

Sweetpotato Production and Variety Performance in Southeast Virginia, 2015-2016

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“Sweetpotato” (*Ipomoea batatas*) is a tropical crop widely grown throughout the world with China being the largest producer. It is a member of the morning glory family, originating in South America. In the United States, it is grown as an annual crop for its enlarged storage roots, which are a good source of fiber, vitamins, minerals, and complex carbohydrates. In general, there are two main groups of sweetpotatoes: those with orange flesh (moist when baked) and those with white flesh (dry when baked). Although orange varieties are referred to as yams for marketing purposes, sweetpotato is not a true yam, which is a tropical plant from a different botanical family (*Dioscorea* spp.), grown for its tubers. Some *Dioscorea* species are found in the wild and backyards in Southern states (including Louisiana, Mississippi, Alabama, and Georgia), but they are not known as a commercial crop in the continental U.S.

The American Society for Horticultural Science has adopted the use of “sweetpotato” as one word to clearly distinguish it from the potato (*Solanum tuberosum*).

Sweetpotato is an important crop for small and medium size vegetable farmers in Virginia. Although the 2012 Census of Agriculture indicates that Virginia farmers grew just 136 acres of sweetpotato in 2012 (U.S. Department of Agriculture-NASS, 2014), in the 1960s, Virginia raised 15,000 to 19,000 acres of sweetpotatoes with a market value of \$5 million to \$8 million for the state (U.S. Department of Agriculture-NASS, 2011a). Therefore, the acreage and production of sweetpotato in Virginia could increase significantly. In fact, demand and per capita consumption are



Figure 1. Sweetpotato foliage and storage roots dug from one plant in a commercial field (Dinwiddie County, Virginia).

increasing — by 46 percent in the last decade (U.S. Department of Agriculture-NASS 2011b) — mainly due to the perceived nutritional and health attributes of sweetpotatoes, and the availability and convenience of value-added processed products made from sweetpotatoes.

Sweetpotato breeders are continually developing and testing new varieties to overcome production challenges and improve the sustainability of the industry. The National Sweetpotato Collaborator Group (NSCG) conducts annual state and regional trials to evaluate the performance of advance breeding lines compared with current commercial varieties. Results of these state trials are reviewed at the NSCG

annual meeting and included in the NSCG Annual Report. Farmers in Virginia are already growing some of the newest sweetpotato varieties, but there is no information on performance in Virginia.

The objective of this study was to determine the performance of current and recently released sweetpotato varieties through an on-farm survey in southeast Virginia as well as in the NSCG replicated variety trials conducted in 2015 and 2016 at the Eastern Shore Agricultural Research and Extension Center (AREC). This information will assist Extension personnel, service providers, and farmers in decisions about sweetpotato varieties in Virginia. Below, there are links to find additional information on current commercial varieties.

Materials and Methods

The on-farm survey of sweetpotato variety performance included nine sweetpotato farms in five locations: Dinwiddie County, Westmoreland County, Northampton County, the City of Virginia Beach, and the City of Chesapeake. Data was also gathered from sweetpotatoes grown at the Virginia 2016 Ag Expo in Dinwiddie County. Cultural practices (planting, fertilization, weed management, irrigation, etc.) varied among farms. When irrigation took place, it was with overhead sprinkler systems.

For the on-farm survey, four plots consisting of one 10-foot-long row each were randomly selected throughout the field at harvest. They were hand-harvested and graded into U.S. No. 1 and U.S. No. 2 (table 1) (U.S. Department of Agriculture, 2005). In addition, a demonstration trial with five commercial varieties (one 50-foot-long row per variety) was set up at the Virginia 2016 Ag Expo in Dinwiddie County. The trial was planted on June 8, 2016, and harvested on Oct. 18, 2016. Storage roots were harvested with a chain digger and total yield was estimated for each variety.



Figure 2. Sweetpotato storage roots dug from one 10-foot row section and separated based on the grades and standards used in this study. From left to right: cull, U.S. No. 2 small, U.S. No. 1, and U.S. No. 2 large.

