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Mississippi Sweetpotato

VARIETY EVALUATIONS, 2008–2012

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Mississippi Sweetpotato Variety Evaluations, 2008–2012

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Introduction

The National Sweetpotato Collaborator Group (NSCG) conducts annual state and regional trials of promising sweetpotato varieties developed by participating geneticists in the U.S. The results of these regional trials are reviewed at the NSCG annual meeting (multistate SERA005: Sweet Potato Collaborators Conference) and included in the NSCG Annual Report. A compilation of the sweetpotato variety trials conducted in Mississippi from 2008 to 2012 is reported in this bulletin.

Sweetpotato is an economically and culturally important crop in Mississippi, the U.S., and the world. Nationally, sweetpotato is produced mainly in the southern states and California, with more than 130,000 acres planted in 2012 (USDA 2013a). Mississippi ranked second nationally in sweetpotato acreage (24,000 acres) and third in crop value ($62.6 million) in 2012 (USDA 2013a, 2013b).

The most common variety grown in Mississippi for fresh market is 'Beauregard' (B-14), a mericlone developed by the Louisiana Agricultural Experiment Station (Villordon et al. 2003; Rolston et al. 1987). It produces straight, tough slips suitable for mechanical transplanting. Roots are fusiform to ovoid with a smooth, light-rose skin and moderately deep-orange flesh. Dry matter is about 24%, and carotene content is about 9.46 mg per 100 g of fresh weight. Beauregard is resistant to fusarium wilt (*Fusarium oxisporum*) and moderately resistant to soil rot or pox (*Streptomyces ipomoea*). 'O'Henry,' a white mutation of Beauregard, has become the standard white variety in the last 10 years because it has many of the growth and disease resistance characteristics of Beauregard (Smith 2012). Nonetheless, variability in yield and grades is a common problem in sweetpotato production, and new lines are being developed and tested to improve agronomic characteristics and consistency across production environments.

Sweetpotato yields storage roots of various sizes. Growers grade them based on the U.S. standards for grades of sweetpotato into U.S. no. 1, U.S. no. 1 petite, U.S. no. 2, and jumbo (USDA 2005). Grades reported in this bulletin are based on the National Sweetpotato Collaborators Group and generally correspond to canners being U.S. no. 1 petite or U.S. no. 2. The sweetpotato fresh market demands U.S. no.1 grade (attractive roots of uniform shape and free of blemishes) that brings the highest value. Demand for fresh market U.S. no. 2 and jumbos are limited. In contrast, the processing industry accepts all grades but at a reduced price. Therefore, to comply with the expectations of sweetpotato growers and the industry, one of the main objectives of breeding programs has been to develop lines with more uniform storage root shape and size that can improve the proportion of U.S. no. 1 grade.

However, with recent expansion of the processing industry, production is moving into a contracted system and field-run bulk harvesting. In this case, total yield of medium to large storage roots is more important than the percentage of U.S. no. 1 grade and aesthetic appeal. Therefore, breeders are also developing varieties that would better fit the expectations of the processing industry. The objective of the NSCG trials in Mississippi is to test new varieties for improvements in agronomic and culinary characteristics that can replace or supplement current varieties for a more sustainable sweetpotato industry.

PROCEDURES

Sweetpotato varieties and advanced lines from the breeding programs at Louisiana State University Agricultural Center and North Carolina State University were evaluated for yield and quality. Yield evaluations were conducted at the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc County, Mississippi, (2008, 2009, 2012), as well as in on-farm studies at Hoenlinden in Calhoun County (2010) and at Bellefontaine in Webster County, Mississippi, (2011). An additional trial at the Truck Crops Branch Experiment Station in Crystal Springs in Copiah County, Mississippi, was conducted in 2012.

The soil types at the sites in Pontotoc, Calhoun, Webster, and Copiah Counties were Faulkner silt loam, Arkabutla silt loam, Bude silt loam, and Providence silt loam, respectively. The trials in Pontotoc County and Copiah County were grown following recommended practices (Thompson et al. 2002), and fertilizer was applied according to Mississippi State University Extension Service soil test recommendations. The on-farm trials followed the farmers' cultural practices.

The experimental design of all trials consisted of a randomized complete block with at least three replications. Each experimental unit (plot) consisted of single 20-foot-long row. Plant spacing was 40 inches between rows and 12 inches within the row. Slips of each variety were hand-planted in all locations.

The planting dates and growing period at the Pontotoc County location are as follows: June 23, 2008, 112 days after planting (DAP); June 15, 2009, 126 DAP; and June 7, 2012, 119 DAP. The planting date and growing period at the Calhoun County, Webster County, and Copiah County locations were June 8, 2010, 118 DAP; June 9, 2011, 92 DAP; and June 15, 2012, 124 DAP, respectively.

