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‘Natchez’ Thornless Blackberry

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‘Natchez’ is the twelfth release in a series of erect-growing, high-quality, productive, floricane-fruiting blackberry (*Rubus* L. subgenus *Rubus* Watson) cultivars developed by the University of Arkansas. ‘Natchez’ ripens early, slightly before or with the Arkansas thornless cultivar Arapaho (Moore and Clark, 1993), and 7 d before ‘Ouachita’ (Clark and Moore, 2005). ‘Natchez’ produces larger fruit than these cultivars and yields higher than ‘Arapaho’ and comparable to ‘Ouachita’. It is expected that ‘Natchez’ will replace ‘Arapaho’ as an early ripening, thornless option for growers.

Origin

‘Natchez’ is a result of a cross of Ark. 2005 × Ark. 1857 made in 1998 (Fig. 1). The original plant was selected in 2001 from a seedling field at the University of Arkansas Fruit Research Station, Clarksville, AR, and tested as selection Ark. 2241. The most thorough testing of ‘Natchez’ has been at this location.

Description and Performance

A single 6.1-m plot was established at Clarksville [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 Hapludults)] in the summer of 2001, and observational data were taken on ‘Natchez’ on this plot for the fruiting seasons of 2002 through 2006. Plots of ‘Arapaho’, ‘Navaho’, ‘Ouachita’, and ‘Apache’ were also present in this planting for comparison, and observational data were collected on these during this evaluation period. In all plantings, standard cultural practices for erect blackberry production were used, including annual preemergence and postemergence herbicide applications, annual spring nitrogen fertilization (56 kg·ha^{-1} N) using ammonium nitrate (NH_4NO_3), summer tipping of primocanes at 1.1 m, and dormant pruning. All plantings received a single application of liquid lime sulfur (94 L·ha^{-1}) at budbreak for control of anthracnose [*Elsinoë veneta* (Burkh.) Jenkins], and this was the only fungicide applied to any plantings in any year.

Data were collected for soluble solids concentration [based on a 25-berry sample collected once each season for 4 years (2003 to 2006)] with soluble solids measured using a handheld refractometer. First ripe fruit ratings were made with 10 = very early ripe and 1 = very late. Fruit ratings were taken based on a rating scale of 1 to 10, in which 10 = best, for these same 4 years for size (10 = largest), firmness (as measured subjectively by hand in the field on eight to 10 berries with a rating of 10 indicating very firm), and flavor (subjectively rated by tasting berries in the field). Plant ratings for vigor (1 to 10 with a rating of 7 to 10 acceptable; vigor rating based on both flori- and primocanes), health (1 to 10 with 10 = excellent health; components of this rating include freedom from diseases and uniform leaf color and size), and erectness (1 to 10 with 10 = very erect) were conducted one time each year for 4 years (2003 to 2006) during the fruiting season. All ratings were done by the senior author (JRC). Winter injury was evaluated (seen as bud or cane injury) each year at the time of fruiting. Additionally, replicated trials were established at research stations in Clarksville (Fruit Research Station) and Hope (Southwest Research and Extension Center) [southwest Arkansas, lat. 33°42′30″, long. 93°33′0″; USDA hardiness zone 8a, soil-type Bowie fine sandy loam (Fragic Palendults)] in 2004. These trials consisted of four replications. Plots in both trials were 3.1 m in length containing five plants per replication spaced at 0.6-m intervals. The cultivars Apache and Ouachita were included for comparison in the replicated trials. Data for 10% and 50% bloom, and first, peak, and last harvest dates were recorded for 2005 to 2006 at Clarksville. Twenty-five berries were collected from ‘Natchez’ and ‘Ouachita’ from a single replication at Clarksville on one harvest date in 2007, seeds (endocarps) were extracted from the berries using a blender, 100-seed samples were weighed (fresh weight after only surface drying of the seeds and dry weights after heating at 70 °C for 24 h), and average seed weight calculated. Berry weight (average for 25 berries/replicate on each harvest date at each location with the average for each replicate for the season being used in the analysis) and total yield data from the replicated plantings for both locations were analyzed as a randomized complete block separately by year and location by the GLM procedure of SAS (SAS Institute Inc., 1989). All mean separation was by t test ($P \leq 0.05$).

