Bulletin 1221 May 2016

Mississippi Sweetpotato

VARIETY TRIAL, 2013

MAFES

Mississippi Agricultural & Forestry Experiment Station • George M. Hopper, Director

Mississippi State University • Mark E. Keenum, President • Gregory A Bohach, Vice President

Mississippi Sweetpotato Variety Trial, 2013

Jeffrey L. Main
Pontotoc Ridge-Flatwoods Branch Experiment Station
Mississippi State University

Juan Silva
Department of Food Science, Nutrition, and Health Promotion
Mississippi State University

Ramon Arancibia
Eastern Shore Agricultural Research and Extension Center
Virginia Polytechnic Institute and State University

This document was approved for publication as MAFES Bulletin 1221 of the Mississippi Agricultural and Forestry Experiment Station. It was published by the Office of Agricultural Communications, a unit of the Division of Agriculture, Forestry, and Veterinary Medicine at Mississippi State University.

Mississippi Sweetpotato Variety Trial, 2013

Introduction

The National Sweetpotato Collaborator Group (NSCG) conducts annual state and regional trials of experimental sweetpotato varieties developed by participating geneticists in the United States. 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. The 2013 sweetpotato variety trial conducted in Mississippi is reported in this bulletin.

Nationally, sweetpotato is produced primarily in the Southeast and California with more than 130,000 acres planted in 2012 (USDA 2013a). Sweetpotato is an economically and culturally important crop in Mississippi. Mississippi ranked second and third in the nation for sweetpotato acreage (24,000 acres) and crop value ($62.6 million), respectively, in 2012 (USDA 2013a and b). The most common variety grown in Mississippi is 'Beauregard B14,' a mericlone of 'Beauregard' developed by the Louisiana Agricultural Experiment Station released in 1987 (Rolston et al. 1987; Villordon et al. 2003). It produces straight, tough slips suitable for mechanical transplanting. Storage roots are fusiform to ovoid with a smooth, light rose skin and moderately deep orange flesh. Dry matter is approximately 24%, and carotene content is 9.46 milligrams per 100 grams 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 as 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.

Materials and Methods

Plant Production

Soil plant beds covered by black plastic were established following standard recommendations (Thompson et al. 2002). Roots were sorted to remove any observed rots and then placed in a single layer on the soil surface. Botran 5F was applied at 5.3 ounces per 1,000 linear feet tank mixed with 1 ounce of Mertec 340F per gallon of solution. Fertilizer was applied at the rate of 0.5 pound of 13-13-13 fertilizer per square yard. Soil was used to cover the roots to a 2 in. depth and then covered with black plastic. Plant beds were established March 15 and endured cool, wet conditions through the first of May, causing delayed planting. The plastic was removed when plants were uniformly emerged from the soil surface on May 8, 2013. Plant beds were rated for sprout production on May 20, 2013, by visual observation. Ratings included slip production based on percentage of surface area covered in plants, uniformity of emergence based on differences in slip height, earliness of production based upon when usable slips will be ready, and root condition based on percentage of rotten "seed" roots 6 weeks after the first cutting.

Yield Trial

Slips were cut on June 6, 2013, and planted on June 11, 2013, into a Bude silt loam soil prepared in May and treated with flumioxazin pretransplant at 2.5 ounces per acre for preemergence broadleaf weed control. Slips were planted directly into the row with a mechanical transplanter after a rainfall event of 1 inch on June 9. Slips were spaced 12 inches apart in-row with 40 inches between rows. Twenty slips were planted per plot with four replications. Clomazone was applied post-transplant at 3 pints per acre for residual weed control. Conditions at planting were favorable, resulting in good plant survival. However, over the next 25 days, plots received only 0.25 inch of rainfall. Furrow irrigation was initiated on July 3 on a weekly basis as needed based on observed plant wilting. Harvest was completed on October 11, 122 days after planting. All roots were graded based on the USDA standards for grades of sweetpotato (USDA 2005) modified to these standards: U.S. no.1 — roots 2–3.5 inches in diameter, 3–9 inches long, and free of defects; canner — roots 1.5–2 inches in diameter, 3–7 inches long; and jumbo — roots that exceed the diameter, length, or weight requirements of the U.S. no.1 grade but are 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 (U.S. no.1 plus canner plus jumbo grades). Culls were roots of the U.S. no.1 and jumbo grades so misshapen or unattractive that they could not be marketed in any of the above grades for fresh market. All yields are reported as 50-pound bushels per acre.