At harvest, all roots were graded based on the U.S. standards for grades of sweetpotato (USDA 2005) modified in the following way: (1) U.S. no. 1 — roots 2–3.5 inches in diameter, 3–9 inches long, and free of defects; (2) canner — roots 1.5–2 inches in diameter, 3–7 inches long; and (3) jumbo — roots exceeded the diameter, length, or weight requirements of U.S. no. 1 but were of marketable quality. In addition, percent U.S. no.1 was calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (culls not included). Culls were roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the three grades.

Yields were evaluated yearly; however, data from 2008, 2010, and 2012 were analyzed together to summarize performance over the years. The trials at Pontotoc County in 2009 and Webster County in 2011 were left out because of unusual growing conditions (excessive rain in 2009 and short growing period in 2011) that affected yields. In addition, advanced lines that were tested 1 year only due to poor performance were left out of the summary.

Baking quality evaluations were made at the Garrison Sensory Evaluation Laboratory in the Department of Food Science, Nutrition, and Health Promotion at Mississippi State University. Baking quality characteristics were examined on storage roots from each variety entered by two tests: a microwave test and a conventional-oven baking test. Samples used for the microwave test were wrapped in clear Saran plastic wrap and microwaved on high power for 5 minutes. Samples for the conventional oven were wrapped in aluminum foil and baked at 370°F for 1 hour. Each year, a trained panel scored the microwaved and baked storage roots by comparison to the standard variety Beauregard B-14.

Four visual sensory attributes were tested: appearance (eye appeal of the storage root exterior); color intensity of the edible flesh in comparison to the standard; color uniformity of the flesh (occurrence of streaks of lighter color); and color freedom from discoloration or browning. Four mouth sensory attributes were tested: texture smoothness of the flesh; texture moistness related to water content in the flesh; texture fiber (presence of strings of fiber in the flesh); and flavor, including sweetness and taste.

The overall score refers to the general acceptance or dislike of the sample. All sensory scores were based on a 10-point scale, with scores of 6 and below being not acceptable for a consumer.

Statistical analyses were conducted with SAS statistical software (version 9.2 for Windows; SAS Institute, Cary, North Carolina). Analysis of variance was performed by PROC MIXED, and differences among means were determined by Fisher's Protected Least Significant Difference (LSD) at $P \leq 0.05$.

Sweetpotato Yields

Pontotoc County, 2008

In this trial, the orange-flesh breeding lines 'Evangeline,' 'Hatteras,' and 'Covington' were evaluated in comparison to 'Beauregard B-14' as the standard. In addition, two white-flesh breeding lines were entered in the variety trial (Table 1).

U.S. no. 1 yield among the orange-flesh varieties ranged from 207 to 344 bushels per acre. The top producer of the U.S. no. 1 grade was Beauregard B-14 (344 bushels) and was greater than Covington but similar to Evangeline and Hatteras among the orange-flesh entries. There were no differences in U.S. no. 1 yield between the white flesh varieties.

There were no differences in yield of canner-sized roots among orange-flesh varieties. Similarly, the canner yields between white flesh lines were the same. Jumbo yield in Beauregard B-14 was similar to Evangeline and superior to Hatteras and Covington. The white-flesh lines had no jumbo grade roots.

Total marketable yield of all varieties ranged from 44 to 571 bushels per acre. Beauregard B-14 had the highest yield (571 bushels) but was similar to Evangeline and Hatteras and greater than Covington. In the white-flesh varieties, marketable yield of 'Murasaki-29' was superior to 'NC Japanese.' The percentages of U.S. no. 1 roots among varieties ranged from 48% to 68%, which were the same among all entries.

Pontotoc County, 2009

In 2009, Hatteras was the only advanced breeding line that was evaluated because Covington and Evangeline were released as varieties in 2008. There were no white-flesh varieties entered in 2009. Yields were low in comparison to other years, and U.S. no. 1 yield ranged from 116 to 183 bushels per acre (Table 2). Long and heavy rains delayed the harvest and losses to rots in the field were significant for all varieties. Yields of U.S. no. 1, canner, and jumbo grades were similar among all entries.

Total marketable yield ranged from 232 to 366 bushels per acre. In contrast to the individual yield components, Covington (366 bushels) was the top performer—superior to Evangeline, Hatteras, and Beauregard B-14 but similar to Beauregard B-63. Percentage of U.S. no. 1 yield ranged from 50% to 55% and was statistically the same among all varieties.

