

'Von' Thornless Blackberry

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'Von' is a new floricanne-fruited blackberry (*Rubus* L. subgenus *Rubus* Watson) released by North Carolina State University. 'Von' is a productive plant with high yield, late harvest season, excellent postharvest attributes, and small seed size (Figs. 1 and 2). 'Von' offer growers a new cultivar for fruit production in the late harvest season in the southern United States. Furthermore, it is the first thornless blackberry released from the North Carolina State University *Rubus* breeding program. 'Von' is named in honor of Mr. Von Harvey Underwood, who worked in the fruit breeding programs at North Carolina State University for over 44 years.

Origin

'Von' is an open-pollinated seedling from bulked seed collected from an F₁ seedling population of 'Navaho × NC 194' grown at the Upper Piedmont Research Station, Reidsville, NC (lat. 36°37" N, long 81°25" W; elevation 271 m; USDA plant hardiness zone 7a). The selection NC 194 was released as a primocane-fruited thorny erect blackberry in 1995 (Ballington and Moore, 1995). 'Navaho' was the first erect thornless blackberry released in from the University of Arkansas breeding program (Moore and Clark, 1989). In 1995, J.R. Ballington collected bulked seeds from the F₁ population. These seeds were germinated in winter 1995, and 282 seedlings were established at the Sandhills Research Station, Jackson Springs, NC (lat. 35°11", long. 79°40"; elevation 173 m) in Spring 1996. In 1998, 'Von' was selected as NC 430 from this group of seedlings. The new selection, NC 430, was propagated by leafy stem cuttings and established in a 10-plant observation plot at the Upper Piedmont

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Performance and Description

Replicated yield trials of 'Von' were established at two North Carolina Department of Agriculture Research Stations. Using plants made from rooted cuttings, a trial was established at the Piedmont Research Station in 2007 and in the Upper Mountain Research Station in 2009. Plots were arranged in randomized block designs with four replications. Five plants were originally set in each plot at 1.2 m between plants and 2.4 m between rows. Plants were allowed to fill in the plots as a wide hedgerow to 0.9 m width and 6.09 m length. Four or five other cultivars were included in the trials for comparison of yield, postharvest attributes, and season of ripening. Cultivars in each location were chosen based on predicted adaptation to each site, i.e., 'Chester Thornless' was included in the Upper Mountain Research Station

Research Station in 1999, where it was determined to be a promising erect thornless blackberry selection. Single plot evaluations continued through 2006 at the Sandhills Research Station and at the Piedmont Research



Fig. 1. Fruit of 'Von' blackberry.



Fig. 2. Ripe fruit on plants of 'Von'.

because it is a cooler site. The soil types were a Cecil sandy clay and a Toxaway loam at the Piedmont Research Station and Upper Mountain Research Station, respectively.

The plants received standard recommended cultural and IPM practices for blackberries in the region (Brannen and Smith, 2012; Krewer and Fernandez, 2012), including training to a two-wire T-trellis, pre- and postharvest herbicide applications, fertilization in the spring, removal of floricanes after harvest, and irrigation by drip tape of 2.5 cm per week during the growing season or as needed depending on rainfall (Krewer and Fernandez, 2012). A full-season fungicide and insecticide program as recommended by Brannen and Smith (2012) was followed in these trials.

Total and marketable yield and fruit weight were determined for 3 years at the Piedmont Research Station (Table 1) and 2 years at the Upper Mountain Research Station (Table 2). Dates for average fruit ripening season were characterized by days on which 5%, 50%, and 95% of total fruit was harvested each year and then those dates were averaged over 2 or 3 years depending on location of trial. Yield data were analyzed as a randomized complete block separated by year using the appropriate analysis of variance procedure (SAS Institute, Cary, NC). Means were separated using Tukey's honestly significant difference at $P < 0.05$.

Ripe fruit was harvested from the Piedmont Research Station in 2009 and 2010 in

the morning into hinged, vented, clear 260-g polyethylene clamshell containers (Southern Container, Wilson, NC). For 2 to 6 weeks during each harvest season, multiple clamshells (8–59) of each cultivar were placed in a cooler packed with ice packs and transported in an air-conditioned vehicle ≈ 27 km to the Plants for Human Health Institute in Kannapolis, NC, for postharvest evaluation. Fruit from the additional cultivar Tupy was collected from an adjacent field in 2010 to compare it with the other cultivars in this trial. It was included because it is the standard cultivar imported into the United States during the winter (P. Perkins-Veazie, personal communication). Fruit was evaluated based on a protocol developed in the 1990s and described by Clark and Perkins-Veazie (2011) for percent of berries that were leaky, moldy, soft, and had red drupelets. In addition, an overall rating was generated by using: 100%—average (percent leaky + percent soft + percent mold), where 100% is the best rating, whereas a score greater than 60 was expected for best shipping life. In addition, samples of fruit were evaluated for soluble solids concentration (SSC) after 7 d in cold storage.