Table 1. Grades and standards for sweetpotato used in this study

Grade	Standard	Size
U.S. No. 1	Consists of sweet potatoes of one type which are firm, fairly smooth, fairly clean, fairly well shaped, which are free from freezing injury, internal breakdown, Black Rot, other decay or wet breakdown, and free from damage caused by secondary rootlets, sprouts, cuts, bruises, scars, growth cracks, scurf, Pox (Soil Rot), or other diseases, wireworms, weevils or other insects, or other means.	<ol style="list-style-type: none"> 1. Maximum diameter shall be not more than 3 1/2 inches. 2. Maximum weight shall not be more than 20 ounces. 3. Length, unless otherwise specified, shall be not less than 3 inches or more than 9 inches. 4. Minimum diameter, unless otherwise specified, shall be not less than 1 3/4 inches (2 inches in this study).
U.S. No. 2	Consists of sweet potatoes of one type which are firm and which are free from freezing injury, internal breakdown, Black Rot, other decay or wet breakdown, and free from serious damage, caused by dirt or other foreign materials, cuts, bruises, scars, growth cracks, Pox (Soil Rot), or other diseases, wireworms, weevils or other insects, or other means.	<p>Unless otherwise specified the minimum diameter shall be not less than 1 1/2 inches and the maximum weight not more than 36 ounces.</p> <p>Small: Diameter between 1 1/2 and 2 inches.</p> <p>Large: Minimum diameter of 3 1/2 inches.</p>

Source: U.S. Department of Agriculture, 2005

The NSCG variety trials were conducted at the Eastern Shore AREC in Painter, Virginia, in 2015 and 2016. The soil type was a Bojac sandy loam. Sweetpotato slips (cuttings) were planted on June 9, 2015, and June 7, 2016, and harvested on Oct. 22, 2015, and Oct. 17, 2016; 135 and 132 growing days, respectively. Cultural practices followed standard recommendations (Arancibia et al. 2017) and overhead irrigation was supplied as needed. Trials followed a randomized complete block design with variety as the main effect with four replications. The experimental unit (plot) consisted of one 20-foot-long row planted at 12 inches, and rows were 3 feet apart. Plots were harvested and storage roots were cured for five days at 85 degrees Fahrenheit. Then, storage roots were graded based on the U.S. standards for grades of sweetpotatoes as described in table 1. Analysis of variance was performed using the statistical procedure PROC GLM, and differences among means were determined by Fisher's Protected Least Significant Difference (LSD) at $P \leq 0.05$ (or 95% confidence). The authors used SAS statistical software 9.3, SAS Institute, Cary, North Carolina.

Results and Discussion

The survey indicates that sweetpotato yields vary greatly among farms in Southeast Virginia (tables 2 and 3). Covington is the main variety grown in Virginia, but some farmers have also obtained and cultivated recently released varieties.

Yields of sweetpotatoes graded at U.S. No. 1 (medium size and the most valuable grade for fresh market) and U.S. No. 2 (large and small) were counted separately in units of 50-pound bushels, and then added together to determine marketable yields.

In 2015 (table 2), yields of sweetpotatoes graded at U.S. No. 1 ranged from 181 to 592 bushels per acre, and marketable yields (U.S. No. 1 and No. 2 combined) ranged from 340 to 1,091 bushels per acre.

In 2016 (table 3), yields of U.S. No. 1 ranged from 80 to 540 bushels per acre, and marketable yields ranged from 169 to 998 bushels per acre.