Calhoun County, 2010

Three new breeding lines from Louisiana, orange flesh 'LA07-146' and 'Orleans' and white flesh 'Bonita,' were included in the 2010 trial. U.S. no. 1 yield of the orange flesh varieties ranged from 262 to 464 bushels per acre and were not different among them (Table 3). Similarly, U.S. no. 1 yield between the white-flesh entries was not different.

Table 1. Yield of sweetpotato cultivars at the Pontotoc Branch Experiment Station, Pontotoc County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Cull	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh						
B-14 Beauregard	344 a	153 a	74 a	571 a	76	60
Evangeline	333 a	114 a	41 ab	488 a	73	68
Hatteras	288 ab	154 a	12 b	454 ab	142	63
Covington	207 bc	92 ab	29 b	328 bc	98	63
White flesh						
Murasaki-29	107 cd	95 ab		202 c	98	53
NC Japanese	21 d	23 b		44 d	76	48

[1]Planted June 23, 2008; harvested 112 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Table 2. Yield of sweetpotato cultivars at the Pontotoc Branch Experiment Station, Pontotoc County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Cull	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh						
Covington	183	169	14	366 a	120	50
B-63 Beauregard	179	91	54	324 ab	118	55
Evangeline	136	116		252 b	106	54
Hatteras	135	115	4	254 b	81	53
B-14 Beauregard	116	101	15	232 b	153	50

[1]Planted June 15, 2009; harvested 126 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Canner yield was the same among orange-flesh varieties, except for Beauregard B-14, which was superior to Covington. Canner yields of the two white-flesh entries were similar. Jumbo yield of Beauregard B-63 (121 bushels per acre) was superior to all other orange-flesh entries. In contrast, jumbo yields from the two white-flesh entries were the same.

Total marketable yield of orange-flesh varieties ranged from 393 to 671 bushels per acre. All entries were the similar except Evangeline, which was superior to Covington. Between the white-flesh varieties, Bonita was superior to O'Henry in marketable yield. The percentages of U.S. no. 1 roots were the same among the orange-flesh varieties/lines, ranging from 52% to 70%. Percentages of U.S. no. 1 between white-flesh varieties were also the same.

Webster County, 2011

Two additional lines from North Carolina, 'NC05-198' (orange flesh) and 'NC07-847' (white flesh), were included in this year (Table 4). However, this trial was harvested too early at 92 DAP. Therefore, storage roots did not size enough, and yields were very low in comparison to other years. Nonetheless, the U.S. no. 1 yield of LA07-146 (203 bushels per acre) was more than all other varieties except Beauregard B14 (111 bushels).

Table 3. Yield of sweetpotato cultivars at Hohenlinden, Calhoun County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Cull	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh						
Evangeline	464 a	164 ab	43 b	671 a	71 b	70 a
LA07-146	413 ab	175 ab	42 b	630 ab	268 a	65 ab
B-14 Beauregard	322 ab	241 a	38 b	601 ab	50 b	54 ab
B-63 Beauregard	293 ab	140 ab	121 a	553 ab	142 ab	52 abc
Covington	275 abc	109 b	9 b	393 bc	6 b	69 a
Orleans	262 abc	144 ab	25 b	431 abc	49 b	61 ab
White flesh						
Bonita	217 bc	223 a	46 ab	487 ab	65 b	45 bc
O'Henry	71 c	137 ab	8 b	216 c	71 b	32 c

[1]Planted June 8, 2010; harvested 118 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Table 4. Yield of sweetpotato cultivars at Bellefontaine, Webster County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Cull	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh						
LA07-146	203 a	187		390 a	53	52
B-14 Beauregard	111 ab	142		253 abc	73	43
Covington	99 b	144		244 bc	46	40
NC05-198	80 b	152		232 bc		35
Evangeline	77 b	221	18	316 ab		26
Orleans	60 b	133		193 bcd	33	30
B-63 Beauregard	49 b	69		118 cd	16	40
White flesh						
O'Henry	23 b	173		196 bcd	10	12
NC07-847	84 b	135		219 bcd		37
Bonita	21 b	121		142 cd	23	15

[1]Planted June 15, 2009; harvested 126 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Furthermore, there were no differences in yields of canners and jumbo grades among all entries. The high canner yields (69 to 221 bushels per acre) and the lack of jumbo roots indicated that the trial could have been left in the field much longer for storage roots to size up.

Total marketable yield of LA07-146 (390 bushels per acre) was similar to Evangeline and Beauregard B-14 but superior to all other varieties. In contrast, marketable yields of white-flesh varieties were the same among all varieties, ranging from 142 to 219 bushels. Similarly, the proportions of U.S. no. 1 were not different among the entries, which further demonstrated that the harvest at this location was too early. However, 52% U.S. no. 1 for LA07-146 is still acceptable.

