

Final Report Research

Title: Identifying Consumer Sensory Attributes of Arkansas Fresh-Market Blackberries that Impact Marketability

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Public Abstract

Breeding and release of new fresh-market blackberries (*Rubus* subgenus *Rubus* Watson) is vital for competitive markets to address evolving changes and production challenges. Blackberries were harvested from the University of Arkansas (UA) System Division Fruit Research Station, Clarksville in 2019. The physiochemical and sensory attributes were evaluated on six blackberry cultivars (Caddo, Natchez, Osage, Ouachita, Ponca, and Prime-Ark® Traveler). The physiochemical attributes of blackberries were within a commercially acceptable range (soluble solids =9-10%, pH=3.1–3.8, titratable acidity=0.6-1.4%, berry weight= 6-10 g). Ponca had the most ideal composition of the cultivars evaluated, with a 12.8 soluble solids/titratable acidity ratio, 10.40% soluble solids, and 0.82% titratable acidity. Natchez had the highest berry weight, longest berry, and widest berry, whereas Osage was the lowest for these attributes. The consumer sensory study (n=81) on the fresh blackberries had two elements, a visual evaluation of displayed blackberries and appearance, tasting and texture evaluation of blackberries. Consumers were 46.9% female, ages 21 to over 70 years with high school to graduate school education. Consumers purchased blackberries at grocery stores (44.5%) and farmer stores (30.9%) at least once a month, mainly for personal consumption. The freshness of berries (97.5%), price (87.6%), and uniform berry color (80.0%) were the three most important factors when consumers purchase fresh-market blackberries. The consumers evaluated the size and shape of individual blackberries and preferred large, cone-shaped oblong blackberries. Consumers preferred clamshells containing larger blackberries as opposed to clamshells containing smaller blackberries. Consumers preferred clamshells containing blackberries with no to some red drupelets. The consumers evaluated appearance, flavor, and texture attributes of blackberries on a 9-point verbal hedonic liking scale (1=extremely dislike; 9=like extremely) and 5-point just about right (JAR) scale (1 = not nearly enough; 3=JAR;5=much too much). The liking scores of all the attributes ranged from 5 (neither like nor dislike) to 7 (like moderately). There was not a difference in the cultivars for appearance or texture. Caddo, a 9-g berry 33 x 24 mm, had the highest score for size and shape. Ponca had the highest liking for overall impression, flavor, sweetness and sourness. The consumers found Caddo 79% JAR for size, Osage 72% JAR for blackberry flavor, and all cultivars 70-80% JAR for firmness. Evaluating the physiochemical and sensory attributes of fresh fruit is an important tool that can be used to determine commercial potential for blackberry cultivars.

Introduction

Blackberry (*Rubus* subgenus *Rubus*) is one of the best examples of a wild-harvested specialty crop that moved to commercial use through increased consumer demand, new cultivars, advanced production methods, and year-round product availability. The development of new blackberry cultivars with improved postharvest performance and better flavor and appearance will improve consumer perceptions of the crop and support further industry expansion. There is a critical need to determine the key sensory attributes that drive consumer preference to steer breeding decisions and help southern U.S. growers' better market their blackberry products.

Despite recent growth, the blackberry industry continues to be plagued by short shelf life and loss of fruit quality during shipping (Joo et al., 2011; Segantini et al., 2017). Red drupelet reversion is a particularly problematic postharvest physiological disorder affecting fresh-market blackberries (Perkins-Veazie, 2017). Blackberries harvested when completely black and full ripe often develop red discoloration after they are returned to room temperature following cold storage (Finn and Clark, 2017). Conventional wisdom is that consumers perceive reverted fruit as unattractive, though few marketing studies have addressed this issue, and excessive reversion can result in rejection of whole shipments of berries. The incidence and severity of red drupelet reversion is impacted by environmental conditions, postharvest handling practices, and cultivar choice (McCoy et al., 2016; Salgado and Clark, 2016; Segantini et al., 2017).

