

1-1-2016

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Recommended Citation

Strang, John; Smigell, Chris; Snyder, John; and Sigler, Pam, "Winter Squash Variety Evaluation" (2016).
Midwest Vegetable Trial Reports. Paper 147.
<https://docs.lib.purdue.edu/mwvtr/147>

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Winter Squash Variety Evaluation

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Twenty winter squash varieties were evaluated in a replicated trial to determine their performance under Central Kentucky conditions. These included hubbard, spaghetti, kabocha, delicata, butternut, and several other types. Culinary evaluations were conducted to assess consumer varietal preferences. Winter squash are valued for their decorative aspects as well as their eating quality and are often purchased just as seasonal decorations.

Materials and Methods

Varieties were seeded on May 27, 2015, into 72-cell plastic plug trays filled with ProMix BX multipurpose media (Premier Horticulture, Inc.) at the University of Kentucky Horticulture Research Farm in Lexington. Plants were set into black plastic-mulched, raised beds using a waterwheel setter on June 11. Plots were 20 feet long, with six plants set 4 feet apart within the row and 10 feet between rows. Each treatment was replicated four times in a randomized complete block design. Drip irrigation provided water and fertilizer as needed.

Forty pounds of N/A as calcium nitrate was incorporated into the field prior to bed shaping and planting. The plot was fertigated with a total of 10 lbs N/A as calcium nitrate divided into eight applications over the season. The systemic insecticide Montana 2F (imidacloprid) was applied with a hand sprayer as a drench at the base of each plant after transplanting using the maximum rate of 8 fl oz/A. Brigade insecticide was applied for insect control as needed. Weekly foliar fungicide applications included Champ, Previcur Flex and Cabrio. No preemergent herbicides were applied due to excessive rainfall.

One fruit from each replication was measured for dimensions and evaluated for skin and interior color. At harvest, one sample of each squash type was microwaved and evaluated for taste.

Three consumer panels also evaluated the winter squash. Each panel sampled a different type of squash, but the procedures for each consumer panel were the same. Consumers were presented with a whole squash and a cross section that included seeds. They were asked to rank the visual appeal as if they were purchasing at a farmers' market. They were asked then to evaluate squash that had been cut, had seeds removed, brushed with vegetable oil, and roasted for 30 minutes at 400°F. These were evaluated for appearance, texture, and flavor. These data were not analyzed statistically because of the low number of taste panelists, but are presented to provide growers some indication of varietal consumer acceptance. The Hoss Butternut was not evaluated in the consumer taste panels.

Results and Discussion

The spring season was cool and wet. Yield and variety characteristics data are shown in Tables 1 and 2. Varieties are grouped by squash type and then ranked on total marketable yield by weight. The top varieties based on Horticultural Research Farm and consumer evaluations were Goldetti and Small Wonder Spaghetti squash; Delica and Sweet Mama kabocha squash; Delicata JS delicata-type squash; and Red Kuri hubbard squash.

Horticultural Research Farm Evaluations

Goldetti spaghetti squash was the top yielding variety in this trial, with 340 cwt per acre and few cull fruit. Microwaved flavor was very good and it has an attractive gold skin color. However, a consumer familiar with growing summer squash might think that this resembles an over-mature zucchini, thus additional marketing information may be needed. Small Wonder spaghetti squash also produced an excellent yield, was attractive, and could be considered a one-serving squash.

Delica and Sweet Mama kabocha squash had good yields and eating quality as in our previous trials. Kabocha squash are noted for their smooth, fine-grained, dry flesh. Both had high levels of cull fruit despite their high yields. Culling was due to sunburn and fruit cracking in the field, indicating that these should be harvested promptly once they have matured. Hai had the top kabocha yield, but did not reach the flavor of some of the other varieties. Thunder, Eclipse, Shokichi Shiro, and Super Delight were notable for their microwaved eating quality. Shokichi Shirro and Shokichi Green were both small and considered to be single-serving kabocha squash.

The Red October hubbard squash variety yielded considerably better than Red Kuri. Both had a reddish orange skin that was very attractive with smooth, fine-grained flesh.