Pontotoc County, 2012

The same varieties as in 2011 were tested in 2012 with the exception of Evangeline, which was dropped from the trial. Trial yields were very good overall compared with trials in previous years. U.S. no. 1 yields ranged from 317 to 693 bushels per acre, with LA07-146 being the highest and superior to all other entries (Table 5). In contrast, Orleans yielded the same as all the other orange-flesh varieties. NC05-198 was similar to Beauregard B63 and Orleans but inferior to Covington and Beauregard B-14. U.S. no. 1 yields among the white-flesh varieties were the same, ranging from 317 to 399 bushels.

The canner grade yield ranged from 89 to 189 bushels per acre, but there were no differences among entries. Jumbo yield of LA07-146 was similar to all orange-flesh entries, but Orleans, Beauregard B-14, and Covington yielded fewer jumbo roots than Beauregard B-63. No differences in jumbo roots were found among the white-flesh entries.

Marketable yield of LA07-146 was superior to all other entries with 1,020 bushels per acre. Marketable yield of all other orange-flesh varieties ranged from 526 to 692 bushels and were the same among all entries. Similarly, marketable yield among white-flesh varieties ranged from 508 to 622 bushels, and there were no differences among them. Percentage of U.S. no. 1 roots ranged from 56% to 71%, and there also were no differences among all entries.

Copiah County, 2012

The same entries used at Pontotoc County were repeated at Copiah County in 2012. Similar to the Pontotoc County location, U.S. no. 1 and total marketable yields of LA07-146 (605 and 989 bushels per acre, respectively) were greater than all other varieties (Table 6). In contrast, Orleans and NC05-198 had U.S. no. 1 yields (237 to 370 bushels) and total marketable yields (424 to 626 bushels) similar to all other orange varieties. There were no differences in U.S. no. 1 (317 to

380 bushels) and marketable yields (496 to 615 bushels) among white-flesh entries.

Similarly, there were no differences in canner yields, which ranged between 110 and 194 bushels per acre, among all entries. Jumbo yield of LA07-146 (189 bushels) was also superior to all orange-flesh varieties except Beauregard B-63. Orleans was the same as all orange-flesh entries except LA07-146. The proportion of U.S. no. 1 roots in relation to marketable yield was not different among varieties, ranging from 54% to 67%.

Yield Summary

Yield from 2008, 2010, and 2012 were summarized in Table 7. The trials at Pontotoc County in 2009 and Webster County in 2011 were left out because of unusual growing conditions in Mississippi that affected yields. Varieties included in the summary were those that had been tested at least 2 years.

Line LA07-146—with U.S. no. 1 and marketable yields of 570 and 879 bushels per acre, respectively—performed better than all other entries. U.S. no. 1 yields (322 to 399 bushels) and marketable yields (478 to 624 bushels) were similar among the other orange-flesh varieties.

Among white-flesh varieties, U.S. no. 1, canner, jumbo, and marketable yield were similar. U.S. no. 1 ranged from 283 to 351 bushels per acre, and marketable yield ranged from 484 to 581 bushels for the white varieties. The proportion of U.S. no. 1 storage roots was the same among all orange- and white-flesh varieties, ranging from 52% to 69%.

Table 5. Yield of sweetpotato cultivars at the Pontotoc Branch Experiment Station, Pontotoc County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Cull	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh						
LA07-146	693 a	158	168 ab	1020 a	78	68
Covington	458 b	102	94 bc	655 bc	6	71
B-14 Beauregard	431 b	129	105 bc	666 bc	63	66
Orleans	422 bc	102	85 bc	610 bc	45	69
B-63 Beauregard	391 bc	108	193 a	692 b	66	56
NC05-198	315 c	89	120 ab	526 bc	49	60
White flesh						
O'Henry	399 bc	189	33 c	622 bc	12	64
NC07-847	374 bc	130	60 bc	565 bc	5	67
Bonita	317 c	160	31 c	508 c	35	63

[1]Planted June 15, 2009; harvested 126 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Table 6. Yield of sweetpotato cultivars at Crystal Springs, Copiah County, Mississippi.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh					
LA07-146	605 a	194	189 a	989 a	61
B-63 Beauregard	370 b	123	132 ab	626 b	59
Covington	347 bc	147	43 cd	539 bc	63
Orleans	347 bc	145	69 bcd	562 bc	61
NC05-198	332 bc	133	29 d	495 bc	67
B-14 Beauregard	237 c	110	76 bcd	424 c	56
White flesh					
O'Henry	380 b	182	52 bcd	615 bc	60
NC07-847	328 bc	158	111 abc	598 bc	54
Bonita	317 bc	160	18 d	496 bc	61

