

## Calabaza Squash and Personal-sized Watermelons – Two High Value Specialty Crops

Abigail A. Maynard  
Connecticut Agricultural Experiment Station  
PO Box 1106  
New Haven, CT 06504  
Abigail.Maynard@ct.gov

Four types of watermelons are available in supermarkets. Traditional seeded watermelons that have been a major part of the market since the 1950's and weigh 18-35 pounds. Large seedless watermelons have been available since 1988 and usually weigh 15-25 pounds. Icebox-size melons, generally weighing 7-12 pounds each, have been available for about twenty years. The newest melons on the marketplace are seedless miniature "personal-sized" watermelons, weighing 3-7 pounds each.

Personal-sized watermelons first became available in markets in 2003. They offer an attractive alternative for small families or for consumers that have limited refrigerator space. Consumers are drawn to the product because it is just the right size for a single-meal serving without the storage and bulk issues associated with traditional seedless watermelon. Personal-sized watermelons also reach a group of consumers who seldom purchased watermelon because of its bulkiness. Beside a smaller size, personal-sized watermelons also have a thinner rind which reduces waste and provides more edible flesh. Because the thin rind makes long distance shipping difficult, personal-sized watermelons are an ideal crop for New England's local farmers' markets and roadside stands. In addition, conventional watermelon growers in the South have resisted growing personal-sized watermelons because they require changes in cultural practices and harvesting equipment.

The economic potential of this crop can be very high for growers who sell directly to the consumer. Based on production in our trials, average yield was 10,120 fruit/A. Gross returns, at a retail price of \$4.99/fruit, exceeded \$50,000/A. With estimated production costs of \$13,000/A, net returns would be \$37,000/A, providing that the entire crop was harvested and sold. If the cultivar Bravo was grown, the average yield would be 16,139 fruit/A, increasing net returns to over \$67,000/A.

*Sites and soils.* Trials of personal sized watermelons were conducted for three years at the Valley Laboratory, Windsor CT, on Merrimac sandy loam (Entic Haplorthod), an inland sandy terrace soil with somewhat limited moisture holding capacity (Shearin and Hill, 1962); and at Lockwood Farm, Mt. Carmel CT, on Cheshire fine sandy loam (Typic Dystrochrept), a coastal loamy upland soil with moderate moisture holding capacity (Reynolds, 1979).

*Cultivars.* Eleven cultivars were grown in 2008-2010 at both sites. The cultivars evaluated in 2008 were: Mielhart, Mini Yellow, Valoria, Vanessa, and Wonder. The cultivars evaluated in 2009 were: Big Tasty, Bravo, Extazy, Fantasy, Leopard, Mielhart, Snack Pack, Vanessa, and Wonder. The cultivars evaluated in 2010 were: Bravo, Extazy, Fantasy, Leopard, Mielhart, Vanessa, and Wonder. The pollinator cultivar for all years was Sidekick.

*Culture.* The personal sized watermelon cultivars and the pollinator cultivar were seeded on April 25-27. The seedlings were grown in Promix BX (Premier, Red Hill PA) in 3x3x3-inch Jiffystrips and placed in a greenhouse maintained at 75°-90°F. After germination, plants were thinned to one per pot. Seedlings were moved to a cold frame for hardening before transplanting in the field. Water-soluble 20-20-20 fertilizer (one tbs/gal) was added to the seedlings before

they were transplanted. In mid-June, plants of each cultivar were transplanted 2 feet apart in 50-foot rows. The pollinating cultivar was planted in every third row except in 2007 where the pollinator was planted every other row. One-half (25 feet) of each row was mulched with 1.25 mil black plastic (3 ft wide). Row centers were alternatively 5 and 6 feet apart. In 2005, paired rows, 5 feet apart, were covered with Reemay spun-bonded polyester (10.5 ft x 50 ft). The Reemay was pinned to the soil with 6-inch wide staples that penetrated 5 inches into the soil to prevent loosening in high winds. The Reemay was removed in early July to allow honey bees and other insects to pollinate the first female flowers forming along the vines.

*Fertilization.* The soils were fertilized at a rate of 1000 lb/A 10-10-10 before planting. After the Reemay was removed or in mid-July, the strips between the black plastic were sidedressed with 240 lb/A calcium nitrate. Total application of nitrogen during the growing season was 140 lb/A. Soil pH was about 6.5 at each site so lime was not applied.

*Harvest.* Watermelons were harvested in September and each fruit was weighed. Fruits weighing less than 3 pounds were not included in the analysis. Rind thickness was measured on ten random samples and the results averaged. Lycopene content was determined by Dr. Penelope Perkins, USDA/ARS, Oklahoma from samples obtained from the center of each randomly sampled fruit.