The heirloom North Georgia Candy Roaster banana squash was notable for its yield, large size, and looks. Although it did not score high in taste ratings, this type of squash is rarely eaten without spices and processing. It was easily processed and made very smooth, outstanding pumpkin pies for which it is noted in Georgia.

Delicata JS was the least productive squash in the trial, but rated as one of the sweetest and best tasting. Delicata squash have a thin skin that is edible.

Hooligan is classified as a mini-pumpkin with outstanding ornamental characteristics. The flesh is a little coarser than most of the other varieties in this trial, but microwaved flavor was very good.

Jester is an attractive multicolored cream, green, and orange variety. It is shaped like an acorn squash, but we felt has a better eating quality in that it is less fibrous and has a finer textured flesh.

The Hoss butternut is a larger-fruited, heavy-yielding butternut that should be good for processing.

Consumer Panel Evaluations

Kabocha (Table 3)

This panel was conducted at the grand opening of an indoor farmers' market in a rural county. Of the 12 panel participants, two ate winter squash regularly (monthly or more often) and six did when in-season. Those who ate winter squash ate acorn, butternut, cushaw, pumpkin, and spaghetti squash. None of the participants had tried a kabocha squash.

Participants rated visual appeal of the whole squash and a cross-cut that included the seeds. Mean scores ranged from 2.3 to 2.8 (somewhat appealing to appealing) for uncooked squash.

Super Delight (3.4), Hai (3.8) and Sweet Mama (3.4) received the highest ratings for visual appeal of the cooked squash. Each retained a bright yellow color after being roasted in their skin. Some varieties took on a green color from the skin after being roasted.

Those consumers who did not eat squash were reluctant to try them, and eight of the 12 consumers participated in the taste panel. Super Delight (3.3) and Sweet Mama (3.0) received the highest ratings for texture. Super Delight (3.5), Delica (3.4), and Sweet Mama (3.3) received the highest ratings for flavor. One consumer mentioned that Sweet Mama was stringier than the other varieties while another consumer commented that Sweet Mama and Hai had the best texture and flavor.

Shokichi Green and Shokichi Shiro are small, individual-serving size squashes. Being roasted at the same temperature and length of time as the larger kabocha squash dried out the smaller ones and may have lowered their ratings.

When asked how likely they would be to purchase kabocha squash, 57% of consumers who tasted the kabocha squash were likely or very likely to purchase. Two who responded “not likely” were farmers who grow kabocha squash, and therefore would typically not need to purchase them.

Delicata, Hubbard, and Banana Squash

The hubbard, delicata, and banana squash consumer panel consisted of seven Master Gardener students of whom 71% purchase winter squash for consumption, and 29% for decoration. A little more than half (57%) reported eating winter squash (acorn, butternut, cushaw, pumpkin, and spaghetti squash) five to eight times per year. Consumers reported being more likely to purchase the Delicata JS and Hooligan varieties based on visual appeal (Table 4).

All of the cooked delicata squash were considered visually appealing (range = 3.3 to 3.9) but Delicata JS ranked highest for texture (mean = 3.5) and flavor (mean = 3.7) compared to the others. Two-thirds (67%) reported being likely or very likely to purchase delicata squash in the future.

Red Kuri, the smallest of the three hubbard and banana squash, ranked highest for visual appeal, flavor, and texture (Table 5). Consumers commented that Red October and North Georgia Candy Roaster were not as appealing due to the large size and inability to utilize the squash in a timely manner.

Spaghetti Squash (Table 6)

The consumer panel for spaghetti squash was conducted at a Healthy Community meeting in a rural county where participants purchased winter squash for decoration (67%) and as a food source (83%). Two-thirds of the panel rarely or never ate winter squash. Those who normally ate squash consumed acorn, butternut, cushaw, pumpkin, and other types.

All varieties were rated similarly for appearance, texture, and flavor, with a slight preference for Small Wonder. Three-fourths (77%) shared that they were likely or very likely to purchase spaghetti squash after sampling. One person planned to try it as a substitute for pasta since her husband was diabetic.