[1]Planted June 15, 2009; harvested 126 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Table 7. Average yield of sweetpotato cultivars in Mississippi, 2008, 2010, and 2012.[1]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*
Orange flesh					
LA07-146	570 a	176	133 ab	879 a	65
B-63 Beauregard	351 b	124	149 a	624 b	56
Evangeline	399 b	139	42 c	580 b	69
Orleans	344 b	130	60 c	534 b	64
NC05-198	324 b	111	75 bc	509 b	64
Covington	322 b	113	44 c	478 b	67
B-14 Beauregard	334 b	158	73 bc	565 b	59
White flesh					
NC07-847	351 b	144	86 bc	581 b	61
Bonita	284 b	181	32 c	496 b	56
O'Henry	283 b	169	31 c	484 b	52

[1]Planted June 15, 2009; harvested 126 days after planting.
Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2" to 3.5" in diameter, 3" to 9" long, must be well shaped and free of defects; **Canner** — roots 1" to 2" in diameter, 2" to 7" long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the previous two grades but are of marketable quality; and **Cull** — roots of the U.S. no. 1 and jumbo grades so misshapen or unattractive that they could not fit as marketable roots in any of the previous grades. **Percent U.S. no. 1** — calculated by dividing the weight of U.S. no. 1 potatoes by the total marketable weight (Culls not included).
bu = 50-pound bushel.
Means with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

Sensory Attributes

2008 Evaluation

Statistical analysis is not available for the 2008 data, but general trends were observed. The standard Beauregard B-14 had good scores in all measured quality characteristics for the microwave test with an overall score of 9.0, but in the bake test, the overall score was less appealing with 7.5.

Evangeline did well in all categories and excelled in moistness, color intensity, and uniformity in the microwave test with overall score of 9.3 (Table 8). In the conventional bake test, Evangeline tended to do much better than the standard in most categories of acceptability with overall score of 8.1 (Table 9).

Covington ranked highest in flavor in the bake test with a 9.3 score and an 8.6 overall score; it performed less well than the standard in the microwave test with overall score of 8.4. Hatteras performed slightly more poorly than the standard in the microwave test but better in the bake test with overall scores of 8.5 and 8.1, respectively.

The white-flesh lines scored lower than the standard in the microwave test with overall scores of 7.4 for NC Japanese and 7.8 for Murasaki-29. In the bake test, both entries performed better than the standard, especially Murasaki-29.

2009 Evaluation

In 2009, the microwave trial had five orange-flesh varieties and one white-flesh variety. There were few differences in quality characteristics among the orange varieties in taste and mouth feel in the microwave test. Hatteras was low in color uniformity with scores near unacceptable and an overall score of 7.3, similar to the standard Beauregard B-14 (Table 10).

The overall performance scores of Evangeline, Covington, and O'Henry were similar to the standard,

Table 8. Microwaved sweetpotato sensory evaluation, 2008.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	9.00	9.00	8.00	10.00	10.00	8.00	10.00	8.00	9.00
Evangeline	8.00	9.50	9.80	10.00	9.50	9.80	9.80	8.00	9.30
Hatteras	7.50	8.80	8.80	10.00	8.80	8.00	9.30	6.80	8.50
Covington	8.50	7.50	9.00	9.50	8.30	8.50	8.80	7.50	8.40
White flesh									
NC Japanese	7.00	7.00	7.50	8.25	7.50	5.75	8.75	7.25	7.40
Murasaki-29	6.00	7.25	7.25	7.25	9.00	8.00	9.50	8.00	7.80

[1]Sweetpotatoes were wrapped in Saran Wrap and microwaved (700 watt) on high for 5 minutes. Sensory score scale: 1–10 with 6 or below being unacceptable.

Table 9. Baked sweetpotato sensory evaluation, 2008.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	7.00	8.00	6.00	7.00	9.00	8.00	8.00	7.00	7.50
Evangeline	8.50	9.30	9.30	9.30	9.30	9.00	8.80	8.00	8.90
Hatteras	7.00	8.30	8.30	8.80	7.80	8.50	8.50	7.80	8.10
Covington	8.30	7.80	8.00	9.00	8.80	8.80	9.00	9.30	8.60
White flesh									
NC Japanese	5.50	7.50	7.50	7.50	9.80	8.50	8.30	7.80	7.80
Murasaki-29	7.50	9.00	8.80	9.30	9.00	9.00	8.70	9.00	8.80

[1]Sweet potatoes were foil wrapped and baked for 1.5 hour at 375°F. Sensory score scale: 1–10 with 6 or below being unacceptable.

but there were some differences in the individual sensory scores. Evangeline was superior in color uniformity (9.1) and moistness (9.0). In the bake test, the varieties had scores similar to the standard, but there were some differences in the individual sensory scores. Covington scored lower than the standard in color intensity (7.1), color uniformity (6.9), and color freedom (7.4) (Table 11).