‘Natchez’ produced yields comparable to or higher than ‘Apache’ or ‘Ouachita’ in three of four yield comparisons of the two replicated trials (Table 1). Although ‘Arapaho’ was not included in these replicated trials, the yields of ‘Natchez’ averaged higher than those of ‘Arapaho’ in previous trials from other years; ‘Arapaho’ yielded between ≈3000 and 5000 kg·ha^{-1} in most comparisons at Clarksville and from 3600 to 7300 kg·ha^{-1} at Hope (Clark and Moore, 2005). ‘Natchez’ yields ranged from over 8,400 to over 17,000 kg·ha^{-1} at the locations in the replicated trials reported here, and prior yields of ‘Ouachita’ and ‘Apache’ were within this range (Clark and Moore, 2005). A major shortcoming of ‘Arapaho’ has been low yields for the early season, and ‘Natchez’ exceeds the yields of ‘Arapaho’.

Average berry weight of ‘Natchez’ ranged from a high of 8.7 to a low of 4.4 g in the replicated trials (Table 1). These weights were comparable to the large-fruited ‘Apache’ at Clarksville, whereas smaller than ‘Apache’ at Hope. In most comparisons, ‘Natchez’ had heavier berries than ‘Ouachita’. In the trial at Hope in 2006, many genotypes in the trial, including ‘Natchez’, suffered from an unknown root pathogen or other damaging issue resulting in less healthy plants and reduced fruit production. This explains the reduced berry weight (and yield) in the 2006 Hope data. In the observational plots, ‘Natchez’ had an average fruit size rating of 10.0 compared with 8.5 for ‘Apache’, 7.5 for ‘Ouachita’, 7.3 for ‘Navaho’, and 7.2 for ‘Arapaho’. ‘Natchez’ was also observed to retain its fruit weight throughout the harvest season with first harvest berries averaging 8.8 g, peak harvest 8.3 g, and last harvest 7.5 g (Clarksville replicated data; Table 2).

Fruit of ‘Natchez’ are elongated and somewhat blocky and very attractive with an exceptional glossy, black finish (Fig. 2). Fruit firmness rated in the field at maturity of ‘Natchez’ was slightly less than that of the other cultivars (Table 2); however, the berries are considered very firm as are all of the comparative cultivars. Soluble solids concentration in the observational plots over 4 years averaged 8.7% for ‘Natchez’, 7.7% for ‘Arapaho’, 9.8% for ‘Ouachita’, 10.1% for ‘Navaho’, and 10.6% for ‘Apache’ (Table 2). In the replicated trial at Clarksville, ‘Natchez’ had average soluble solids for the season of 8.9% in 2005 and 9.5% in 2006 (data not shown). Flavor rating for ‘Natchez’ averaged 7.5, near that of ‘Arapaho’ of 7.7 but lower than that of the other cultivars (Table 2). Postharvest evaluations done in 2002 to 2006 indicated that ‘Natchez’ stored comparably to ‘Navaho’, ‘Apache’, and ‘Ouachita’ in all comparisons when held at 5 °C for 7 d

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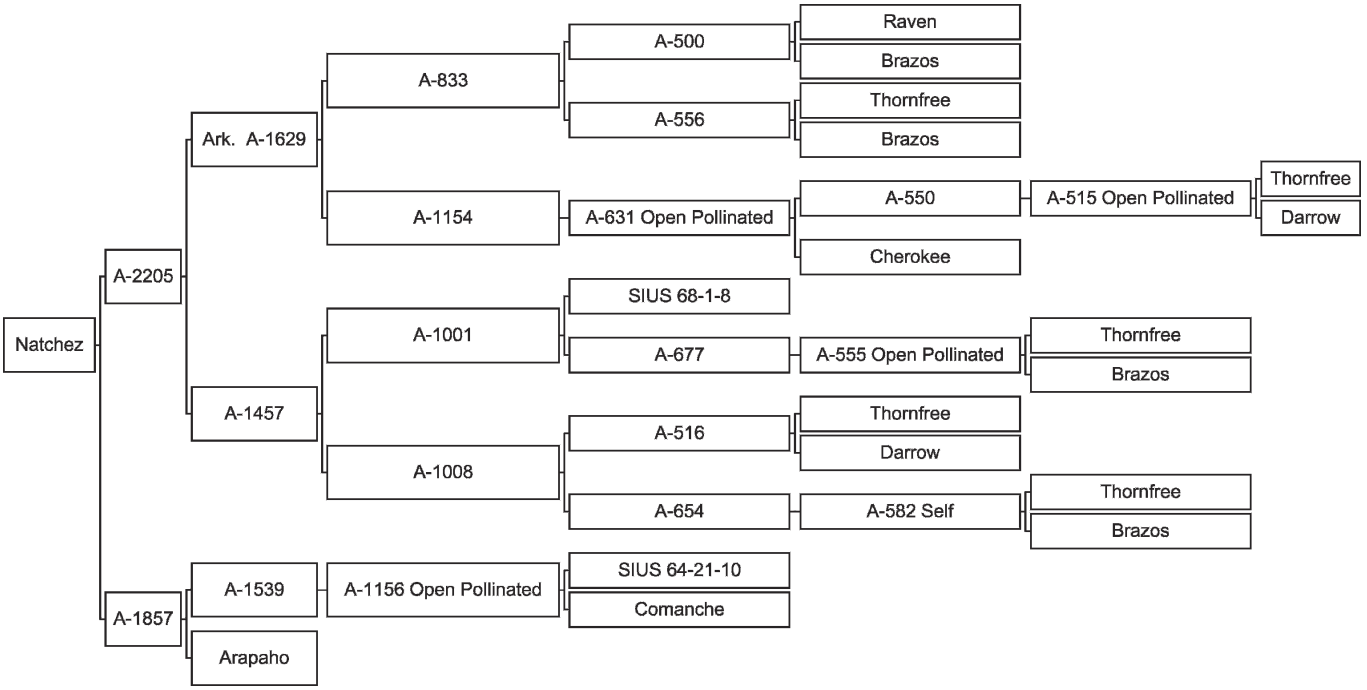