*Percent soluble solids.* Percent soluble solids in fruit is an indicator of percent sugars. The Brix meter is the standard tool for taking this measurement rapidly in the field. Samples were obtained from the center of randomly sampled fruit, the juice squeezed out, and its Brix measured. The 10 Brix readings for each cultivar were averaged.

*Results.* The average total estimated yield of personal-sized watermelons of all cultivars in 2008-2010 was 10,504 fruit/acre (A) at Windsor compared to 9,737 fruit/A at Mt. Carmel (Maynard 2010). At Windsor, the average number of fruit/plant was 4.6 with an average of 47% of the fruit in the 3-7 pound range. At Mt. Carmel, the average number of fruit/plant was 3.9 with 56% of the fruit in the 3-7 pound range. Compared to plots with no mulch, yields on black plastic mulch increased at both sites in all years by an average of 32%. Mielhart and Bravo had the greatest yields of personal-sized watermelons. Mielhart, Bravo, Fantasy, Leopard, Wonder, and Vanessa produced the largest percentage of melons in the 3-7 pound personal-sized watermelon range. Big Tasty, Mini Yellow, and Snack Pack had significantly thicker rinds, averaging 0.49 of an inch. The varieties producing the thinnest rinds were Bravo, Mielhart, Vanessa, and Valdoria, averaging 0.35 of an inch. Bravo, Mini Yellow, Valdoria, and Wonder had sugar content equal to or greater than 11%.

Calabaza squash, also known as tropical pumpkin, is mostly grown in tropical and semi tropical climates. The shape of its large fruit is round to oblate with deep yellow to orange colored flesh. The fruit are borne on several long runners that branch from the crown and may extend 25-50 feet. Since the growth of the vines is indeterminate, fruit with several stages of maturity may be attached to the same plant. At full maturity, the color of the rind changes from green or green-cream mottled to buff or buff-cream, but the color change only occurs when the vine is still actively growing. Fruit attached to senescent vines may change to buff but remain immature. Because of this, in the marketplace, Calabaza is always sold in sections and wrapped in clear plastic. The buyer must be able to observe the color, texture, and quality of the seeds (which remain intact) to determine if the fruit is mature.

Because excessive vine growth requires abundant space, plant breeders at the University of Florida (Maynard et al. 2002) and the University of Puerto Rico are developing more compact

plants with shorter vines (10-18 feet). These short-vine cultivars also mature in less than 80 days compared to long-vine cultivars that mature in 100-115 days (Anon 1998). Shorter time to maturity enables them to be planted in more northerly latitudes.

Calabaza is highly prized by Hispanic consumers. It was identified by the Connecticut Department of Agriculture as one of the most sought-after vegetables at Connecticut's farmers' markets. The flesh can be served as a baked or mashed vegetable, or pureed for soups, pie fillings, puddings, and breads. The seeds are often boiled, pureed, and mixed with spices to produce a condiment or roasted for snacking.

The economic potential of this crop is estimated to be very high for growers who sell directly to the consumer. Based on production in our trials, average yield was 37 tons/A. Gross returns, at a retail price of \$0.99/lb, exceeds \$73,000/A. With total production cost estimated to be \$3,400/A, net returns would be almost \$70,000/A provided the harvested crop was completely sold.

*Sites and soils.* Trials of personal sized watermelons were conducted for three years at the Valley Laboratory, Windsor CT, on Merrimac sandy loam (Entic Haplorthod), an inland sandy terrace soil with somewhat limited moisture holding capacity (Shearin and Hill, 1962); and at Lockwood Farm, Mt. Carmel CT, on Cheshire fine sandy loam (Typic Dystrochrept), a coastal loamy upland soil with moderate moisture holding capacity (Reynolds, 1979).

*Cultivars.* Five cultivars were grown at both sites 2001-2002. Short-vined varieties included El Dorado, G38-2-22 sem, PR Shortvine, and La Estrella. Also grown was La Primera, a long-vine, open pollinated cultivar for comparison.

*Culture.* Calabaza seeds were grown in Promix BX (Premier, Red Hill PA) in 3x3x3-inch Jiffystrips in a greenhouse maintained at 75°-90°F. Seeding occurred in early May for mid-June transplanting. After germination, plants were thinned to one per pot. Seedlings were moved to a cold frame for hardening before transplanting in the field. Water-soluble 20-20-20 fertilizer (one tbs/gal) was added to the seedlings before they were transplanted. In mid-June, the seedlings of each cultivar were planted 3 feet apart in single 60-foot rows spaced 6 feet apart, equivalent to a planting density of 2420 plants/acre.