2010 Evaluation

Overall scores for all the orange-flesh varieties ranged from 7.2 to 8.0 in microwave tests and from 7.9 to 9.2 in bake tests. These scores were not different from the standard Beauregard B-14 (Table 12), but there were some differences in individual sensory scores.

Evangeline topped the rankings in color intensity (8.4), uniformity (8.8), and freedom (8.9); it was superior to all other orange-flesh entries except the standard. Bonita was compared to O'Henry, the standard for the white-flesh varieties. There were no differences between them in the overall score, but some individual sensory scores were different. Bonita scored better than O'Henry in texture smoothness and texture moistness.

The overall scores of the bake test for all orange-flesh entries were not different from the standard, but some differences were detected in the individual sensory scores (Table 13). Evangeline and Orleans were similar but superior in color intensity, uniformity, and freedom to Covington and LA07-146. Likewise, the overall baking scores between the white-flesh varieties were similar. However, Bonita was superior in eye appeal, color intensity, uniformity, and freedom, but it was inferior in texture smoothness and moistness.

2012 Evaluation

For all the orange-flesh varieties, overall scores for microwave tests ranged from 7.9 to 8.5 and overall scores for bake tests ranged from 8.0 to 9.7. There were no differences among them (Table 14). Although Cov-

Table 10. Microwaved sweetpotato sensory evaluation, 2009.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	6.3 a	7.6 bc	6.4 d	6.6 c	7.1 c	7.6 bc	8.4 a	9.0 a	7.7 ab
B-63 Beauregard	6.7 a	8.9 a	8.4 ab	8.3 ab	8.4 a	8.4 ab	9.1 a	9.3 a	8.6 a
Hatteras	6.3 a	7.4 c	6.7 d	7.3 bc	7.3 bc	7.1 c	8.6 a	8.4 a	7.3 b
Evangeline	6.6 a	8.4 bab	9.1 a	8.4 a	8.6 a	9.0 a	9.0 a	8.9 a	8.4 a
Covington	6.7 a	8.6 ab	8.0 bc	8.0 ba	8.1 ab	7.4 c	7.9 a	8.6 a	7.9 ab
White flesh									
O'Henry	6.3 a	8.1 abc	7.3 dc	7.4 bac	7.7 abc	7.7 bc	8.0 a	8.7 a	8.1 ab

[1]Sweetpotatoes were wrapped in Saran Wrap and microwaved (700 watt) on high for 5 minutes. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

Table 11. Baked sweetpotato sensory evaluation, 2009.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	7.4 a	9.0 ab	8.9 a	9.1 a	8.7 a	9.3 a	9.6 a	8.9 a	8.9 ab
B-63 Beauregard	7.7 a	9.4 a	9.4 a	9.6 a	9.6 a	9.4 a	9.7 a	9.3 a	9.4 a
Hatteras	8.0 a	8.4 bc	8.7 ab	9.4 a	8.6 a	9.3 a	9.1 a	9.3 a	8.9 ab
Evangeline	8.1 a	9.3 ab	9.6 a	9.4 a	9.3 a	9.6 a	9.4 a	9.1 a	8.9 ab
Covington	8.3 a	7.1 d	6.9 c	7.4 c	9.0 a	9.3 a	9.6 a	8.7 a	8.0 b
White flesh									
O'Henry	8.0 a	8.0 cd	7.9 b	8.3 b	9.3a	9.6 a	9.7 a	8.7 a	8.6 ab

[1]Sweet potatoes were foil wrapped and baked for 1.5 hour at 375°F. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

ington was the only orange-flesh variety that scored better than all white varieties, in general, the overall score of white-flesh varieties as a group was slightly reduced in the microwave test.

In individual sensory scores, Covington scored higher or among the highest in color attributes and smoothness. Also, white-flesh varieties as a group were inferior in color freedom, smoothness, and flavor (Table 14). In the baking tests, there were no differences in the overall score among all entries (Table 15). NC05-198 outperformed most varieties in color intensity (9.2) but was similar to Beauregard. Most entries were the same in color uniformity and color freedom (except LA07-146), smoothness (except LA07-146 and Bonita), fiber (except Orleans), and flavor (except Orleans and Bonita) (Table 15). White-flesh varieties as a group tended to score lower in texture moistness.