Plant yield. Total yields (all fruit from plants) and marketable yield (fruit are free of injury, decay, sunscald, are fully black in color, appear and feel turgid, and had similar shape to all other fruit of the same cultivar) were determined (Table 1). In the first year of harvest, total yield of 'Von' was comparable

to 'Apache' and 'Ouachita'. During the second and third years of harvest, 'Von' had total yields equally high or higher than 'Navaho'. However, over a 3-year harvest period (2008–10), the average total yield of 'Von' was as high as 'Navaho'. Similarly, marketable yield of 'Von' was lower than 'Navaho' in the first year but was as high or higher than 'Navaho' in the second and third years of harvest.

At the Upper Mountain Research Station, a high elevation site (867 m), there were no differences in total or marketable yield among the cultivars (Table 2). However, total and marketable yield of all cultivars was much lower compared with the Piedmont Research Station. During each of the winters from 2008 to 2011, there were nine incidents when hourly low temperatures of -12 °C or less were recorded (State Climate Office of North Carolina, 2012). Although tunnel-grown primocane-fruited blackberries have performed well at this site (Fernandez and Ballington, 2010), it is not suited for floricane-fruited blackberry production as a result of the annual occurrence of temperatures that cause winter injury.

'Von' started, peaked, and ended fruit harvest season similarly to 'Navaho' (Table 1). These dates would characterize 'Von' with a late season of ripening. Although harvest season varied a few days each year, the relative season of ripening remained the same for all the cultivars tested (data not shown). The Piedmont Research Station is

Table 1. Total and marketable yield, fruit weight, and harvest season of six blackberry cultivars planted in a replicated trial planted in 2007, harvested 2008–10 at the Piedmont Research Station (Salisbury, NC).

Cultivar	Total yield (kg·ha ⁻¹)			Marketable yield (kg·ha ⁻¹)			Fruit wt (g)	Harvest season (2008–10)				
	2008	2009	2010	2008–10	2008	2009		2010	2008–10	5%	50%	95%
Apache	13,820 b ^z	23,592 b	14,401 cd	17,271 b	9,039 bcd	18,128 b	8,908 cd	12,025 b	9.4 a	26 June d	12 July cd	3 Aug. cd
Arapaho	8,958 c	10,631 c	9,873 d	9,820 c	5,897 d	8,459 c	7,629 d	7,328 b	5.7 c	6 June a	15 June a	3 July a
Natchez	9,454 c	15,194 bc	19,073 bc	14,574 bc	7,895 cd	13,167 bc	14,999 bc	12,020 b	8.9 a	9 June ab	24 June ab	13 July ab
Navaho	25,012 a	32,431 a	25,674 bc	27,706 a	20,520 a	28,364 a	21,182 b	23,355 a	5.2 d	24 June cd	16 July d	9 Aug. d
Von	12,559 bc	34,139 a	44,553 a	30,417 a	10,793 bc	30,917 a	39,568 a	27,093 a	6.6 b	22 June cd	7 July cd	2 Aug. cd
Ouachita	14,480 b	15,842 bc	10,144 d	13,489 bc	11,615 b	13,301 bc	7,184 d	10,700 b	7.1 b	16 June bc	1 July bc	23 July bc

^zMean separation Tukey's honestly significant difference $P < 0.05$.

Table 2. Total and marketable yield, fruit weight, and harvest season of six blackberry cultivars planted in a replicated trial in 2009, harvested 2010–11 at the Upper Mountain Research Station (Laurel Springs, NC).

Cultivar	Total yield (kg·ha ⁻¹)			Marketable yield (kg·ha ⁻¹)			Fruit wt (g)	Harvest season (2010–11)		
	2010	2011	2010–11	2010	2011	2010–11		2010–11	5%	50%
Chester	814 ab ^z	4383 a	2598 a	647 bc	3029 a	1838 a	4.1 c	3 Aug.	21 Aug.	4 Sept.
Natchez	1281 a	3441 a	2361 a	1085 ab	3010 a	2047 a	8.1 a	12 July	28 July	14 Aug.
Navaho	1382 a	4421 a	2902 a	1240 a	2110 a	1675 a	4.3 c	29 July	20 Aug.	15 Sept.
Von	218 b	3402 a	1810 a	177 c	2803 a	1490 a	6.1 b	23 July	9 Aug.	22 Aug.
Ouachita	1131 a	405 a	768 a	907 ab	330 a	618 a	5.3 bc	19 July	7 Aug.	22 Aug.

^zMean separation Tukey's honestly significant difference $P < 0.05$.

Table 3. Seed number, weight and dimensions of five floricane-fruited blackberries.^z

	Avg no. seeds/fruit	Seed wt (mg/100 seeds)	Seed ht (mm)	Seed width (mm)	Seed length (mm)
Chester	35	294 c ^z	2.3 a	1.2 b	3.4 ab
Natchez	101	352 ab	2.5 a	1.2 a	3.8 ab
Navaho	56	590 b	2.4 a	1.3 ab	3.5 a
Ouachita	53	374 a	2.2 a	1.1 b	3.4 bc
Von	61	286 c	1.9 b	1.0 ab	3.6 c

^zFruit collected from the Piedmont Research Station (Salisbury, NC).