Sensory Evaluation

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 by two tests on storage roots from each variety entered: a microwave test and a conventional oven-baking test. Samples used for the microwave test were wrapped in clear 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 1.5 hours. A trained panel scored the microwaved and baked sweetpotatoes by comparison to the standard variety Beauregard B-14. Visual sensory attributes tested were appearance (eye appeal of the storage root exterior), color intensity of the edible flesh; color uniformity of the flesh (occurrence of streaks of lighter color), and color freedom from discoloration or browning. Taste sensory attributes were texture smoothness of the flesh, texture moistness related to water content in the flesh, texture fiber (presence 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 not acceptable for consumers.

Statistical analyses were conducted with SAS statistical software (version 9.3 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 $P \leq 0.05$. Statistical analyses were not conducted on baking test data.

Results

Plant Production

Visual observations were made of sprout production, uniformity of emergence, earliness and root condition. Beauregard (both B63 and B14), 'Orleans,' 'Bayou Belle' (previously LA 07-146), and 'Bonita' were scored as acceptable (for slip production, earliness, and uniformity of emergence) in the production of slips (Table 1). 'Covington,' 'NC 05-198,' 'NC 07-847,' and 'NC 04-032' were inferior in the production of slips, uniformity, and earliness. NC 07-847 and NC 04-032 were the lowest scoring in slip production, with a score of 1 or less than 50% coverage of the bed surface with plants. This was probably due to the cold conditions experienced in the beds and suggests differences among entries in their temperature requirements for slip growth.

Yield Trial

Orange Flesh — Beauregard B14 was the high-yielding entry for U.S. no. 1 and total marketable yield in 2013 with 622 and 901 bushels per acre, respectively (Table 2). Beauregard B14 was higher than all other entries with the exception of Bellevue (544 bushels), which was only higher than Burgundy (311 bushels) for U.S. no. 1 yield. While canner yield ranged from 149 bushels for Covington to 75 bushels for Burgundy, there were no significant differences among entries. Jumbo yield also varied widely among entries, ranging from 151 bushels for Beauregard B14 to 42 bushels for NC 05-198. Again, no significant differences were observed. Total marketable yield ranged from 901 bushels for Beauregard B14 to 433 bushels for Burgundy. Beauregard B14 was better than all other entries with the exception of Bellevue (789 bushels), which was only greater than Burgundy (433 bushels). There were no differences in the proportion of U.S. no. 1 yield, which ranged from 74% for NC 05-198 to 63% for Covington. Cull roots ranged from 203 bushels for Bayou Bell to 44 bushels for Beauregard B63. Bayou Belle (203 bushels) was not different from Covington (162 bushels) or Burgundy (138 bushels).

Table 1. Sweetpotato variety trial sprout production ratings at the Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc County, Mississippi, in 2013.[1]

Variety	Roots presprouted	Slip production[2]	Uniformity of emergence[3]	Earliness[4]	Root condition[5]
Orange Flesh					
Beauregard B14	Yes	4	4	2	4
Bellevue	NA[6]	NA	NA	NA	NA
Beauregard B63	Yes	4	4	2	3
NC 05-198	Yes	3	2	3	3
Bayou Belle	Yes	4	4	2	4
NC 04-032	Yes	1	4	3	4
Covington	Yes	2	1	1	1
Orleans	Yes	4	4	2	4
Burgundy	NA	NA	NA	NA	NA
White Flesh					
O'Henry	Yes	3	3	2	3
Bonita	Yes	4	4	2	3
NC 07-847	Yes	1	1	1	2

