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**Tropical
Pumpkin (Calabaza)
Trials 2000-2002**

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SUMMARY

In 2000-2002, four cultivars of tropical pumpkin (calabaza) were grown at Windsor on a sandy terrace soil and at Mt. Carmel on a loamy upland soil. In 2000 at Windsor, late direct seeding (June 30) resulted in poor germination (20-46%), and relatively small immature fruit (avg. 6-7 lb).

In 2001 at Windsor, two long-vine cultivars (La Primera and Unknown) and one short-vine experimental variety (G38-2-22sem), grown from transplants, produced an average of 38.3 tons/acre compared to 42.5 tons/acre at Mt. Carmel. Greater yields at Mt. Carmel compared to Windsor were due to the greater number of fruit/plant (2.9 vs. 2.5, respectively). At both sites, yield of the Unknown long-vine cultivar exceeded 50.0 tons/acre. At Windsor, the experimental variety, G38-2-22sem, had the heaviest fruit (avg. 14.8 lb). At Mt. Carmel, the Unknown variety had the heaviest fruit (avg. 12.8 lb).

In 2002 at Windsor, average yield of short-vine cultivars El Dorado, La Estrella, and PR Shortvine and long-vine cultivar La Primera, grown from transplants, was 36.6 tons/acre compared to 30.6 tons/acre at Mt. Carmel, a 20% difference. The greater yield at Windsor was due to greater average fruit/plant (2.7 vs. 2.4) and greater weight of fruit (11.8 lb vs. 11.0 lb). At Windsor, long-vine La Primera had the greatest yield (48.5 tons/acre). At Windsor and Mt. Carmel, La Estrella had the fewest fruit/plant (1.4 and 1.7, respectively) but their fruit were heaviest (12.7 lb and 15.2 lb, respectively). At Windsor, El Dorado had the greatest number of fruit/plant (3.6) but the lowest average weight/fruit (9.3 lb).

In 2002 at Windsor, the differences in the average diameter of fruit among the four cultivars was less than 1 inch. The diameter of La Estrella was greatest (8.3 inches); El Dorado was the smallest (7.5 inches). At Mt. Carmel, the diameter of La Estrella was greatest (9.7 inches); PR Shortvine was the smallest (6.7 inches). La Estrella had the largest seed cavities at both sites (5.3-6.0 inches), but the flesh thickness varied among sites because of the variance in fruit diameter. El Dorado had the thickest flesh at both sites (1.8 and 1.9 inches).

At Mt. Carmel, the crowns of all plants in all cultivars divided into 2-11 runners within 1 foot of the crown. PR Shortvine had the greatest average number of runners (6.9/plant) while La Estrella and La Primera had the fewest (5.6/plant). Average length of runners of short-vine cultivars, PR Shortvine and El Dorado, was 10.9 and 11.8 feet, respectively. Average runner length of long-vine La Primera was 24.0 feet while short-vine La Estrella was of intermediate length (16.2 feet). Few plants developed fruit near the crown. The average distance to the first mature fruit was 6-10 feet for all short-vine cultivars and 15 feet for long-vine La Primera.

Economic potential of tropical pumpkin is estimated to be high for direct sales to consumers. Based on average yields in 2002 of 37.5 tons/acre at both sites, and a retail price of \$0.50/lb, gross and net returns would exceed \$37,500/acre and \$34,100/acre, respectively, provided all fruit were harvested and sold at retail prices. At wholesale prices, the net profit would be considerably less.

Tropical Pumpkin (Calabaza) Trials 2000-2002

By David E. Hill

Tropical pumpkin, also known as calabaza, West Indian pumpkin, or Cuban pumpkin (in Florida), has the scientific name *Cucurbita moshata* (Duchesne) Poir. It is commonly grown throughout the Caribbean and southern Florida. The shape of its large fruit is round to oblate with deep yellow to orange colored flesh. Its fine texture closely resembles butternut squash. The fruit are borne on several long runners that branch from the crown and may extend 25-50 feet. Some runners produce a single fruit far removed from the crown. 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 maturity enables them to be planted in more northerly latitudes.

Before the mid-1970s, little research was directed toward crop improvement and cultural details (Volin 1979). Previously, growers saved seed from the current crop for the next year's crop. They seldom selected fruit of superior quality to improve their seed stock. In Florida, Volin (1979) improved the seed stock of cv. La Primera, an open pollinated Cuban variety, to produce uniformly round fruit with thick, yellow flesh. Since the growth of the vines is indeterminate, fruit with several stages of maturity may be attached to the same plant. Initial harvest occurred approximately 60 days after fruit set. At full maturity, the color of the rind changes from green or green-cream mottled to buff or buff-cream mottled, but the color change is valid only when the vine is still actively growing. Fruit attached to senescent vines may change to buff but remain immature.