Fig. 1. Pedigree of 'Natchez' blackberry.

Table 1. Yield and berry weight of three thornless blackberry cultivars in plantings established at two locations in Arkansas in 2004.

	Yield (kg·ha^{-1})		Wt/berry (g)	
Cultivar	2005	2006	2005	2006
		Clarksville		
Natchez	12,773 a[z]	8,697 a	8.7 a	8.0 a
Apache	13,058 a	10,699 a	8.6 a	8.2 a
Ouachita	8,913 b	7,997 a	6.3 b	6.2 b
		Hope		
Natchez	7,169 a	8,417 b	6.7 b	4.4 b
Apache	4,278 ab	9,957 b	7.9 a	6.7 a
Ouachita	3,159 b	21,676 a	5.8 c	4.7 b

[z]Mean separation within columns and locations by *t* test ($P \leq 0.05$).

Table 2. Plant and fruit characteristics of five thornless blackberry cultivars at the University of Arkansas Fruit Substation, Clarksville.

	Cultivar				
Characteristic	Natchez	Apache	Ouachita	Navaho	Arapaho
Bloom date[z]					
10% bloom	21 Apr.	24 Apr.	23 Apr.	—	—
50% bloom	24 Apr.	28 Apr.	28 Apr.	—	—
Harvest date[z]					
First	3 June	19 June	10 June	—	—
Peak	8 June	7 July	26 June	—	—
Last	11 July	28 July	20 July	—	—
First-ripe rating[y]	7.5 (±0.5)	2.3 (±1.0)	5.3 (±0.5)	3.0 (± 1.2)	6.8 (± 2.5)
Berry weight[z] (g/berry)					
First	8.8	8.3	7.5	—	—
Peak	10.2	10.1	7.0	—	—
Last	8.0	8.8	5.7	—	—
Fruit:					
Firmness[yx]	7.8 (±0.6)	8.0 (±0.0)	8.3 (±0.5)	8.3 (±0.5)	8.2 (±0.4)
Flavor[yx]	7.5 (±0.5)	8.0 (±0.0)	8.0 (±0.0)	8.3 (±0.5)	7.7 (±0.5)
Seed fresh wt.[w] (mg/seed)	6.8	—	6.2	—	—
Seed dry weight[w] (mg/seed)	4.2	—	4.2	—	—
SS (%)[y]	8.7 (±0.8)	10.6 (±1.3)	9.8 (±2.2)	10.1 (±3.0)	7.7 (±1.6)
Plant[yx]					
Vigor	7.0 (±0.0)	7.5 (±0.6)	7.0 (±0.0)	6.8 (±0.5)	6.7 (±0.5)
Health	7.8 (±0.5)	8.5 (±1.0)	8.3 (±0.5)	7.5 (±0.6)	7.7 (±0.8)
Erectness	7.0 (±0.8)	8.0 (±0.0)	8.5 (±0.6)	7.5 (±0.6)	7.5 (±1.1)

[z]Means of 2 years, 2005 to 2006, from the replicated trial.
[y]Means of 4 years, 2003 to 2006, with data collected from the observational plots; ± = standard deviation; SS = soluble solids.
[x]Rating scale of 1 to 10 where 10 = best. First ripe fruit ratings with 10 = very early ripe and 1 = very late.
[w]Average seed weight of from a 100-seed sample collected from mature fruit in 2007.