[1]Bedded March 15, 2013; evaluated May 20, 2013.
[2]Slip Production rated from 1–5 based on observation during cutting season: 1 indicates poor plant production (less than 50% surface coverage with plants), while 5 indicates good plant production (100% of the surface covered with plants).
[3]Uniformity of emergence is rated from 1–5: 1 indicates poor uniformity (at least 4 inches difference in plant heights), while 5 indicates the highest degree of uniformity of emergence (no difference in plant height).
[4]Earliness of plant production is rated from 1–3: 1 indicates late production (at least 2 weeks until cutting), while 3 indicates early production (ready for cutting).
[5]Root conditions 6 weeks after first cut are rated 1–5: 1 indicates 100% rotting, while 5 indicates 0% rots.
[6]Roots were not available for bedding. Slips from Louisiana State University were used for planting.

Table 2. Mean sweetpotato variety trial yield by flesh color at the Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc County, Mississippi, in 2013.[1,2]

Cultivar	U.S. no. 1	Canner	Jumbo	Total marketable	Culls	Pct. U.S. no. 1
	bu/A	*bu/A*	*bu/A*	*bu/A*	*bu/A*	*%*
Orange Flesh						
Beauregard B14	622 a[3]	128	151	901 a	74 cd	69
Bellevue	544 ab	98	148	789 ab	61 d	69
Beauregard B63	468 b	143	111	722 b	44 d	65
NC 05-198	458 b	119	42	619 bc	85 bcd	74
Bayou Belle	449 bc	115	126	689 b	203 a	65
NC 04-032	427 bc	132	55	614 bc	70 cd	70
Covington	414 bc	149	94	657 bc	162 ab	63
Orleans	412 bc	107	123	641 bc	58 d	64
Burgundy	311 c	75	47	433 de	138 abc	72
White Flesh						
O'Henry	431 a[x]	159 a	60	651 a	75 b	66
Bonita	342 ab	136 a	26	504 ab	37 b	68
NC 07-847	206 b	43 b	93	342 b	225 a	60

[1]Planted: June 11, 2013; harvested 122 days after planting.
[2]Modified U.S. standards for grades of sweetpotato: **U.S. no. 1** — roots 2–3.5 inches in diameter, 3–9 inches long, must be well shaped and free of defects; **Canner** — roots 1–2 inches in diameter, 2–7 long; **Jumbo** — roots that exceed the diameter, length, and weight requirements of the other 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 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).
[3]Means within flesh type, with different letters are significantly different by Fisher's Protected Least Significant Difference at $P \leq 0.05$.

White Flesh — O'Henry (431, 159, and 651 bushels per acre) was greater than NC07-847 (206, 43, and 342 bushels) for U.S. no. 1, canner, and total marketable yield, respectively. However, O'Henry was not different than Bonita (342, 136, and 504 bushels) for U.S. no. 1, canner, and total marketable yield, respectively. There were no significant differences in jumbo sweetpotatoes, which ranged from 93 bushels for NC 07-847 to 26 bushels for Bonita. NC 07-847 produced a significant number of culls (225 bushels) compared with O'Henry (75 bushels) and Bonita (37 bushels).

Sensory Evaluation

Covington, Orleans, Bayou Belle, and Burgundy had the highest acceptability ratings in the baked trial, with the last two higher in sweetness and flavor scores (Table 3). While Orleans has higher sucrose levels than Beauregard, it was given low scores on sweetness and flavor (6 and 5.9, respectively). Beauregard B14 was given 6.3 in each category. Burgundy had the highest weighted score and the only acceptable scores on sweetness and flavor in the microwave trial (Table 4). While not considered acceptable, Orleans (4.8 and 5.1) and Bayou Belle (4.7 and 4) were both considerably higher than Beauregard B14 (3 and 3) in sweetness and flavor categories, respectively. Most other entries scored better or similar to the control. Of the white cultivars tested, Bonita seemed to have higher acceptability than O'Henry.