^yMean separation Tukey's honestly significant difference $P < 0.05$.

close to the one of the major production areas of commercial blackberry in the western Piedmont region of North Carolina. Therefore, plantings of 'Von' are expected to have similar harvest dates and yield potential for growers in this production area.

Fruit and plant characteristics. Fruit of 'Von' has good drupelet set with very little observed sterility. Fresh fruit was attractive with a glossy black finish and medium size of 6.6 g, which was comparable to 'Ouachita' in our trials (Fig. 2; Table 1). Seeds of 'Von' weighed less than 'Natchez', 'Navaho', and 'Ouachita', whereas seed height, length, and width were as low or lower than all other cultivars measured in this study (Table 3).

Canes of 'Von' were thornless and erect. On a scale of 1 to 9, evaluation of single plots of 'Von' and 'Navaho' indicates that both scored 8 for winter-hardiness and vigor in 2010. The scale scores were 1 to 9 with the least desirable rating for a trait at 1 and 9 indicating the best or most desirable trait.

Under a standard commercial spray program, 'Von' has shown no significant infection of common diseases observed, including orange rust (*Gymnoconia nitens*), fruit anthracnose (*Elsinoe veneta*), and double blossom/rosette (*Cercospora rubi*). Virus infection and susceptibility are unknown.

Postharvest performance. Post harvest evaluations for fruit indicate that 'Von' performs well after 7 d of storage. Based on our evaluation, overall ratings of 'Von' were 90.3 and 90.6 in 2009 and 2010, respectively, which were significantly higher than 'Arapaho' and 'Apache' in 2009 and 'Apache' and 'Tupy' in 2010 (Table 4). In general, fruit of 'Von' had a low percentage of leaky decayed or soft berries and had SSC values (10.4 and 9.4), comparable to other cultivars in this trial.

'Von' is recommended for the Coastal Plain and Piedmont regions of North Carolina and the adjacent states. Key attributes of 'Von' include high yield, late harvest

Table 4. Fruit attributes taken at harvest of thornless blackberry cultivars grown at the Piedmont Research Station (Salisbury, NC).

Cultivar	No. of boxes	No. of weeks	Percent berries with				Overall rating ^v	SSC ^u
			Leak ^z	Mold ^y	Soft ^x	Red drupelet ^w		
2009								
Apache	43	5	55.4 b ¹	7.1 b	15.5 b	0.2 a	74.0 ab	10.6 b
Arapaho	40	5	43.7 ab	8.6 b	19.1 b	0.7 a	70.2 b	10.9 ab
Navaho	59	6	32.2 a	1.5 a	14.4 b	1.4 a	83.1 a	11.6 a
Ouachita	51	6	18.5 a	5.0 b	6.1a	1.8 b	89.4 a	10.6 b
Von	44	5	6.9 a	1.4 a	3.0 a	2.0 b	90.3 a	10.4 b
Natchez	25	5	13.3 a	2.2 a	4.4 a	2.5 b	93.4 a	10.9 ab
2010								
Apache	27	5	41.9 c	5.3 b	24.4 b	7.9 a	77.6 b	10.5 a
Arapaho	8	3	10.0 ab	0.5 a	0.0 a	4.1 a	96.5 a	9.7 a
Navaho	38	6	14.5 ab	1.3 a	13.7 ab	6.2 a	89.6 a	10.2 b
Ouachita	20	6	15.4 ab	3.0 c	9.1 ab	9.1 a	91.1 a	10.1 b
Von	27	5	12.5 ab	1.8 ab	11.1 ab	13.4 ab	90.6 a	9.4 a
Natchez	22	4	7.3 a	0.8 a	4.4 a	17.2 b	95.8 a	9.1 a
Tupy	8	2	24.8 b	4.7 c	11.4 ab	10.5 a	68.8 b	8.7a

^zPercent leak was determined as individual berries showing a stain on a paper towel when gently rolled, calculated as number of total fruit per clamshell.

^yPercent mold was determined as individual berries in each clamshell having visible mold/decay.

^xIndividual berries were ranked as 1 (firm) to 5 (mushy). Those ranked 4 or 5 were considered soft (unmarketable) and determined as the percent of total berries in the clamshell.

^wThe percent of berries in each clamshell was determined by individual rating of berries for the presence of red drupelet in clusters of three or more drupelets per berry.

^vOverall rating represents 100%—average (percent leaky + percent soft + percent mold), where 100% is the best rating; a score greater than 60 was expected for best shipping life.

^uSSC is the percent soluble solids content determined from blackberry puree placed on a digital refractometer.

¹Mean separation Tukey's honestly significant difference $P < 0.05$.

season, small seed size, and good postharvest shelf life.

Availability

Names of propagators producing 'Von' plants would be supplied on request from Gina E. Fernandez.

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