Table 2. Sweetpotato yield by grade in southeast Virginia from the on-farm survey, 2015

Location	Cultivar	Irrigation	U.S. No. 1* medium bu/acre [†]	U.S. No. 2 large bu/acre	U.S. No. 2 small bu/acre	Marketable bu/acre
VB1 [‡]	O'Henry	Y [§]	592	252	247	1,091
VB2	Covington	Y	472	113	182	767
VB3	Covington	N	279	0	168	447
VB4	Covington	N	181	44	127	352
DW	Covington	Y/N	338	115	136	589
DW	Beauregard	Y/N	371	135	147	653
WML	Evangeline	N				434
WML	Covington	N				340
WML	Bonita	N				395
NH	Bellevue	Y	335	208	198	741
NH	Covington	Y	357	108	242	707
NH	Burgundy	Y	473	22	182	677
NH	Diane	Y	293	51	253	597

Source: U.S. Department of Agriculture, 2005

* U.S. No. 1, U.S. No. 2 large, and U.S. No. 2 small: see table 1 for description

[†] bu: 50-pound bushel

[‡] City of Virginia Beach (VB); Dinwiddie County (DW); Westmoreland County (WML); Northampton County (NH)

[§] Irrigation: yes (Y); no (N); irrigated once after planting (Y/N)

In the demonstration plot at the Virginia Ag Expo, only total yield was estimated because most storage roots were in the U.S. No. 2 large (jumbo) grade, which is mainly for processing (table 3). Total yield ranged from 760 to 1,106 bushels per acre (19 to 27 tons per acre), which is within the expected yield for field-run bulk harvest intended for processing.

Cultural practices (planting, fertilization, weed management, irrigation, etc.) varied among farms according to their conditions, so comparison is not appropriate.

Four out of nine farms used irrigation, and overall yields tended to be significantly greater than in non-irrigated fields. The exception was a field in Dinwiddie County in 2016 that achieved relatively high yields without irrigation. Yields in irrigated farms were within the expected level for a profitable crop. In

general, estimated yields of U.S. No. 1 grade for fresh market in irrigated fields were well within those found in Southern sweet-potato producing states (Kemble et al. 2006; Main et al. 2014 and 2016; U.S. Department of Agriculture-NASS 2017).

Varieties that excelled in both years were O’Henry, Covington, and Bellevue.

The NSCG variety trial at the Eastern Shore AREC in Painter, Virginia, evaluated the performance of recently released varieties under irrigation. In 2015, U.S. No. 1 yields ranged from 244 to 582 bushels per acre and marketable yields ranged from 532 to 972 bushels per acre (table 4). In 2016, (table 5), yields of U.S. No. 1 ranged from 191 to 360 bushels per acre, and marketable yields ranged from 380 to 567 bushels per acre. Orange-flesh varieties that performed well in both years were Beauregard, Covington, Bellevue, and

Table 3. Sweetpotato yield by grade in southeast Virginia from the on-farm survey and at the Virginia AgExpo, 2016

Location	Cultivar	Irrigation	U.S. No. 1* medium bu/acre†	U.S. No. 2 large bu/acre	U.S. No. 2 small bu/acre	Marketable bu/acre
VB1‡	O’Henry	Y§	374	577	47	998
VB1	Evangeline	Y	412	226	128	766
VB3	Beauregard	N	415	89	144	648
VB5	Orleans	N	221	82	115	418
VB5	Covington	N	95	0	96	191
VB5	Evangeline	N	130	0	39	169
VB5	Murasaki	N	160	0	68	228
DW1	Covington	N	540	75	121	736
DW1	Bellevue	N	435	56	153	644
DW1	Orleans	N	307	118	121	546
Chspk	Covington	N	80	0	114	194
DW2AgExpo	Beauregard	Y				944
DW2AgExpo	Covington	Y				804
DW2AgExpo	Orleans	Y				760
DW2AgExpo	Bellevue	Y				804
DW2AgExpo	O’Henry	Y				1,106

* U.S. No. 1, U.S. No. 2 large, and U.S. No. 2 small: see table 1 for description

† bu: 50-pound bushel

‡ City of Virginia Beach (VB); Dinwiddie County (DW1); City of Chesapeake (Chspk); Virginia Ag Expo demonstration plot in Dinwiddie County (DW2AgExpo)

§ Irrigation: yes (Y); no (N)

Orleans. Among the white-flesh varieties, O’Henry outperformed the other two varieties. These yields are within those of other sweetpotato-producing states (Kemble et al. 2006; Main et al. 2014 and 2016; U.S. Department of Agriculture-NASS 2017). In contrast, the local white flesh variety, Hayman, underperformed in both years. Yield, storage root shape and appearance were not up to the levels of all other varieties.