(Penelope Perkins-Veazie, personal communication for 2003 to 2005 data). 'Natchez' exceeded postharvest performance of 'Arapaho' in most years (data not shown). This is noteworthy because the comparison cultivars are considered to have exceptional shelf life berry (Clark and Moore, 2005; Perkins-Veazie et al., 1999). 'Natchez' is expected to perform well in commercial shipping use, also based on this comparison. Fresh and dry seed weights of 'Natchez' were similar to 'Ouachita' (Table 2) and the seed weight of 'Natchez' should be as acceptable to consumers as 'Ouachita'.

'Natchez' began bloom 2 d before 'Ouachita' and 3 d before 'Apache'. Fifty percent bloom was 4 d before 'Ouachita' and 'Apache' (Table 2). First harvest date for 'Natchez' averaged 3 June, 7 d before 'Ouachita' and 16 d before 'Apache'. Peak and last harvest dates had similar trends (Table 2). First-ripe ratings indicated 'Natchez' was often earlier than 'Arapaho', ripening 2 to 4 d before Arapaho in some years (Table 2).

Canes of 'Natchez' are thornless and are erect to semierect. Average erectness ratings for 'Natchez' were 7.0, less than that of other cultivars (Table 2). If primocanes are tipped at 1.1 m to control length and encourage lateral branching, 'Natchez' can be grown in a hedgerow without trellis support. However, support of floricanes during fruiting is recommended and with a support trellis, the slightly less erect canes of 'Natchez' should be easily managed by growers. A common trellis used on erect cultivars by growers consists of two wires placed ≈1.0 to 1. 2 m above the soil surface and separated

Fig. 2. Fruit of 'Natchez' blackberry.

horizontally 1.0 m. Vigor rating of 'Natchez' was good and similar to the other cultivars (Table 2). Average health rating for 'Natchez' was good, near that of 'Arapaho' and 'Navaho' but slightly lower than 'Ouachita' and 'Apache' (Table 2). No orange rust [caused by *Gymnoconia nitens* (Shwein.) F. Kern & H.W. Thurston] has been observed on 'Natchez' in any evaluations, although infected plants have been seen within 30 m of plots of 'Natchez'. 'Natchez' is moderately resistant to anthracnose, because only a small amount of anthracnose was noted on berries or leaves in one of 4 years in the selection observation planting in evaluations where a single spray of lime sulfur was applied. Reaction of 'Natchez' to rosette/double blossom [*Cercosporella rubi* (Wint.) Plakidas] has not been evaluated. We expect 'Natchez' to be resistant to this disease as are the other Arkansas thornless cultivars, and 'Natchez' should hold promise for production in areas where this disease is limiting.

In recent years at test sites in Arkansas, white drupelets have been observed on some blackberry genotypes near or at fruit maturity and has been most severe on 'Apache'. In repeated trials, 'Natchez' was observed to have very few to no white drupes, whereas incidence of this was very high for 'Apache' in some portions of some fruiting seasons. Additionally, uneven drupelet set has often been observed in 'Navaho' and has been attributed to some degree of sterility. 'Natchez' has excellent fruit fertility and full drupelet set (data not shown).

Plant hardiness was observed to be good on 'Natchez' in that it showed no to little injury to canes and buds. Minimum winter low temperatures at Clarksville during evaluation reached –14 °C (Dec. 2005) and plants did not show injury at this temperature.

Root cutting sprouting of adventitious shoots of 'Natchez' was 94% in a single evaluation using 83 root cuttings placed in pots in a greenhouse in commercial potting soil in 2004. By comparison, 'Apache' had 71% and 'Ouachita' 52% root sprouting. When adventitious shoots were counted from 26 root cuttings placed in soil trays containing commercial potting soil in 2004, 'Natchez' averaged 6.8 shoots per root, whereas 'Apache' had 2.6 and 'Ouachita' 1.2. This high level of adventitious sprouting may be of value for propagators that use this type of propagation method (Thompson et al., 2004). The chilling requirement for 'Natchez' has not been measured and it has not been tested fully in environments of less than 800 h of chilling (hours below 7 °C during dormancy).

Outstanding characteristics of 'Natchez' include early fruit-ripening date, high fruit quality, consistent high yields, large fruit size, and excellent postharvest fruit-handling potential. Superior plant characteristics include thornless, erect to semierect canes and good vigor and health. 'Natchez' should be a commercial cultivar with good potential for shipping as well as an option for home gardens. 'Natchez' is expected to perform well in areas where 'Apache', 'Arapaho', 'Ouachita', or 'Navaho' are adapted, including all areas of the South and into the Midwest in addition to the West and Pacific Northwest.

Availability

An application for a U.S. plant patent has been filed for 'Natchez'. A list of nurseries licensed to propagate and sell 'Natchez' can be obtained from John R. Clark, 316 Plant Science, Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR 72701 (jrclark@uark.edu).

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