

# Growers Get On The Bite-Size Bandwagon

Whether it's convenience, uniqueness or gourmet, consumers can't get enough of miniature food items — especially vegetables. Research from the University of Florida shows how growers can produce these profitable crops in the greenhouse.

**By Nicole Shaw**

**E**verything from cookies and candy bars to vegetables now comes "bite-size." For me, it started with the Beit Alpha minicucumber. The Beit Alpha cucumber has traditionally been grown in the Mediterranean region and marketed throughout local areas and Europe. However, in recent years, newer cultivars of this "baby" cucumber are being grown in Florida, California, Mexico and Canada and shipped throughout the United States. The minicucumber is about 4-6 inches long and super sweet. The fruit are seedless and have a thin skin that doesn't require peeling; they are "burr-less" and don't leave that bloated feeling after being ingested unlike regular field or salad cucumbers.

## Looking For Gold

After four years of growing Beit Alpha and other minicucumbers, I wanted to try something different. Working at the University of Florida Protected Agriculture Project (UFPAP) in Gainesville and Citra, Fla., I receive many phone calls from growers with varying interests. We had been approached by several hydroponic greenhouse growers who catered to restaurant chefs about the possibility of producing squash blossoms. The chefs were paying up to \$3 a piece for blossoms that they used for fancy appetizers and table arrangements. With a value like that, I couldn't pass up the chance to help these growers out.

My supervisor, Dan Cantliffe, chair/professor of the Horticultural Sciences Department, mentioned to me several times that anyone who could grow squash, especially zucchini, at Christmas time would be a millionaire, so he was also eager to see what could be done with growing hydroponic squash in the greenhouse. Since Florida is the largest squash-producing state by acreage, I had to justify the production cost of putting squash in the greenhouse. The blossoms alone could not support a greenhouse operation, but by marketing the small, immature fruit, the baby squash struck gold!

The benefits of growing squash in the greenhouse start with the high yielding capacity of a virtually blemish-free, year-round product. Also, we have been successful in implementing biological control measures at the UFPAP ➤



*The benefits of growing squash in the greenhouse start with the high yielding capacity of a virtually blemish-free, year-round product. (Photos: Nicole Shaw)*

Squash Cultivars				
Type	Cultivar name	Description	Seed company	
Zucchini	'Bareket'	Dark green	Hazera Genetics, Inc.	
	'Eight Ball'	Round, green	Hollar Seeds, Inc.	
	'Gold Rush'	Deep yellow	Johnny's Selected Seeds	
	'Goldy'	Yellow	Hazera Genetics, Inc.	
	'Hurricane'	Medium green	Nunhems USA	
	'Sebring'	Yellow, PMR*	Hollar Seeds, Inc.	
	'Revenue'	Medium green	Johnny's Selected Seeds	
	'Raven'	Dark green	Johnny's Selected Seeds	
Yellow-summer	'Seneca Supreme'	Straightneck	Johnny's Selected Seeds	
	'Sunray'	Straightneck	Johnny's Selected Seeds	
	'Superset'	Crookneck	Johnny's Selected Seeds	
	'Yellow Crookneck'	Crookneck	Johnny's Selected Seeds	
	'Zephyr'	Green blossom end, straightneck	Johnny's Selected Seeds	
Patty-pan/Scallop	'Butter Scallop'	Pale yellow	Johnny's Selected Seeds	
	'Patty Green Tint'	Light green	Johnny's Selected Seeds	
	'Starship'	Dark green	Johnny's Selected Seeds	
	'Sunburst'	Deep yellow	Johnny's Selected Seeds	
Cousa	'HA-187'	Mottled green	Hazera Genetics, Inc.	
	'Magda'	Pale green	Johnny's Selected Seeds	

\*PMR = powdery mildew resistant.

Source: Shaw, N.L. and D.J. Cantliffe. 2005. "Hydroponic greenhouse production of 'baby' squash: selection of suitable squash types and cultivars." *HortTechnology*. 15(3):722-728.

*Figure 1. Shown here are the squash cultivars evaluated for hydroponic "baby" squash production in a passively ventilated greenhouse in Florida using soilless media.*

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## crop cultivation

since 2001, and we knew we had a good chance to produce baby squash pesticide free. Though hydroponic certified organic production is still in its infancy, "pesticide free" production was one step closer to providing consumers with a safer product.