The improvement of fruit firmness is an important objective in the University of Arkansas (UA) System Division of Agriculture blackberry breeding program, as firm fruit generally perform better for many postharvest quality parameters (Finn and Clark, 2012). Fruit firmness was once considered an intractable trait that could not be improved in fresh-market blackberries (Clark, 2005). However, significant improvements in firmness have been made through classical breeding, with substantial variation in firmness observed among UA selections and cultivars (Perkins-Veazie et al., 1996; Clark and Perkins-Veazie, 2011; Segantini et al., 2017). A dramatic advance in firmness was achieved with the discovery of a very distinct 'crispy' texture in a thorny, floricanne fruiting selection in 1991 (Clark, 2005). Although this original crispy selection was used as a parent in many crosses during the 1990s, crispy texture was not recovered in first generation progeny. Crispy texture was finally recovered in 2008 in two promising full-sib selections, A-2453 and A-2454, which were second-generation offspring of the original crispy selection (Salgado and Clark, 2016). These crispy selections are considerably more firm than other UA breeding selections and cultivars at harvest and after seven days of cold storage experience significantly less red drupelet reversion (McCoy et al., 2016; Salgado and Clark, 2016; Segantini et al., 2017). Only 13% of berries from crispy genotypes experienced color reversion after storage at 5°C and 80% relative humidity for seven days, compared to 41% of berries from standard-textured genotypes (Salgado and Clark, 2016).

Crispy-textured blackberries have the potential to increase the profitability of the U.S. blackberry industry because of their superior postharvest performance and resistance to red drupelet reversion. However, it is unknown whether consumers will embrace blackberries with extremely firm flesh. It is also unclear how firmness and appearance (including lack of red drupelet reversion) compare to other taste attributes such as astringency, acidity, sweetness, and aromatics in terms of importance to consumers.

Preliminary research was done in 2017 to gather information on consumer perceptions and purchase intent of blackberries through an online study. This survey was active from February to May 2017. The survey had 1,179 total consumers respond and 879 consumers of blackberries that completed the full survey. The survey respondents were 76.7% female and 23.3% male from

ages 21-40 (47.2%), 41-60 (36.0%), and 61 and over (16.8%) with varying levels of education and incomes. Consumers (41.6%) responded that they consume fresh blackberries once per month, followed by 29.1% once per year, and 12.2% once per week. Consumers that purchased blackberries once per month purchased mostly at grocery stores (33.6%), and once per year 30% purchased at either grocery stores, farmer stores, or roadside stands. About 90% of the consumers agreed with the statements “Blackberry consumption is beneficial for my health” and “I love the flavor of blackberries”. The freshness of the berries (98.1%) and the price (87.8%) were rated highest as reasons to buy fresh blackberries. When shown several individual berries varying in shape and size, the consumers ranked large, oblong berries as more preferred. When shown two clamshell containers of blackberries, one filled with large berries and one with small berries, 68.6% of the consumers preferred the clamshell with the larger berries. When shown three clamshell containers of blackberries with increasing levels of red drupelets (black drupelets that had reverted to red during storage), 72.9% of the consumers preferred blackberries with the least red drupelets as compared to 20.1% that preferred the mid-level, and 7.0% that preferred the most. The survey showed that participants consume blackberries once per month, like large, oblong blackberries, prefer blackberries with less red drupelets, purchase blackberries based on freshness and price, purchase blackberries at grocery stores, and think blackberries are healthy and have a well-liked flavor.

The online survey provided unique data to characterize consumer perception and purchasing of fresh-market blackberries, but needs to be supplemented using fresh blackberries and in person consumer evaluations. These evaluations will allow consumers to assess texture and flavor attributes and gauge appearance in a more representative manner. We are particularly interested in evaluating the consumer perception of blackberry texture and red drupelet reversion in this study.

The objective of this research was to **identify physiochemical and consumer sensory attributes of fresh-market blackberry genotypes from the University of Arkansas blackberry breeding program**. As with all crops, breeding and release of new cultivars to address evolving changes and production challenges is vital to keep healthy markets. Data generated from the proposed work provided information used in marketing these genotypes.