Table 3. Baked sweetpotato sensory evaluation, 2013 sweetpotato variety trial, Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc County, Mississippi.[1]

Variety	Statistic	Sensory scores[2]										
		Eye appeal	Color intensity	Color uniformity	Color freedom	Taste smooth	Taste moistness	Taste fiber	Taste sweetness	Flavor	WS1[3]	WS2[4]
Orange Flesh												
Beauregard B14	SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Control)	Mean	7.2	8.1	8.1	6.3	8.1	8.1	7.2	6.3	6.3	7.3	7.1
Covington	SD	0.5	1.0	0.9	1.1	0.5	0.7	0.9	1.1	1.1	0.6	0.6
	Mean	7.8	7.8	8.1	8.1	8.7	8.5	8.6	7.3	7.5	8.0	7.9
Orleans	SD	0.9	1.2	0.8	0.9	0.7	1.3	1.1	1.2	1.3	0.5	0.5
	Mean	7.9	7.4	7.5	7.4	7.8	7.7	8.4	6.0	5.9	7.0	6.9
Bayou Belle	SD	2.0	1.3	1.2	0.8	0.9	0.8	1.2	1.1	1.0	0.6	0.6
	Mean	7.3	6.9	6.2	6.5	7.7	8.1	8.1	7.2	7.0	7.3	7.1
Burgundy	SD	2.2	0.8	1.1	1.3	0.8	1.1	1.1	1.0	0.8	0.6	0.7
	Mean	6.8	8.3	8.0	7.6	8.3	8.2	8.4	7.0	7.2	7.8	7.5
Bellevue	SD	1.6	0.7	0.5	1.2	1.4	1.0	2.1	0.9	1.1	0.7	0.7
	Mean	7.9	8.7	8.8	8.0	7.3	8.0	7.5	6.5	6.8	7.7	7.6
White Flesh												
Bonita	SD	1.2	1.4	0.8	0.9	0.5	0.9	0.9	1.1	1.2	0.4	0.5
	Mean	7.5	6.4	8.0	7.2	7.6	7.0	8.3	6.2	6.3	7.2	7.1
O'Henry	SD	0.9	1.1	1.2	0.9	0.7	0.9	1.4	0.9	1.1	0.6	0.6
	Mean	7.9	7.7	7.2	7.8	7.9	6.8	8.3	6.3	6.9	7.4	7.4

[1]Sweetpotatoes were foil-wrapped and baked for 1.5 hours at 375°F.
[2]Score scale: 1–10 with 6 or below being unacceptable.
[3]WS1 = Weighted Score 1 = (EA+CI+CU+CF+TS+TM+TF+SW+FL)/9.
[4]WS2 = Weighted Score 2 = (EA+(CI+CU+CF)/3)+((TS+TM+TF+SW)/4)+FL)/4.

Table 4. Microwaved sweetpotato sensory evaluation, 2013 sweetpotato variety trial, Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc County, Mississippi.[1]

Variety	Statistic	Sensory scores[2]										
		Eye appeal	Color intensity	Color uniformity	Color freedom	Taste smooth	Taste moistness	Taste fiber	Taste sweetness	Flavor	WS1[3]	WS2[4]
Orange Flesh												
Beauregard B14	SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Control)	Mean	5.6	7.0	4.0	10.0	8.0	7.0	3.0	3.0	3.0	6.4	5.6
Covington	SD	1.2	1.1	1.6	1.4	0.8	1.1	1.6	1.6	1.9	1.0	0.9
	Mean	7.5	6.2	6.1	8.4	7.6	7.1	4.7	4.7	5.1	6.8	6.6
Orleans	SD	2.2	1.2	1.5	2.4	1.1	0.5	1.3	1.3	1.7	1.3	1.3
	Mean	6.2	5.8	4.6	6.2	7.4	7.0	4.8	4.8	5.1	6.8	6.5
L07-146	SD	1.2	1.8	2.5	1.9	1.0	0.8	1.4	1.4	1.4	1.1	0.9
	Mean	6.2	5.5	4.6	8.0	6.8	6.5	4.7	4.7	4.0	6.2	5.9
L04-175	SD	0.8	0.7	1.0	0.3	0.8	0.7	2.0	2.0	1.9	0.8	0.8
	Mean	8.4	8.7	8.0	8.9	8.4	7.8	6.5	6.5	6.3	8.0	7.8
L06-52	SD	0.7	1.5	1.3	3.3	1.0	0.7	2.5	2.5	2.0	0.8	0.7
	Mean	7.5	7.7	6.2	7.8	7.5	7.0	4.8	4.8	5.5	7.0	6.8
White Flesh												
Bonita	SD	1.0	1.5	2.5	1.7	1.1	1.3	1.3	1.3	1.2	0.8	0.6
	Mean	8.2	6.6	6.6	8.3	7.1	5.9	3.7	3.7	4.6	6.6	6.6
O'Henry	SD	1.4	1.1	1.4	1.3	1.7	1.3	1.5	1.5	1.8	0.7	0.6
	Mean	6.1	7.3	7.4	8.4	6.1	5.3	4.2	4.2	4.9	6.5	6.2