Table 12. Microwaved sweetpotato sensory evaluation, 2010.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	8.6 a	8.2 a	8.6 a	8.2 ab	8.3 ab	7.8 ab	9.2 ab	7.8 ab	7.9 a
B-63 Beauregard	7.8 abc	6.7 bc	7.1 b	7.2 cd	8.6 a	8.2 a	9.7 a	7.8 ab	7.8 a
Evangeline	8.8 a	8.4 a	8.8 a	8.9 a	8.4 ab	8.1 a	9.2 ab	8.1 a	8.0 a
Orleans	7.7 abc	7.1 b	6.8 bc	6.5 de	7.2 cd	7.1 b	8.7 ab	7.4 abc	7.2 ab
Covington	7.4 bcd	6.0 c	6.8 bc	7.3 bcd	7.9 ab	7.8 ab	9.1 ab	7.7 abc	7.3 ab
LA07-146	7.2 bcd	6.8 bc	6.8 bc	7.8 bc	8.0 ab	7.8 ab	9.1 ab	8.2 a	7.8 a
White flesh									
O'Henry	8.2 ab	7.9 a	8.2 a	7.9 bc	7.8 ab	7.2 b	8.8 ab	7.6 abc	7.7 a
Bonita	8.2 ab	8.2 a	8.2 a	8.2 ab	6.7 d	6.2 c	8.2 b	6.8 c	7.2 ab

[1]Sweetpotatoes were wrapped in Saran Wrap and microwaved (700 watt) on high for 5 minutes. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

Table 13. Baked sweetpotato sensory evaluation, 2010.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	8.5 abc	8.8 ab	8.7 ab	9.3 ab	9.6 a	9.4 abc	9.4 abc	8.3 abc	8.6 ab
B-63 Beauregard	8.4 abc	8.4 b	8.3 ab	9.1 ab	8.9 abc	8.7 cd	9.2 abc	7.8 bcd	8.1 bc
Evangeline	8.5 abc	9.4 a	9.2 a	9.7 a	9.5 a	9.5 ab	9.3 abc	9.0 a	9.2 a
Orleans	8.8 ab	8.9 ab	8.6 ab	9.2 ab	9.5 a	9.6 a	9.6 ab	8.7 ab	8.7 ab
Covington	8.2 abc	7.0 c	7.2 c	8.5 bc	9.4 a	9.3 abc	9.5 ab	8.8 a	8.4 ab
LA07-146	8.1 abc	7.1 c	7.0 cd	7.4 cd	8.5 bc	9.5 ab	9.7 a	8.3 abc	7.9 bc
White flesh									
O'Henry	7.7 c	7.2 c	6.7 cd	6.4 de	8.3 c	7.7 e	8.5 c	7.7 cd	7.5 cd
Bonita	9.0 a	8.8 ab	9.1 a	9.2 ab	7.4 d	6.8 f	8.7 bc	7.6 cd	7.9 bc

[1]Sweet potatoes were foil wrapped and baked for 1.5 hour at 375°F. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

Table 14. Microwaved sweetpotato sensory evaluation, 2012.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	7.8 abc	7.7 ab	8.2 ab	9.6 a	8.6 bc	8.2 a	7.3 abcd	7.9 ab	7.9 abc
Covington	8.6 a	7.6 ab	7.7 abcd	9.4 a	9.1 a	8.6 a	7.8 a	8.2 a	8.5 a
Orleans	8.2 ab	7.5 ab	7.8 abcd	8.8 b	8.7 abc	8.3 a	7.2 abcd	7.7 abc	7.9 abc
LA07-146	8.1 ab	7.4 b	7.9 ab	9.3 ab	8.5 bc	8.2 a	7.5 abc	7.9 ab	8.0 abc
NC05-198	7.8 abc	8.1 a	8.2 a	8.7 b	8.2 bcd	8.1 a	7.5 abc	7.6 abc	8.0 abc
White flesh									
O'Henry	7.6 bc	7.8 ab	7.8 abc	8.6 bc	7.6 d	6.9 b	6.6 d	6.9 c	7.1 c
Bonita	8.1 ab	7.2 b	7.3 bcd	8.2 cd	8.4 bcd	7.7 ab	6.9 bcd	7.2 bc	7.4 bc
NC07-847	7.5 bc	7.8 ab	6.9 d	7.3 d	7.9 cd	7.6 ab	6.8 cd	7.3 bc	7.2 bc

[1]Sweetpotatoes were wrapped in Saran Wrap and microwaved (700 watt) on high for 5 minutes. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

Table 15. Baked sweetpotato sensory evaluation, 2012.[1]