Acknowledgments

The authors would like to thank Steve Diver, Dave Lowry, Joseph Tucker, Israel Avelar, Nattapon Maneerut, and Sininchai Sommeechai for their help and assistance in the successful completion of this trial. Funding for this project was provided by a Kentucky Horticulture Council grant through the Agricultural Development Fund.

Table 1. Winter squash variety trial yield and fruit characteristics, Lexington, Kentucky, 2015.

Variety ¹	Squash Type ²	Seed Source ³	Days to Harvest	Yield (cwt/A) ⁴	Avg. No. Fruit/A	Avg. Wt./Fruit (lb)	Culls (%) ⁵	Outside Measurements		Cavity Measurements	
								Length (in)	Width (in)	Length (in)	Width (in)
Goldetti	Sp	BU	100	340 a	7,260	4.7	4	11.1	4.9	8.4	2.9
Small Wonder	Sp	RU	90	300 a	14,670	2.0	11	5.6	4.8	3.5	2.6
Pinnacle	Sp	ST	85	200 bc	6,610	3.0	8	7.5	5.3	5.5	3.1
Hai	Ka	CF	85-95	230 b	3,010	7.5	11	6.6	8.3	3.8	5.7
Delica	Ka	CF	85	160 bcd	3,340	4.9	23	4.7	7.9	2.6	5.9
Sweet Mama	Ka	SW	85	160 bcd	2,940	5.2	28	5.1	8.1	2.7	5.5
Winter Sweet	Ka	JS	95	140 cde	3,270	4.4	8	4.1	7.5	2.2	5.4
Thunder	Ka	RU	85	130 cde	3,270	3.8	14	4.2	7.2	2.6	5
Shokichi Green	Ka	JS	100	120 de	13,140	0.9	5	2.8	4.4	1.7	2.9
Space Station	Ka	RU	90	120 de	2,830	4.1	32	4.6	7.6	2.4	5.1
Eclipse	Ka	RU	85	110 de	2,610	4.3	31	4.3	7.7	2.5	5.1
Shokichi Shiro	Ka	JS	100	110 de	12,670	0.9	4	2.8	4.1	1.6	2.7
Super Delight	Ka	ST	90	110 de	3,120	3.6	24	5.4	6.7	3.1	4.7
N. GA Candy Roaster	Ba	JS	100	320 a	4,180	7.6	0.2	22.3	4.4	17.3	1.6
Hoss Butternut	Bn	CF	90-95	300 a	6,970	4.2	0.6	8.7	5.3	3.1	3.1
Red October	Hu	SW	90	290 a	3,740	7.8	5	11.0	8.5	7.2	6.3
Red Kuri	Hu	JS	92	160 bcd	3,630	4.4	16	7.0	7.1	3.9	5.2
Hooligan	Mp	JS	90	140 cde	18,330	0.8	0.9	2.3	4.2	1.4	2.8
Jester	DI/Ac	JS	95	120 de	9,550	1.3	2	4.7	3.8	3.2	2.3
Delicata JS	DI	JS	100	70 e	7,730	0.9	13	6.3	2.6	5.4	1.3

¹Listed in decreasing order of yields of each type.

²Sp = spaghetti, Ka = kabocha, Ba = banana, Bn = butternut, Hu = hubbard, Mp = mini-pumpkin, DI = delicata, Ac = acorn.

³Days to harvest from seed catalogues.

⁴Numbers followed by the same letter are not significantly different (Duncan Multiple Range Test P≤0.05).

⁵Cull percentage of total squash number.

Table 2. Winter squash fruit characteristics, Lexington, Kentucky, 2015.

