

'Apache' Thornless Blackberry

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'Apache' is the ninth release in a series of erect-growing, high-quality, productive blackberry (*Rubus* L. subgenus *Rubus* Watson) cultivars developed by the Univ. of Arkansas. It is the third thornless, erect cultivar released. 'Apache' produces larger fruit and higher yields than the previously released Arkansas thornless, erect cultivars Navaho (Moore and Clark, 1989) and Arapaho (Moore and Clark, 1993).

Origin

'Apache' resulted from a cross of Ark. 1007 x 'Navaho' made in 1988 (Fig. 1). The original plant was selected in 1991 from a seedling field at the Univ. of Arkansas Fruit Substation, Clarksville. 'Apache', tested as selection A-1798, has been evaluated most thoroughly at this location.

Description and performance

A single, 6.1-m plot was established at Clarksville in 1991 and observational data were taken on 'Apache' on this plot after fruiting began in 1993 and continued through 1998. Plots of comparative cultivars Arapaho and Navaho were also present in this planting 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, 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]. The data collected included soluble solids concentration [based on a 25-berry sample collected once each season for 5 years (1993–95, 1997, and 1998) using a hand-held refractometer],

and ratings for 6 years for several fruit variables, based on a rating scale of 1 to 10 where 10 = best. The fruit ratings included firmness (as measured subjectively by hand in the field on eight to 10 berries, with rating of 10 indicating very firm) and flavor (subjectively rated by tasting berries in the field). Plant ratings were conducted one time each year for 6 years (1993–98) during the fruiting season for vigor (1 to 10 with a rating of 7 to 10 acceptable), health (1 to 10 with 10 = excellent health), and

erectness (1 to 10 with 10 = very erect). Winter injury ratings, reflecting hardiness, were conducted in late April to early May, also for 6 years, using a scale of 1 to 10 with 10 = no injury. Additionally, replicated trials were established at research stations in Clarksville (Fruit Substation), Hope (Southwest Research and Extension Center), and Fayetteville (Arkansas Agricultural Research and Extension Center), Ark., in 1996. These trials consisted of four replicated plots, 3.1 m in length, with five plants produced from root cuttings per replication spaced at 0.6-m intervals. The comparative cultivars Arapaho and Navaho were included in the replicated trials. Data for 10% and 50% bloom, and first, peak, and last harvest dates were recorded for 1997 and 1998 and averaged for the replicated plots at Clarksville. Also, 25-berry samples were collected from the four replications at Clarksville on one harvest date in 1998. Seeds (endocarps)