Objectives

1. Evaluate physiochemical attributes of fresh-market blackberries

Measure physical attributes and composition attributes of fresh-market blackberries

2. Identify consumer-driven sensory attributes of fresh-market blackberries

Conduct consumer sensory analysis to determine key sensory characteristics of fresh-market blackberries

Materials and Methods

Blackberries were harvested from the UA System Fruit Research Station, Clarksville. Fruit were hand-harvested from the plants on June 25, 2019. The blackberries were harvested at the shiny-black stage of ripeness by 11:00 AM and were free of major blemishes, flaws, or damage. About 4 kg of fruit was harvested from each of the six cultivars (Caddo, Natchez, Osage, Ouachita, Ponca, and Prime-Ark® Traveler). Ponca (formerly A-2538) was recently approved for release from the UA System. Fruit was harvested directly into 240-g (pint), low-profile vented clamshells, placed in chilled coolers and transported to the UA System Department of Food Science, Fayetteville. A random sample of fruit was collected from the harvest clamshells and used for the physiochemical and sensory analysis. A 200 g sample of each cultivar was frozen (–10°C) in triplicate for physiochemical analysis, and the remainder was stored overnight in clamshells at 2°C for consumer sensory analysis.

Objective 1. Evaluate physiochemical attributes of fresh-market blackberries

Physical and composition attributes of each of the fresh-market blackberry genotypes were evaluated. Three replicate samples of approximately 200 g of berries were collected for each cultivar for physiochemical analyses.

Berry attributes. Five berries per cultivar and replication were used to determine berry attributes (individual berry weight, berry length, and berry width). The five-berry samples were weighed on a digital scale and the width and height of each blackberry were measured with digital calipers.

Soluble solids, pH, and titratable acidity. Three replicate five-berry samples of each cultivar were used to determine soluble solids, pH, and titratable acidity. Samples were placed in cheesecloth to extract the juice from the berries. Titratable acidity and pH were measured with an automated titrimer and electrode standardized to pH 2.0, 4.0, 7.0, and 10.0 buffers. Titratable acidity was determined using 6 mL of juice diluted with 50 mL of deionized, degassed water by titration with 0.1 N sodium hydroxide (NaOH) to an endpoint of pH 8.2; results were expressed as g/L citric acid. Total soluble solids (expressed as %) was measured with a digital refractometer. Soluble solids/titratable acidity was calculated.

Objective 2. Identify consumer-driven sensory attributes of fresh-market blackberries

The consumer sensory evaluation was done at the UA System Sensory Service Center, Fayetteville. The consumer participants (n=81) were recruited from a Sensory Service Center database (n≈5,500). Participants were selected based on consumption, purchasing habits, and liking of fresh blackberries. The consumers evaluated the fresh-market blackberries and were paid with gift card incentives. Consumers were also asked demographic questions (gender, age group, education, and income) and questions regarding purchase and consumption habits for fresh blackberries. The consumer sensory study had two elements; a visual evaluation of displayed fresh blackberries and an appearance, tasting and texture evaluation of the fresh blackberries.

Visual evaluation. The consumers were shown displays of fresh, individual blackberries and blackberries in clamshells and asked to provide ranking or preference for various attributes. Consumer were shown three displays of individual blackberries (three berries of different shapes, three berries of different sizes, and six berries of different shapes and sizes) Consumers were shown clamshell containers of blackberries,

one filled with large berries and one with small berries then three clamshells filled with blackberries with increasing levels of red drupelets (black drupelets which have reverted to red after storage). The sample presentation order in the displays was randomized and balanced so that the different samples appeared the same number of times at each presentation position. Consumers responded to questions on a paper ballot.

Appearance, tasting, and texture evaluation. Consumers evaluated the appearance, taste, and texture of six blackberry cultivars. The sample presentation order was randomized and balanced so that the different blackberries cultivars appeared the same number of times at each presentation position. Sample plates were labeled with three-digit codes, and each panelist was served four berries. Unsalted crackers and water were provided for palate cleansing between samples. Each consumer was asked to evaluate eight attributes (appearance, size, shape, overall flavor, overall impression, sweetness, sourness, and firmness) on the 9-point verbal hedonic scale (1 = dislike extremely; 9 = like extremely), and five attributes (size, blackberry flavor, sweetness, sourness, and firmness) on a 5-point Just About Right (JAR) scale (1 = not nearly enough 3 = just about right; 5 = much too much). Data was acquired using a computerized sensory data acquisition system (Compusense 5 version 5.0, Compusense, Guelph, Canada).

Statistical analysis

Analysis of physiochemical attributes and consumer sensory data was conducted using JMP® (version 14.0; SAS Institute Inc., Cary, NC). The physiochemical study was analyzed as a completely randomized design with three replicates per genotype. Tukey's HSD (Honestly Significant Difference) was used for mean separation.

