark and Moore 2011; Clark and Sandefur 2013). Slow-softening flesh has also been described in cultivars from other breeding programs (e.g., 'Big Top', 'Diamond Princess', and 'Rich Lady') and appears to be associated with delayed ethylene production (Ghiani et al. 2011; Sandefur et al. 2013). Slow-softening flesh is of interest to the fresh-market peach industry because fruit could potentially hang on the tree longer or spend more time in postharvest storage conditions and still eventually reach the full-melting texture desired by most consumers. The average fruit firmness rating of 'Whitewater' in nonreplicated observational plots was 8.3 out of 10 (Table 3). This rating is comparable with the other slow-melting and

nonmelting flesh peach cultivars under observation and higher than 'White River'.

'Whitewater' fruit has low acidity with a light white peach flavor. The average flavor rating for 'Whitewater' was 7.3 in nonreplicated observational trees, comparable to the comparison cultivars 'White Cloud', 'White County', and 'White River' and better than 'Souvenirs', 'White Diamond', and 'White Rock' (Table 3). Soluble solids concentration for 'Whitewater' averaged 12.7% in the observational tree samples, which was higher than 'Souvenirs', 'White Cloud', and 'White Rock', but lower than 'White Diamond' (Table 3). No significant differences in SSC were found between 'Whitewater', 'Souvenirs', 'White County', and 'White Diamond' in the replicated trial during 2016–18 (Table 5). Only 'White Diamond' had significantly higher SSC than 'Whitewater' in 2019. Although 'Whitewater', 'Souvenirs', 'White County', and 'White Diamond' are all classified as 'low acid', we found significant differences in titratable acidity among cultivars in all 4 years of data collection in the replicated trial. 'Whitewater' and 'Souvenirs' had the lowest acidity and there was no significant difference between them in any year (Table 5). 'White Diamond' had higher acidity than the other three cultivars, and 'White County' also had higher acidity than 'Whitewater' in 2016 and 2017.

'Whitewater' has attractive fruit with white flesh without red flecking or discoloration (Fig. 1). The average estimated blush for 'Whitewater' was 86% more than 8 years of observation. This is equivalent to 'Souvenirs' and higher than all other UADA peach cultivars (Table 3). The average finish rating of 'Whitewater' was 8.5, the highest of all the comparison cultivars in the observational trial (Table 3).

In 3 years of postharvest evaluations (2017, 2018, and 2020), the overall ranking for 'Whitewater' was 2.1 on a 0 to 5 scale,

slightly better than 'White County' (1.6) and 'Souvenirs' (1.3) (Table 6). The overall ranking for 'Whitewater' was 3.3 during the first week but dropped down to 2.0 after 1 week of storage, and 1.7 after 2 weeks of storage (Table 6). On a scale of 0 to 10, where 0 was the worst and 10 the best, 'Whitewater' received an average rating of 7 or higher for all postharvest attributes before cold storage. Even after 3 weeks of storage, 'Whitewater' still scored 7 or higher for skin color and quality, flesh color, and lack of mealiness (Table 7). However, flesh quality and juiciness ratings fell below 5 after 3 weeks of storage. Although these postharvest storage results are not as promising as the most recently released nonmelting flesh nectarine cultivar 'Effie' (Worthington and Clark 2018), they indicate that 'Whitewater' performs at least as well in postharvest storage as 'White County' and 'Souvenirs', which have both outperformed older commercial checks 'Loring' and 'Redhaven' in previous postharvest evaluations (Clark and Sandefur 2013).

Overall, 'Whitewater' is very similar to its parent 'Souvenirs' in terms of bloom date, yield potential, fruit size, texture, SSC, acidity, and percent blush. The major differences between 'Whitewater' and 'Souvenirs' are flesh color and ripening date. 'Whitewater' has white flesh and ripens ~5–10 d before 'Souvenirs', which has yellow flesh. The outstanding characteristics of 'Whitewater' are its attractive, flavorful white peach fruit, its firm, slow-melting texture, and its early ripening season. Additionally, 'Whitewater' has adequate commercial bacterial spot resistance for areas where this disease is problematic. 'Whitewater' is recommended for trial where other medium- to high-chill peaches and nectarines developed in the eastern United States are grown.

Availability

A U.S. plant patent has been issued for the new peach cultivar under the name 'Whitewater' (US Plant Patent No. 35,017), and it will be licensed on a nonexclusive basis in the United States. For a list of licensed propagators or to inquire about propagation licenses please contact the University of Arkansas System Division of Agriculture Technology Commercialization Office at agritco@uada.edu.

Table 6. Mean overall storage performance rating for 'Whitewater', 'Souvenirs', and 'White County' peaches during three weeks of cold storage in 2017, 2018, and 2020.¹

Cultivar	Week 0	Week 1	Week 2	Week 3	Avg rating
Whitewater	3.3	2.0	1.7	1.5	2.1
Souvenirs	2.1	1.8	0.8	0.6	1.3
White County	2.8	1.6	0.9	1.1	1.6

¹ Overall 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 7. Average postharvest performance ratings of ‘Whitewater’ during 3 weeks of cold storage over 3 years of testing in 2017, 2018, and 2020.ⁱ

Week	Skin color	Skin quality	Flesh color	Flesh quality	Brownness	Juiciness	Mealiness	Taste	Total score ⁱⁱ	Overall rating ⁱⁱⁱ
0	9.2	8.4	8.5	7.6	8.5	8.8	9.4	9.2	69.3 ± 8.98	4
1	8.9	8.7	8.2	5.7	8	5.4	9.5	6.2	60.4 ± 7.90	3
2	8.2	8	7.2	4.6	7.6	5.4	8.1	8.1	57.1 ± 11.0	2
3	8.6	8.1	7.1	3.5	6.2	4.9	8.5	6.6	53.2 ± 9.78	2

ⁱ Ratings are on a scale from 0 (worst) to 10 (best).

ⁱⁱ Total score is the sum of ratings of all variables (\pm SD).

ⁱⁱⁱ Overall 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.

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