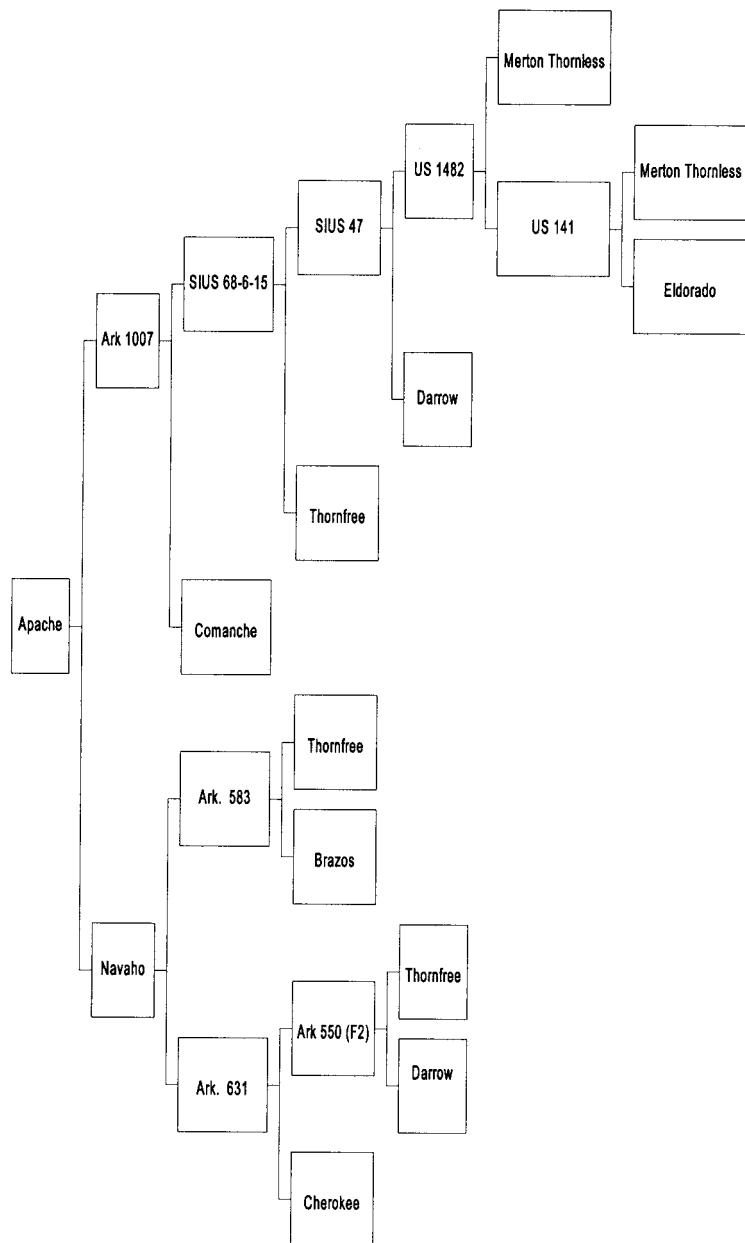


Fig. 1. Pedigree of 'Apache' thornless blackberry.

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were extracted from the berries using a blender, and 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). 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 1997 and 1998 for all locations were analyzed by the GLM procedure of SAS (SAS Institute, 1989) and were analyzed as a split-split plot, with location as the main plot factor and sub-plot factors year and cultivar. Seed weight data from 1998 from Clarksville only were analyzed as a randomized complete block. All mean separation was by *t* test ($P \leq 0.05$).

Statistical analysis of the data for yield indicated a significant location × year × cultivar interaction. ‘Apache’ produced yields higher than or similar to ‘Arapaho’ and ‘Navaho’ in all years at all locations (Table 1). ‘Apache’ was as productive or more productive than ‘Arapaho’ and ‘Navaho’ at all locations, whether grown at Hope [southwest, U.S. Dept. of Agriculture (USDA) hardiness zone 8a], Clarksville (west-central, USDA hardiness zone 7a), or Fayetteville (northwest, USDA hardiness zone 6b).

Analysis for fruit weight also indicated a significant location × year × cultivar interaction. Fruit weight of ‘Apache’ is a noteworthy attribute, in that it is larger than either ‘Arapaho’ or ‘Navaho’ (Table 1). Over the 2 years, ‘Apache’ was roughly twice as large as ‘Navaho’ and 78% larger than ‘Arapaho’. ‘Apache’ also maintained very good fruit weight over its harvest season. In 1997, when the average fruit weight for the season at Clarksville for ‘Apache’ was 10.0 g (Table 1), the lowest average fruit weight recorded was 7.1 g at the last harvest date (data not shown). In 1998, with an average of 9.5 g (Table 1), the lowest fruit weight recorded during the harvest season was 8.5 g (data not shown). Additionally, uneven drupelet set has often been observed in ‘Navaho’ and has been attributed to some degree of sterility. ‘Apache’ has excellent fruit fertility and full drupelet set (data not shown).

‘Apache’ bloomed 2 to 3 d later than ‘Arapaho’ and 2 to 3 d before ‘Navaho’ (Table 2). First harvest date for ‘Apache’ averaged 15 d later than ‘Arapaho’ and 5 d later than ‘Navaho’ (Table 2). Peak and last harvest dates were 7 and 6 d earlier, respectively, for ‘Apache’ than ‘Navaho’. On average, the fruiting period was 11 d shorter in ‘Apache’ than in ‘Navaho’.

Fruit of ‘Apache’ are blocky and conical and very attractive with a glossy, black finish (Fig. 2). Fruit firmness of ‘Apache’ was less than that of ‘Navaho’ but comparable to that of ‘Arapaho’ (Table 2). Soluble solids concentration over 5 years averaged 10.7% for ‘Apache’, 11.4% for ‘Navaho’, and 9.6% for ‘Arapaho’ (Table 2). In flavor ‘Apache’ was between ‘Arapaho’ and ‘Navaho’ (Table 2). Postharvest evaluations indicated that ‘Apache’ stored better than ‘Shawnee’ but not as well as ‘Navaho’ (Penelope Perkins-Veazie, personal communication) (data not shown). Seeds of

Table 1. Yield and berry weight of three thornless blackberry cultivars in plantings established at three locations in Arkansas in 1996.

Cultivar	Yield (kg-ha ⁻¹)		Weight/berry (g)	
	1997	1998	1997	1998
<i>Clarksville</i>				
Apache	10,100 a ^z	7,683 a	10.0 a	9.5 a
Arapaho	4,940 b	4,974 b	5.4 b	5.2 b
Navaho	15,066 a	4,764 b	5.1 b	4.6 b
<i>Hope</i>				
Apache	4,512 a	14,533 a	6.6 a	8.4 a
Arapaho	3,635 a	9,703 b	4.7 b	5.0 b
Navaho	3,024 a	11,115 ab	3.9 c	4.9 b
<i>Fayetteville</i>				
Apache	7,481 a	8,349 a	8.9 a	7.4 a
Arapaho	2,047 b	4,996 b	4.7 b	3.5 b
Navaho	2,711 b	4,785 b	3.2 b	3.1 b

^zMean separation within columns and locations by *t* test ($P \leq 0.05$).