Results and Discussion

Objective 1. Evaluate physiochemical attributes of fresh-market blackberries

Physical attributes and composition attributes of each of the fresh-market blackberry cultivars were evaluated.

Berry attributes. Five berries per genotype and replication were used to determine berry attributes (individual berry weight, berry length, and berry width). The physical attributes of the blackberries are reported in Table 1. Natchez had the highest berry weight (9.98 g), longest berry (34.67 mm), and widest berry (25.55 mm). Osage had the lowest berry weight (4.83 g), the shortest berry (22.93 mm), and the narrowest berry (21.84 mm).

Table 1. Physical attributes of fresh-market blackberry cultivars, Clarksville, AR (2019)

Cultivar	Berry weight (g)	Berry length (mm)	Berry width (mm)
Caddo	9.15 ab ^a	33.28 a	23.87 ab
Natchez	9.98 a	34.67 a	25.55 a
Osage	4.83 d	22.93 c	21.84 b
Ouachita	7.74 abc	27.81 b	23.85 ab
Ponca	6.70 cd	26.36 bc	22.21 b
Prime-Ark® Traveler	6.97 bcd	28.91 b	22.66 b
<i>P-value</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0002</i>

^a Means with different letter(s) for each attribute are significantly different (p<0.05) using Tukey's Honestly Significant Difference test

Soluble solids, pH, and titratable acidity. The composition attributes of the blackberries are reported in Table 2. The soluble solids ranged from 8.50-10.40%, but there was not a significant difference in these cultivars. Osage (3.83) had the highest pH and Caddo (3.10) the lowest. Ouachita (1.61%) had a higher titratable acidity than the other cultivars. Osage, Ponca, and Prime-Ark® Traveler had soluble solids/titratable acidity ratios of 12.83-15.85 and Caddo, Natchez, and Ouachita had 5.87-6.80. Ponca had the most ideal composition of the cultivars evaluated, with a 12.83 soluble solids/titratable acidity ratio, 10.40% soluble solids, and 0.82% titratable acidity.

Table 2. Composition attributes of fresh-market blackberry cultivars, Clarksville, AR (2019)

Cultivar	Soluble solids (%)	pH	Titratable acidity (% tartaric)	Soluble solids/titratable acidity ratio
Caddo	8.50 a ^a	3.10 c	1.33 a	6.44 bc
Natchez	9.33 a	3.13 c	1.37 a	6.80 abc
Osage	9.80 a	3.83 a	0.64 b	15.39 ab
Ouachita	9.30 a	3.21 bc	1.61 a	5.87 c
Ponca	10.40 a	3.54 ab	0.82 b	12.83 abc
Prime-Ark® Traveler	9.50 a	3.63 a	0.67 b	15.85 a
<i>P-value</i>	0.0668	<0.0001	<0.0001	0.0053

^a Means with different letter(s) for each attribute are significantly different ($p < 0.05$) using Tukey's Honestly Significant Difference test

Objective 2. Identify consumer-driven sensory attributes of fresh-market blackberries

Consumer sensory analysis was done to determine key sensory characteristics of fresh-market blackberry cultivars.

Participant demographics

Demographic information was collected on the 81 consumers. Consumers were 46.9% female and 60.5% were married. Ages of consumers ranged from under 21 to over 70 years old, with the largest percentage between the ages of 31-40 years old (34.6%). The level of education of the consumers ranged from high school to graduate school. A 4-year degree was the highest level of education for 30.7% of consumers and some college for 43.2% of the consumers. While annual gross incomes ranged from under \$20,000 to over \$200,000 USD, nearly half of consumers earned \$20,000-60,000 USD (46.9%).

Participant purchasing and consumption habits

The consumers were asked about purchasing and consumption habits of fresh-market blackberries. Reasons for purchasing blackberries included for personal consumption (91.4%), for consumption with family or friends (90.1%), as a dessert (87.7%), for a special occasion (80.2%), or with a meal (66.7%). Places that consumers purchased blackberries included retail markets, farmer stores, natural food stores, pick your own farms, agritourism farms, and roadside stands (Figure 1). Consumers purchased blackberries at grocery stores (44.5%) and

farmer stores (30.9%) at least once a month. A total of 28.4% consumers responded that they ate blackberries once per month, 24.5% of participants responded that they ate blackberries two to three times per month, 17.3% ate blackberries less than once per month, and 16.0% ate blackberries once per week.