In 2003, no one was growing baby squash in the United States on a com-

mercial scale in the field or greenhouse. Wholesale distributors were importing the product from countries such as Guatemala, and by the time the fruit were harvested, packed and air freighted to the United States, postharvest quality was diminished and decay was around the corner. I knew growers in the United States could achieve a far better quality product with less stress on distribution.

### Where To Begin?

**Selecting cultivars.** I knew I could successfully produce cucurbit crops (cucumber and muskmelon) hydroponically in a greenhouse, but baby squash was a blank slate. The first step was selecting suitable cultivars. I looked at what was available at local grocery stores as well as what was available through wholesale distributors via the Internet. It appeared that summer squash types, including yellow-summer, straight or crookneck, zucchini and many types of patty-pan/scalloppini squash, were prevalent. Dr. Cantliffe also suggested adding the coussa squash, a common Middle Eastern type, since it was well adapted to protected cultivation in the Mediterranean. A few other interesting cultivars were thrown into the mix based on their catalog descriptions: a round zucchini ('Eight Ball') and a summer squash that was half yellow and half green ('Zepyhr').

**Vertical production.** To achieve vertical production in the greenhouse, I had to tie up or trellis the squash plants, but that didn't limit the cultivar choices to vining types. The fruit would be harvested much earlier than standard squash plants, thus keeping my hopes up that the plants would remain vegetative and create a dominate meristem, even for the bush-type plants. Fortunately, this came true for most of the plants in the trials, although there were a few anomalies. The cultivars that were in the original trial are listed in Figure 1, page 52.

**Spacing.** Plant spacing is extremely important in the greenhouse since the number of plants relates directly to total fruit yields. Plant spacing can be much closer in a greenhouse than in the field since tractors (tire width) and

other large machines do not play a limiting role. Our minimum row-to-row width of 4 ft. is, however, limited by ladders and carts. Within-row spacing varies among the types of crops grown; it ranges from 12 inches between plants for peppers and cucumbers to larger for melons and tomatoes. We chose 15 inches between squash plants based on our experience with other cucurbits in the greenhouse. We kept plant spacing close to create some light competition among plants to further vertical growth. Our final plant spacing was .2 plants per sq.ft. or six times greater than recommended in Florida for field production of vining-type squash.

**Pots and media.** Other greenhouse production practices used for squash were similar to those used for cucumbers and muskmelon production. At the UFPAP, we generally use 3-gal. nursery pots with single plants and screened pine bark for media. We have moved away from the traditional lay-flat bags filled with perlite due to durability and expense. Three-gal. plastic nursery pots can be used for at least five years, if not 10, and pine bark is readily available in Florida and other areas due to regional paper processing industries. The pine-bark-filled pots can be reused in the greenhouse for at least four consecutive seasons, thus saving money for both supplies and labor needed to move, wash and refill the pots as was needed after only two seasons with the lay-flat bags.

**Trellising.** For most greenhouse crops, I would recommend using transplants instead of direct seeding to ensure a uniform stand of well-developed plants, but you can successfully direct seed squash. Each plant is trellised on UV-resistant string (twine) hung above each plant. (We secure them to a cable, and the cable is secured to the greenhouse.) Initially, the string can be fastened to the plant using a tomato clip, but as the plant develops, the tomato clips are not large enough to surround the main stem, so twist ties are used. Unlike cucumbers, there is no need to twist the squash plant around the twine; the squash are very strong and will not slip down the string like a cucumber will when it is loaded with fruit.

**Planting season.** Squash can be planted in both spring and fall in Florida. Spring planting can be in late



Vegetable plant spacing in the greenhouse can have a significant impact on total fruit yields.