Tables 4 and 5 indicate which differences in yields are statistically significant. Yields are followed by a letter or letters, a through e; any numbers within a column that have the same letter are not significantly different from each other. Farmers and others should take this into account when recommending or making decisions on which cultivar to plant.



Figure 3. Harvest of sweetpotato O’Henry in Virginia Beach (2015). Each row of storage roots corresponds to two rows of sweetpotato plants. Marketable yield in this irrigated field was 1,091 50-pound bushels per acre.

Table 4. Sweetpotato yield by grade at the Eastern Shore Agricultural Research and Extension Center, Painter, Virginia, 2015

Cultivar	U.S. No. 1* medium bu/acre [†]	U.S. No. 2 large bu/acre	U.S. No. 2 small bu/acre	Marketable bu/acre
Orange flesh				
Bellevue	567 a [‡]	168 bc	222 abcd	957 ab
Covington	478 b	73 cde	190 bcde	741 c
Orleans	461 b	235 ab	134 e	830 abc
Beauregard	460 b	160 bcd	152 cde	772 bc
Burgundy	404 bc	226 ab	149 de	779 abc
Bayou Belle	353 c	298 a	132 e	783 abc
Evangeline	348 c	89 cde	221 abcd	658 cd
White flesh				
O’ Henry	582 a	111 bcde	279 a	972 a
Bonita	443 b	37 de	261 ab	741 c
Hayman	244 d	18 e	270 a	532 d

* U.S. No. 1, U.S. No. 2 large, and U.S. No. 2 small: see Table 1 for description

[†] bu: 50-pound bushel

[‡] Means within columns followed by the same letter are not significantly different by LSD multiple range test at $P \leq 0.05$ (95% confidence).

Table 5. Sweetpotato performance at the Eastern Shore Agricultural Research and Extension Center, Painter, Virginia, 2016

Cultivar	U.S. No. 1* medium bu/acre[†]	U.S. No. 2 large bu/acre	U.S. No. 2 small bu/acre	Marketable bu/acre
Orange flesh				
Bayou Belle	360 a [‡]	125	82 e	567 a
Beauregard	341 ab	84	125 cde	550 ab
Bellevue	281 abcd	11	229 a	521 abc
Evangeline	268 abcd	21	111 de	400 de
Orleans	267 abcd	71	154 bcd	492 abcd
Burgundy	245 bcd	21	190 ab	456 bcde
Covington	236 dc	76	134 bcde	446 cde
White flesh				
O' Henry	303 abc	56	130 cde	489 abcd
Bonita	215 dc	16	172 abc	403 de
Hayman G-2	191 d	65	124 cde	380 e

* U.S. No. 1, U.S. No. 2 large, and U.S. No. 2 small: see Table 1 for description

[†] bu: 50-pound bushel

[‡] Means within columns followed by the same letter are not significantly different by LSD multiple range test at $P \leq 0.05$ (95% confidence). Means in the column without letters are not significantly different from each other.

Conclusion

There is interest in increasing sweetpotato production among farmers in Virginia. Yields among vegetable farmers vary greatly, but irrigation appears to be an important factor in some areas to obtain yields comparable with other states. The two main commercial sweetpotato varieties (Beauregard and Covington) and recently released ones performed well in the variety trials, and are recommended for production in Virginia. Many local consumers prefer the white variety Hayman, but alternative white-flesh varieties with better yield and storage root quality are available for commercial production.

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Resources

Online information on varieties

LSU-AgCenter, Louisiana State University. 2017. Sweet Potato Variety Descriptions

http://www.lsuagcenter.com/portals/our_offices/research_stations/sweetpotato/features/varieties/sweet-potato-variety-descriptions.

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