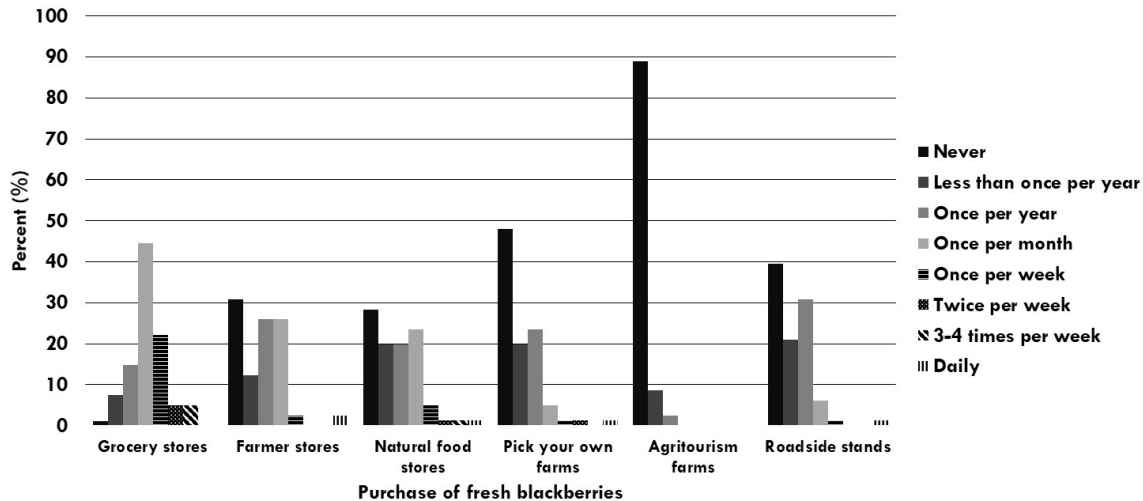


Figure 1. Percent of consumers (n=81) asked “How often do you purchase fresh-market blackberries from these locations?”

The consumers were asked about important factors when purchasing fresh-market blackberries. Over 65% of the consumers indicated the type and size of package, large berry size, uniform color of berry, freshness of berry, and price were important factors when purchasing blackberries (Figure 2). The freshness of berries (97.5%), price (87.6%), and uniform berry color (80.0%) were the three most important factors when consumers purchase fresh-market blackberries.

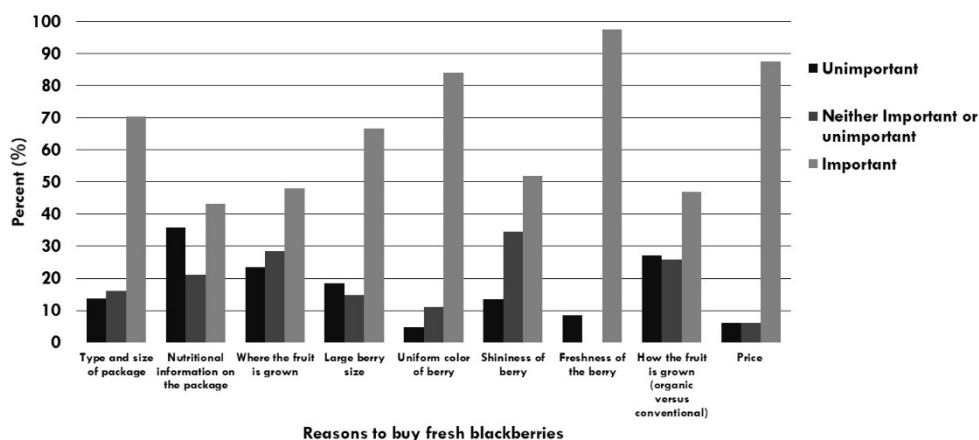


Figure 2. Percent of consumers (n=81) asked “If you were going to buy fresh blackberries, please rate the importance of the reason(s) for your decision to buy them?”

Consumer visual evaluation of individual blackberries

The participants were asked to evaluate the shape, size, and overall appearance of individual blackberries with a U.S. quarter and ruler shown as a reference. The blackberries were labeled with random, three-digit numbers which the participants were asked to rank from most to least preferred.