*Fertilization.* The soil at Windsor and Mt. Carmel was fertilized with 10-10-10 at a rate of 1000 lb/acre and 1300 lb/acre, respectively. After 4 weeks at Windsor, when the plants began to form runners, the rows were side-dressed with calcium nitrate at a rate of 240lb/acre. At Windsor, total application of nitrogen for the season was 140 lb/acre, at Mt. Carmel 130 lb/acre.

*Harvest.* Calabaza fruit was harvested each year in early October following the first light frost. At a spacing of 6 feet between rows, vines from adjacent rows intertwined. Special care was taken to determine the source of each fruit. Individual fruits were weighed and judged for maturity. Immature fruit, generally weighing less than 5 pounds and located at the extremities of the vines, were discarded. Representative samples of fruit from each cultivar were halved to measure the diameters of the fruit and seed cavity.

*Vine Length.* In 2002, at Mt. Carmel, vine lengths were measured for plants randomly selected in each cultivar row. The distance from the crown to the location of mature fruit along the runner was also measured. Runners shorter than 5 feet were always barren.

*Results.* The average total estimated yield of calabaza of all cultivars in 2001-2002 was 37.4 tons/acre (A) at Windsor compared to 36.6 tons/A at Mt. Carmel (Hill 2003). Long-vine variety La Primera consistently had the greatest yields (35-48 tons/A) but some plants produced fruit whose shapes were oblate or oblong instead of spherical. Among the short-vine cultivars, El Dorado averaged the greatest yields (32-35 tons/A) compared to PR Shortvine (28-35 tons/A)

and La Estrella (21-31 tons/A). La Estrella produced the largest fruit (14 lb/fruit) but its productivity was lowest among all cultivars because it set the fewest fruit/plant (1.6 fruit/plant). El Dorado produced the greatest number of fruit/plant (3.0 fruit/plant). Its fruit were smaller than other cultivars (10 lbs/fruit), but the seed cavities were also small. Average length of runners of short-vine cultivars PR Shortvine and El Dorado was 10.9 feet and 11.8 feet, respectively. The runners of long-vine La Primera had an average length of 24.0 feet while the runners of short-vine La Estrella were of intermediate length (16.2 feet). Average distance to the development of the first mature fruit in PR Shortvine and El Dorado was 6 and 8 feet beyond the crown, respectively. La Estrella and La Primera developed their first mature fruit 10 and 15 feet beyond the crown, respectively.

In 2003, one plant of La Estrella produced mature fruit in only 90 days on 12-foot vines. Early maturing fruit were generally found on the vine within 2 feet of the planting site. Fruit that mature in 90 days is appealing to northern growers because the majority of fruit can mature before frost. Fruit that formed on longer vines does not always reach maturity. We saved the seeds from the fruit planted them at Mt. Carmel and Windsor in 2005. At Windsor, 17% of the plants produced early-maturing fruit (90 days) within 2 feet of the planting site while only 4% produced early fruit at Mt. Carmel. We continued this process of saving the seed from plants that produced mature fruit within 2 feet of the plant and planting them at Mt. Carmel and Windsor for 5 growing seasons. In 2010, 82% of the plants at Windsor produced fruit within 2 feet of the plant compared to 37% of the plants at Mt. Carmel.

## References

- Anon. 1998. The pumpkin of the tropics likes Florida, too, research shows. Science Daily. Univ. of Florida, Institute of Food and Agricultural Science. <http://www.sciencedaily.com/releases/1998/11/981126103008.htm>
- Hill, D.E. 2003. Tropical Pumpkin (Calabaza) Trials 2000-2002. Connecticut Agricultural Experiment Station Bulletin 1033. March 2010. 20 pp
- Maynard, A.A. 2010. Personal-sized Watermelon Trials 2008-2010. Connecticut Agricultural Experiment Station Bulletin 1014. June 2008. 15 pp.
- Maynard, D.N., G.W. Elstrom, S.T. Talcott, and R.B. Carle. 2002. 'El Dorado' and 'La Estrella': compact tropical pumpkin hybrids. HortScience 37:831-833.
- Reynolds, C.A. 1979. Soil Survey of New Haven County, Connecticut. United States Department of Agriculture, Soil Conservation Service. 197 pp.
- Shearin, A.E. and D.E. Hill. 1962. Soil Survey of Hartford County, Connecticut. United States Department of Agriculture, Soil Conservation Service. 126 pp.