Cultivar	Eye appeal	Color intensity	Color uniformity	Color freedom	Texture smoothness	Texture moistness	Texture fiber	Flavor	Overall
Orange flesh									
B-14 Beauregard	9.1 a	8.8 ab	8.8 a	8.8 ab	9.2 a	9.7 a	7.7 ab	8.2 ab	8.3
Covington	8.0 bc	8.0 bcd	8.5 ab	8.9 a	9.1 a	9.8 a	8.4 a	8.5 a	8.7
Orleans	8.4 abc	7.6 cde	8.3 abc	8.6 ab	8.7 ab	9.4 ab	7.2 c	7.5 b	8.2
LA07-146	7.7 c	8.1 bcd	7.6 c	7.9 b	8.2 b	9.2 b	8.0 ab	8.0 ab	8.0
NC05-198	7.9 bc	9.2 a	8.9 a	9.4 a	8.9 a	9.4 ab	8.1 a	8.3 ab	8.5
White flesh									
O'Henry	7.9 bc	8.1 bcd	8.5 ab	8.7 ab	9.1 a	9.2 b	7.7 ab	7.8 ab	7.8
Bonita	8.3 bc	7.8 cde	8.8 a	9.4 a	8.2 b	8.8 c	7.9 ab	7.6 b	7.9
NC07-847	7.7 c	8.2 bcd	8.5 ab	8.7 ab	9.0 a	9.2 b	7.9 ab	7.9 ab	8.3

[1]Sweet potatoes were foil wrapped and baked for 1.5 hour at 375°F. Sensory score scale: 1–10 with 6 or below being unacceptable. Means with the same letter are not different by Fisher's Protected LSD at $P \leq 0.05$.

Discussion and Conclusion

While not all advanced breeding lines were included in all years or locations, differences in performance compared with the standard varieties were detected. LA07-146, developed by the Louisiana State University Agricultural Center, was the best performer. It surpassed Beauregard B-14 and all the other entries by an average of 65% for U.S. no. 1 yield and 60% for marketable yield. LA07-146 storage roots have red to slightly purple skin and a deep-orange flesh (Smith 2012). The red-purple skin, however, has faced acceptance difficulties in the fresh market. Nonetheless, this variety was released to the processing industry and has become important in field-run, bulk-harvest systems because of its high yield. The variety LA 07-146 is licensed (Bogren 2012).

Covington, Evangeline, Orleans, and NC05-198 performed similarly, and yields were comparable to both Beauregard clones. In addition, the proportion of U.S. no. 1 was similar among them. While not addressed in the study, these new varieties have a good number of roots per plant that are smooth and more uniform in size than the standards.

Covington, developed by North Carolina State University, is an orange-fleshed, smooth-skinned, rose-colored, table-stock sweetpotato with dry matter 1 to 2 points higher than Beauregard (Yencho et al. 2008). Covington is resistant to *F. oxysporum* and southern root knot nematode (*Meloidogyne incognita*) and is moderately resistant to pox.

Evangeline, developed by the Louisiana State University Agricultural Center, has similar characteristics to Beauregard, but it has southern root knot nematode resistance and deeper orange flesh (La Bonte et al. 2008). It also has higher sucrose content than Beauregard, making it more acceptable for microwave baking because the sweetness of sucrose is more apparent in flavor than maltose (La Bonte et al. 2008).

Orleans, developed by the Louisiana State University Agricultural Center, has been released for the fresh market and processing sector, is also a licensed variety (La Bonte et al. 2012). Its storage root is consistent in shape and elliptical without lobing. Its skin and flesh color and its dry matter are similar to Beauregard.

NC05-198 was developed by North Carolina State University, but it has not been released for commercial use. Hatteras is another variety developed by North Carolina State University, but it was removed from the market due to the high incidence of internal necrosis, a disorder manifested in postharvest (Clark et al. 2013; Schultheis 2011).

There is a limited number of moist, white-flesh varieties available for the fresh market in the U.S. Most of the white-flesh varieties available in other sweetpotato-producing countries are of the dry and starchy type. Bonita and NC07-847 have done well in the trials in which they entered, performing as well as the standard O'Henry.

Bonita, released by the Louisiana State University Agricultural Center, has elliptic storage roots without lobing and has a light-tan skin and white flesh with a yellow cast. Dry matter is about 29%. It is slightly less resistant to soil rot and fusarium wilt than Beauregard, but it is highly resistant to root-knot nematode (LaBonte et al. 2011). NC07-847, developed by North Carolina State University, has smooth roots but will not be released because of its susceptibility to postharvest diseases (Clark et al. 2013).

The sensory score summary over the years indicated no differences among the varieties either in the microwave test or the bake test. This finding suggests that the varieties are very similar and differences in a particular year may be attributed to environmental factors. Therefore, in terms of acceptability by the consumer, the tested varieties were as good as the standards. In addition, white-flesh varieties tend to be dryer and starchier than the orange counterparts in baking trials. However, Bonita did very well in appearance and quality scores in the baking trials.

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