1. Blackberry shape

The consumers were asked to evaluate the shape of three blackberries, one that was cone-shaped oblong ('825'), one that was round ('718'), and one that was cylinder-shaped and oblong ('316') (Figure 3). About 59.3% of the consumer preferred the blackberry '825', followed by 22.2% preferring '718', and 18.5% preferring '316'. The consumers preferred the shape of the cone-shaped oblong blackberry.

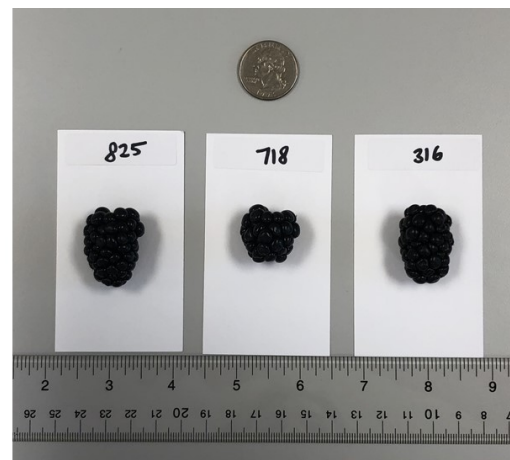
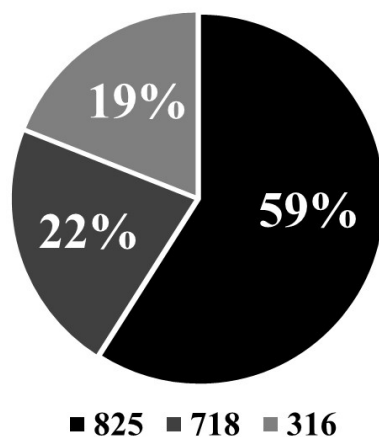


Figure 3. Percent of consumers (n=81) ranked blackberries by preferred shape. Panelists were asked to “Rank the blackberries from your most preferred SHAPE to your least preferred with 1 meaning your most preferred and 3 your least preferred”.

2. Blackberry size

The consumers were asked to evaluate the size of three blackberries, one that was twice as large as the U.S. quarter ('945'), one slightly larger than the U.S. quarter ('378'), and one that was slightly smaller than the U.S. quarter ('402') (Figure 4). About 54.3% of consumers preferred the size of blackberry '945', followed by 42.0% preferring '378', and 3.7% preferring '402'. The consumers preferred the largest blackberry.

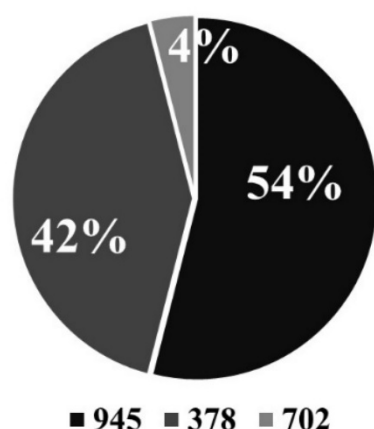


Figure 4. Percent of consumers (n=81) ranked blackberries by preferred size. Panelists were asked to “Rank the blackberries from your most preferred SIZE to your least preferred with 1 meaning your most preferred and 3 your least preferred”.

3. Blackberry overall appearance

The consumers were asked to evaluate the overall appearance of six blackberries with different sizes and shapes (Figure 5). The consumers preferred blackberry ‘484’ (a cone-shaped oblong, large berry), while ‘729’ (a small, round berry) was least preferred. In general, consumers preferred blackberries that were oblong as opposed to round and were large rather than small.

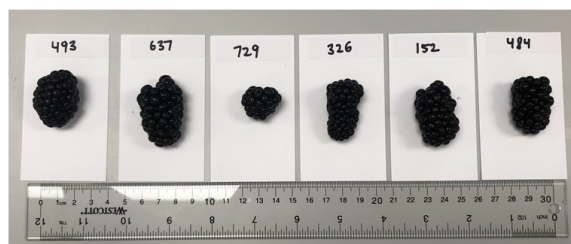
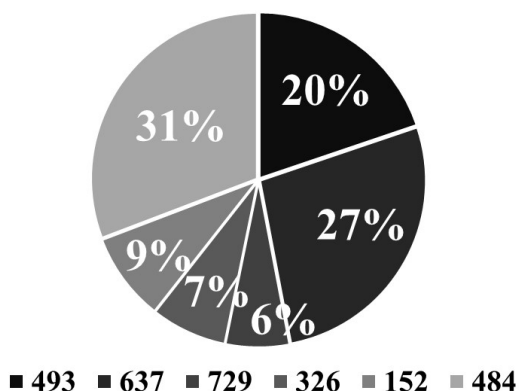