Yield Variables							
Cultivar*	Baby fruit (no.)	Baby fruit wt. (oz.)	Fancy fruit (no.)	Fancy fruit wt. (oz.)	Culls (no.)	Marketable fruit (no.)	Marketable fruit wt. (lb./plant)
<b>Zucchini</b>							
'Bareket'	16	14.4	4	7.2	< 1	22	1.5
'Eight Ball'	20	19.3	7	15.4	< 1	28	2.2
'Gold Rush'	21	15.3	4	5.5	< 1	27	1.5
'Goldy'	19	14.8	5	6.6	< 1	25	1.5
'Raven'	25	22.3	11	20.9	< 1	34	2.9
'Revenue'	22	24	17	36.2	3	41	4.2
'Sebring'	17	13.4	5	7.2	< 1	23	1.3
<b>Yellow-summer</b>							
'Seneca Supreme'	48	35.8	22	30.7	1	74	4.4
'Sunray'	40	29.7	16	23.1	2	59	3.5
'Superset'	43	30	15	20.9	4	59	3.3
'Yellow Crookneck'	42	28.9	14	18.5	17	66	3.5
'Zephyr'	27	20.7	14	23.8	3	48	3.3
<b>Patty-pan/scallop</b>							
'Butter Scallop'	51	33.9	26	37	< 2	80	4.6
'Patty Green Tint'	50	37	26	40.5	< 2	83	5.3
'Starship'	51	36.1	17	24.1	< 1	70	4
'Sunburst'	67	43.4	15	19.9	< 3	85	4.2
<b>Cousa</b>							
'HA-187'	34	35.5	13	26.1	< 1	47	4
'Magda'	27	29.6	17	36.7	< 1	44	4

\*Yields are an accumulation of 28 harvests. Plants were grown Feb. 14-May 15, 2003, in Gainesville, Fla.

Source: Shaw, N.L. and D.J. Cantliffe. 2005. "Hydroponic greenhouse production of 'baby' squash: selection of suitable squash types and cultivars". HortTechnology. 15(3):722-728.

Figure 2. These are the yield variables per plant for selected squash cultivars grown hydroponically during Spring 2003 in Gainesville, Fla.

## **crop cultivation**



To ensure a uniform stand of well-developed plants, transplants are recommended instead of direct seeding, but you can successfully direct seed squash.

January to mid-February, but some heat may be needed if there is a chance of frost. A fall crop can be planted in July, but be prepared to work daily because the plant's vegetative growth is rapid under the high temperatures.

### **Harvesting**

Regardless of a spring or fall crop, squash plants develop rapidly and harvesting begins within four weeks after transplanting. Published information is limited on specialty crops such as baby squash, but after looking at what was sold in local grocery stores, it was determined to harvest the squash around 4 inches long for the yellow-summer and zucchini-types, and 1½ inches in diameter for the patty-pan and round types. Retail package size was 10 oz. and contained about 10-12 pieces of fruit (retail cost of \$2.49-3.99 per pack). We were able to harvest squash every other day for 6-8 weeks. Sometimes fruit should be harvested daily to retain the desired baby size, otherwise, fruit size is similar to a fancy-grade field squash.

Insect pests were controlled with beneficial insects, but powdery mildew was a cause for crop termination in both spring and fall. Since the cultivars used in our trials were generally for home garden use, powdery mildew resistance was not a priority of the seed company but more so the creation of unique and interesting shapes and colors of fruit — characteristics ideal for such a specialty crop.

Of the cultivars chosen for the trial, none were truly labeled as baby squash until more recently (the patty-pan types) and only one was labeled for greenhouse production (the coussa type HA-187). Regardless, many of the cultivars tested performed very well. For a small grower, I recommend growing a variety of squash types, especially if you would be selling fruit at a farmers' market, roadside stand or local restaurant, because the beauty of the various shapes and colors is quite appealing. The patty-pan types produced the greatest number of baby fruit per plant (approximately 65 fruit per plant), but some of the yellow types were not far behind (See Figure 2, left).

One word of caution: I learned from my trials (where all plant types were mixed throughout the greenhouse) that you must keep each plant type together. The patty-pan types and some of the yellow-summer squash cultivars grow very fast and quickly dominate the zucchini types: The light competition reduces yield, and the weight of the higher leaves will break off those of shorter plants when they overlap under the high plant density. There is great potential from newer zucchini cultivars for greenhouse squash production that have powdery mildew resistance.

Growers can visit our Web site, [www.hos.ufl.edu/protectedag](http://www.hos.ufl.edu/protectedag), for complete publications on baby squash production and postharvest handling recommendations as well as all our research at the UFPAP. [GPN](#)

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