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

Characteristic	Cultivar		
	Apache	Arapaho	Navaho
Bloom date ^z			
10% bloom	30 Apr.	27 Apr.	2 May
50% bloom	6 May	4 May	8 May
Harvest date ^z			
First	20 June	5 June	15 June
Peak	30 June	12 June	7 July
Last	27 July	14 July	2 Aug.
Fruit:			
Firmness ^{y, x}	8.2	8.3	8.7
Flavor ^{y, x}	8.8	8.3	9.2
Seed fresh weight ^z (mg/seed)	12.6 a ^w	8.7 c	10.6 b
Seed dry weight ^z (mg/seed)	4.8 a ^w	3.3 c	4.2 b
Soluble solids (%) ^y	10.7	9.6	11.4
Plant ^{y, x}			
Vigor	9.5	7.2	7.3
Health	9.7	8.3	8.8
Erectness	9.0	8.5	8.0
Winter injury	9.5	9.3	9.5

^zMeans of 2 years, 1997 and 1998, with data collected from the replicated plots.

^yMeans of 6 years, 1993 through 1998, with data collected from the observational plots.

^xRating scale of 1 to 10 where 10 = best.

^wMean separation within rows by *t* test ($P \leq 0.05$).

^vMeans of 5 years, 1993 through 1995, 1997, and 1998, with data collected from the observational plots.

‘Apache’ were significantly heavier than those of either ‘Arapaho’ or ‘Navaho’ (Table 2).

Canes of ‘Apache’ are thornless, and are more erect than those of either of the cultivars used for comparison (Table 2). If primocanes are tipped at 1.1 m to control primocane length and encourage lateral branching, ‘Apache’ can be grown in a hedgerow without trellis support. Vigor and health ratings for ‘Apache’ were higher than those for either ‘Arapaho’ or ‘Navaho’ (Table 2), and winter injury ratings were comparable to those of ‘Arapaho’ or ‘Navaho’ (Table 2). Minimum temperatures experienced during the winters of evaluation at Clarksville were: 1992–93, –5.6 °C; 1993–94, –12.8 °C; 1994–95, –10.5 °C; 1995–96, –17.2 °C; 1996–97, –12.2 °C; 1997–98, –6.6 °C. In 1996, a spring freeze (–12.2 °C) occurred near budbreak on 10 Mar. and probably further damaged the plants. Only in 1996 was a winter

injury rating of <10 recorded for ‘Apache’. Sprouting of root cuttings of ‘Apache’ is equal to that of the thorny cultivar Shawnee, and higher than that of ‘Arapaho’ (data not shown).

‘Apache’ is moderately resistant to anthracnose and no disease problems have been experienced in evaluations where a single spray of lime sulfur was applied. No orange rust [*Gymnoconia nitens* (Shwein.) F. Kern & H.W. Thurston] has been observed on ‘Apache’ in any planting. Reaction of ‘Apache’ to rosette/double blossom [*Cercospora rubi* (Wint.) Plakidas] has not been determined.

Outstanding characteristics of ‘Apache’ include large fruit, high yields, good fruit quality, and thornless, vigorous, healthy, erect plants. ‘Apache’ should be popular as a commercial cultivar, as well as an option for home gardens. ‘Apache’ is expected to perform well in areas where ‘Arapaho’ or ‘Navaho’ are

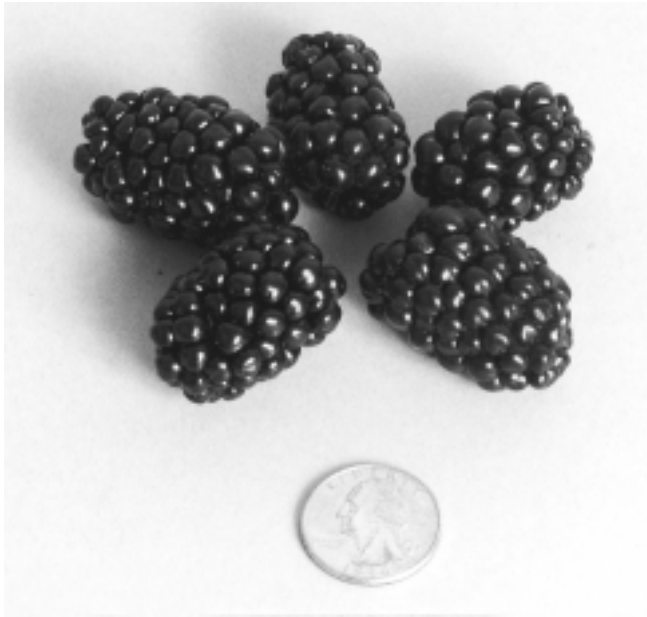


Fig. 2. Fruit of 'Apache' thornless blackberry.

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 'Apache'. A list of nurseries licensed to propagate and sell 'Apache' can be obtained from J.R.C., 316 Plant Science, Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR 72701.

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