Figure 5. Percent of consumers (n=81) ranked blackberries by preferred overall appearance. Panelists were asked to “Rank the blackberries from your most preferred OVERALL APPEARANCE to your least preferred with 1 meaning your most preferred and 6 your least preferred”.

Consumer visual evaluation of blackberries in clamshells

The consumers were asked to evaluate clamshells filled with blackberries. The blackberries were labeled with random, three-digit numbers which the consumers were asked to rank from most to least preferred.

1. Size of blackberries in clamshells

The consumers were asked to evaluate two clamshells filled with blackberries (one with large berries and the other with small berries) (Figure 6). The clamshells had the same weight of berries in each but a different number of berries. When asked which container of blackberries they would prefer to purchase, 56.8% of the consumers preferred clamshell '735' (clamshell of large berries) followed by 43.2% preferring '916' (clamshell of small berries). Consumers preferred clamshells containing larger blackberries as opposed to clamshells containing smaller blackberries.

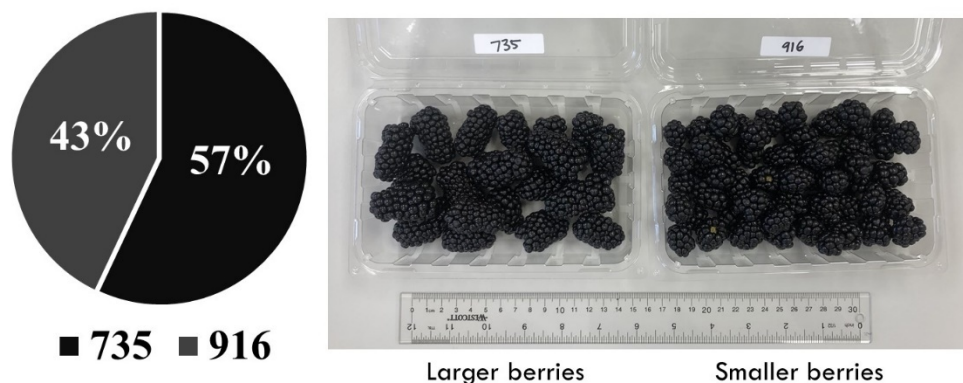


Figure 6. Percent of consumers (n=81) ranked clamshells of blackberries containing different size berries when presented with the question “Which of these containers of blackberries would you prefer to purchase with 1 being your most preferred and 3 your least preferred”

2. Red drupelet reversion of blackberries in clamshells

The consumers were asked to evaluate three clamshells filled with blackberries with varying levels (none, some, and more) of red drupelet reversion, a postharvest disorder where the black drupelets on the blackberry turn red during or after cold storage (Figure 7). When asked which container of blackberries they would prefer to purchase, 53.1% of the consumers preferred clamshell '942' (no red drupelet reversion), followed by 28.4% preferring '516' (some red drupelet reversion), and 18.5% preferring clamshell '378' (most red drupelet reversion). Consumers were aware of the presence of red drupelet reversion on the blackberries, and the consumers preferred blackberries with no to some red drupelets.



Figure 7. Percent of consumers (n=81) ranked clamshells of blackberries with different amounts of red drupelet reversion when presented with the question “Which of these containers of blackberries would you prefer to purchase with 1 being your most preferred and 3 your least preferred?”

Consumer appearance, tasting and texture evaluation

The liking scores for all the fresh-market blackberry attributes evaluated ranged from 5 (neither like nor dislike) to 7 (like moderately). The liking scores for appearance ranged from 6.6-7.1, but there was not difference between the cultivars. Caddo, a 9-g berry that was 33 x 24 mm, had the highest score for the liking of size and shape. Ponca had the highest liking for overall impression, flavor, sweetness and sourness. Ponca had 10.4% soluble solids, 0.82% titratable acidity, and 12.8 soluble solids to titratable acidity ratio. The liking scores for texture ranged from 6.4-6.9, but there was no a difference between the cultivars.