[1]Sweetpotatoes were wrapped in plastic wrap and microwaved (800 Watt) on high for 5 minutes.
[2]Score scale: 1–10 with 6 or below being unacceptable.
[3]WS1 = Weighted Score 1 = (EA+CI+CU+CF+TS+TM+TF+SW+FL)/9
[4]WS2 = Weighted Score 2 = (EA+(CI+CU+CF)/3)+((TS+TM+TF+SW)/4)+FL)/4.

Conclusions

Beauregard B14 remains the standard for consistent yield in a fresh-market variety. Bellevue produced a good yield of U.S. no. 1 roots, but its light skin color may cause marketing challenges in the Southeast, where consumers are familiar with the darker copper skin of Beauregard. Mixing of these varieties would be obvious in the same bin. While Bayou Belle yield faltered this year, it may also face similar challenges in marketing with its dark-red to purple skin coloration. At this time, Bayou Belle is considered a processing variety primarily for the french-fry market. Orleans produced a good yield of U.S. no. 1 and total marketable roots, and it was higher than Beauregard B14 for sweetness and flavor in the microwave taste trial. This performance suggests a potential for niche marketing. For white-flesh varieties, O'Henry and Bonita were similar in yield and baking quality.

Literature Cited

La Bonte, D.R., C.A. Clark, T.P. Smith, A.Q. Villordon, and C.S. Stoddard. 2014. 'Burgundy' Sweetpotato. Hortscience 49(5):669-71.

U.S. Department of Agriculture. 2005. United States standards for grades of sweetpotatoes. 7 Aug. 2013. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5050330

U.S. Department of Agriculture. 2013a. Crop production 2012 summary. 7 Aug. 2013. http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-11-2013.pdf

U.S. Department of Agriculture. 2013b. Crop values 2012 summary. 7 Aug. 2013. http://usda01.library.cornell.edu/usda/current/CropValuSu/CropValuSu-02-15-2013.pdf

Villordon, A.Q., J.M. Cannon, H.L. Carroll, J.W. Franklin, C.A. Clark, and D.R. LaBonte. 2003. Sweetpotato 'Beauregard' Mericlones Vary in Yield, Vine Characteristics, and Storage Root Size and Shape Attributes, HortScience: 38:1089-1092.

Smith, T. 2012. Sweet Potato Variety Descriptions. La Agric. La Agric. Exp. Stn. 20 Sept. 2013. http://www.lsuagcenter.com/en/crops_livestock/crops/sweet_potatoes/Sweet+Potato+Variety+Descriptions.htm

Rolston, L.H., E.G. Riley, P.W. Wilson, M.L. Robbins, C.A. Clark, J.M. Cannon, and W.M. Randle. 1987, 'Beauregard' sweet potato, HortScience 22:1338-1339.

Thompson, P., M. Williams, J. Byrd, J. Thomas, D. Parvin, and F. Killebrew. 2002. Commercial sweetpotato production in Mississippi. Mississippi State Univ. Ext. Serv. Publ. 1678.

MISSISSIPPI STATE
UNIVERSITY®