Variety	Flavor (1-5) ¹	Skin Color ²	Interior Color ²	Comments
Goldetti	4	gold	lt gr	Moist, crunchy, slightly sweet; pale speckles on skin
Small Wonder	3	or-y	cr-y	Moist, bland taste; smooth and attractive
Pinnacle	3.7	lt y	wh-y	Very moist, crunchy, slightly sweet; canary yellow
Hai	3.8	grey-gr	brn-or	Moist, not as fine-grained as other kabochas; deep sutures
Delica	4.2	ol-gr	or	Dry, fine-grain, slightly sweet; attractive interior & exterior; lighter green sutures & speckles
Sweet Mama	4.4	dk ol	dk y	Dry, smooth flesh
Winter Sweet	4	grey	dk y	Very dry flesh; attractive interior & exterior; darker blotches on skin
Thunder	4.4	dk ol	brn-or	Very dry, fine-grain, sweet; pale, sunken spots and streaks
Shokichi Green	3.8	ol	dk y	Dry, fine-grain flesh; slightly streaked skin, fine speckles
Space Station	4.2	dk ol	y-or	Light grey sutures and small dimples around top
Eclipse	4.4	dk ol	lt or	Fine-grain, slightly sweet, moist; pale, thin suture streaks
Shokichi Shiro	4.3	grey-gr	dk y	Dry, fine-grain flesh; no streaks or speckles
Super Delight	4.3	dk ol	or-y	Very dry, fine-grain flesh; not flat like other kabochas
N. GA Candy Roaster	3.7	pink-or	dk y	Very fine, smooth, moist flesh
Hoss Butternut	3.3	flesh	y-or	Very dense; attractive interior, coarser-grain flesh than other varieties in trial
Red October	3.8	red-or	dk y	Moist, fine-grain flesh
Red Kuri	3.5	red-or	brn-or	Smooth, fine-grain flesh, not sweet; attractive inside & out; light orange sutures
Hooligan	4.5	cr-y	lt y	Coarse-grain flesh, dry, sweet; very attractive; variable color & size, orange sutures
Jester	4.5	cr-wh	y-or	Very sweet, medium grain flesh, not stringy
Delicata JS	4.7	cr-wh	cr-y	Very sweet, moist; edible skin

¹Flavor: 1 = poor, 5 = excellent. Based on 2 samples microwaved under plastic wrap and tasted without any seasoning.

²Interior and skin color: or = orange, cr = cream, y = yellow, brn = brown, gr = green, ol = olive, wh = white, lt = light, dk = dark, br = bright, ; e.g., red-or = "reddish orange."

Table 3. Mean ratings¹ by panelists who evaluated kabocha squash.

Variety	Visual Appeal Raw	Visual Appeal Roasted	Texture Roasted	Flavor Roasted
Delica	2.3	2.6	2.9	3.4
Sweet Mama	2.5	3.4	3.0	3.3
Shokichi Green	2.8	1.6	2.3	2.1
Shokichi Shiro	2.8	2.5	2.9	2.8
Thunder	2.4	2.8	2.5	2.0
Winter Sweet	2.3	1.6	2.2	2.1
Space Station	2.3	2.4	2.9	2.8
Eclipse	2.4	2.3	2.6	2.5
Hai	2.8	3.8	2.9	2.5
Super Delight	2.7	3.4	3.3	3.5

¹Range: 1 = not appealing to 4 = very appealing.

Table 4. Mean ratings¹ by panelists who evaluated delicata squash.

Variety	Visual Appeal Raw	Visual Appeal Roasted	Texture Roasted	Flavor Roasted
Delicata JS	3.3	3.7	3.5	3.7
Jester	2.9	3.3	1.6	2.2
Hooligan	3.3	3.9	2.2	2.3

¹Range: 1 = not appealing to 4 = very appealing.

Table 5. Mean ratings¹ by panelists who evaluated banana and hubbard squash.

Variety	Visual Appeal Raw	Visual Appeal Roasted	Texture Roasted	Flavor Roasted
Red October	2.4	3.0	2.9	2.7
North Georgia Candy Roaster	2.6	3.1	2.9	3.0
Red Kuri	3.1	3.4	3.4	3.3

¹Range: 1 = not appealing to 4 = very appealing.

Table 6. Mean ratings¹ by panelists who evaluated spaghetti squash.

Variety	Visual Appeal Raw	Visual Appeal Roasted	Texture Roasted	Flavor Roasted
Small Wonder	2.8	3.7	3.2	2.6
Goldetti	2.6	3.2	3.0	2.6
Pinnacle	2.6	3.1	2.8	2.3

¹Range: 1 = not appealing to 4 = very appealing.