Table 4. Consumer sensory (n=81) attributes of fresh-market blackberry cultivars evaluated on a 9-point hedonic scale (1 = dislike extremely; 5 = neither like nor dislike; 9 = like extremely), Clarksville, AR (2019)

Genotype	Appearance	Size	Shape	Overall impression	Overall flavor	Sweetness	Sourness	Texture
Caddo	7.0 a ^a	7.1 a	7.1 a	6.7 ab	6.6 a	6.1 bc	5.7 ab	6.9 a
Natchez	7.1 a	6.9 ab	6.9 ab	6.4 ab	6.4 ab	5.9 bc	5.7 ab	6.7 a
Osage	6.6 a	6.0 c	6.4 c	6.6 ab	6.7 a	6.2 b	5.9 ab	6.6 a
Ouachita	6.7 a	6.4 bc	6.7 abc	5.7 c	5.5 c	4.9 d	4.9 c	6.7 a
Ponca	6.7 a	6.4 c	6.5 bc	6.9 a	6.8 a	6.8 a	6.0 a	6.8 a
Prime-Ark [®]								
Traveler	6.6 a	6.4 bc	6.5 c	6.3 b	6.0 b	5.6 c	5.3 bc	6.4 a
<i>P-value</i>	<i>0.2132</i>	<i>0.0003</i>	<i>0.0117</i>	<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0004</i>	<i>0.3214</i>

^a Means with the different letters for each attribute are significantly different (p<0.05) using the Least Significance Difference method

For data analysis, the JAR data were collapsed to “Too Low”, JAR, and “Too Much” (Table 2). Ideally in JAR evaluations, it is desired that at least 75% of participants consider an attribute JAR. The consumers found Caddo 79% JAR for size and Osage 72% JAR for blackberry flavor. The consumers found that all the cultivars were 70-80% JAR for firmness.

Table 2. Percent (%) of consumer sensory (n=81) attributes for fresh-market blackberry cultivars on a collapsed 5-point just about right (JAR)^a scale

Cultivar	Size			Blackberry flavor			Sweetness			Sourness			Firmness		
	Not enough	JAR	Too Much	Not enough	JAR	Too Much	Not enough	JAR	Too Much	Not enough	JAR	Too Much	Not enough	JAR	Too Much
Caddo	4	79	17	27	68	5	46	48	6	12	49	38	12	80	7
Natchez	5	62	33	30	60	10	51	46	4	10	48	42	25	70	5
Osage	54	44	1	27	72	1	47	47	6	12	60	27	25	74	1
Ouachita	36	60	4	41	47	12	77	23	0	4	32	64	15	73	12
Ponca	42	56	2	26	69	5	27	63	10	21	58	21	22	74	4
Prime-Ark® Traveler	25	62	10	47	49	4	59	36	5	21	43	36	17	70	12

^a The 5-point JAR scale (1 = not nearly enough; 2 = not enough; 3 = JAR; 4 = too much; 5 = much too much) was collapsed to Not Enough, JAR, and Too Much

CONCLUSIONS

The primary goal of this research was to identify consumer-driven attributes of fresh-market blackberries through physiochemical and consumer sensory evaluations. The UA System blackberry cultivars (Caddo, Natchez, Osage, Ouachita, Ponca, and Prime-Ark® Traveler) had physiochemical attributes within a commercially acceptable range. Ponca had the most ideal composition of the cultivars evaluated. Natchez was the biggest berry and Osage the smallest. The consumers evaluated the shape, size, and overall appearance of individual blackberries and displays of blackberries in clamshells. In general, consumers preferred oblong, large blackberries as opposed to round or small. Consumers preferred to purchase clamshells containing larger blackberries and preferred blackberries without red drupelet reversion. The consumers liked the size and shape of Caddo and the overall impression, flavor, sweetness and sourness of Ponca. The consumers found Caddo JAR for size, Osage for blackberry flavor, and all cultivars for firmness. Identifying marketability attributes of fresh-market blackberries helps provide information to advance breeding efforts for fruit with commercial potential.

Impact Statement

The physiochemical and sensory data on fresh-market blackberries from this study will be used for presentations at regional and national conferences in 2020. In addition, a journal publication will be produced using this data combined with a previous online consumer study for fresh-market blackberries.

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