Regional preferences exist for some fruit traits. In Puerto Rico, for example, the flesh of the Cuban variety La Primera is too pale yellow to be accepted. Puerto Ricans prefer fruit with a thick pulp that is deep yellow or orange (Unander and Varela-Ramirez 1988).

In the marketplace, tropical pumpkin is always sold in sections and wrapped in clear plastic (Cuniowski 1998). The buyer must be able observe the color, texture and quality of the seeds (which remain intact) before it is purchased. The

seeds are often boiled, pureed, and mixed with spices to produce a condiment or roasted for snacking. Nutritionally, tropical pumpkin is an important source of beta-carotene, thiamin, and riboflavin (Unander and Varela-Ramirez 1988). The fruit of tropical pumpkin can be served as a baked or mashed vegetable, or pureed for soups, pie fillings, puddings, and breads.

Present outlook. Tropical pumpkin is highly prized by the Hispanic community, which, according to the 2000 U.S. Census, numbers 320,000 in Connecticut, an increase of 107,800 in the last decade. Although 10% of the population in Connecticut is Hispanic, the greatest concentrations are in Hartford, New Haven, and Fairfield Counties.

Currently, tropical pumpkin is not grown in Connecticut. It is available seasonally in some supermarkets and specialty markets in urban areas. The best opportunity for tropical pumpkin sales is through direct marketing at farm stands and farmer's markets. In 2001, 60 farmer's markets operated 1-5 days/week and were tended by 120 growers (Connecticut Department of Agriculture, personal communication). Most of these markets are located in urban areas and densely populated suburbs. A survey of customers at farmer's markets by the Connecticut Department of Agriculture listed calabaza among 28 vegetables and herbs most sought after by customers.

The economic potential for this crop is estimated to be high for direct sales to consumers. Based on production in our 2002 trials, average yield was 37.5 tons/acre. Gross returns, at a retail price of \$0.50/lb, exceeded \$37,500/acre. With total cost of production estimated to be \$3,400/acre, net returns would be \$34,100/acre provided the harvested crop was completely sold.

METHODS AND MATERIALS

Soils. Tropical pumpkin trials were conducted at the Valley Laboratory, Windsor on Merrimac sandy loam, a well-drained sandy terrace soil with somewhat limited moisture holding capacity, and at Lockwood Farm, Mt. Carmel on Cheshire fine sandy loam with moderate moisture holding capacity.

Table 1. Pertinent planting and harvest dates.

	2000	2001	2002
Direct seeding in field	June 30	-	-
Seeding in greenhouse	-	May 17	May 8
Transfer seedlings to cold frame	-	June 7	June 5
Transplant seedlings in field	-	June 12-13	June 12-14
Harvest after first light frost	October 24	October 11-15	October 23-28

Cultivars. In 2000, seeds of two short-vine hybrids were obtained from the Gulf Coast Research and Education Center, University of Florida. They included G38-2-22sem (an unreleased hybrid with some parentage similar to cv. La Estrella but with different characteristics) and Compact Hybrid 1 (now released as cv. El Dorado). Also sent was seed of cv. La Primera, a long-vine, open-pollinated cultivar for comparison.

In 2001, seeds of unknown origin (Unknown) were extracted from fruit purchased from a local supermarket. These seeds produced long-vine plants in 2001 trials.

In 2002, seeds of released cultivars El Dorado and La Estrella were obtained from the University of Florida. In addition, seeds of PR Shortvine-1 were obtained from the Agricultural Experiment Station at the University of Puerto Rico, Mayaguez.

Culture. Pertinent dates of planting and harvesting are shown in Table 1. In preliminary trials at Windsor, seeds of each cultivar were sown directly in the field in 50-foot rows spaced 6 feet apart. Groups of 3-4 seeds were spaced 3 feet apart within each row. Germination was poor, resulting in low plant density. In 2001 and 2002, to compensate for the uncertainty of seed germination in the field, seeds were started in a greenhouse in early May for mid-June transplanting. Seeds were sown in 3x3x3-inch Jiffy-strips held in 6-pot packs filled with Promix BX and placed in a greenhouse maintained at 75-90F. After germination, the seedlings were thinned to one/pot. The 4-week-old seedlings were moved to a cold frame for hardening about a week 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. Single rows of long-vine cultivars of winter squash, Castilla and Mexicana, were planted along each side of the plot as guard rows to eliminate edge effects.

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, and rototilled in. After 4 weeks at Windsor, when the plants began to form runners, the rows were sidedressed with calcium nitrate at a rate of 240 lb/acre. At Windsor, total application of nitrogen for the season was 140 lb/acre, at Mt. Carmel 130 lb/acre. Soil pH

was 6.5 at both sites; lime was not applied.

Disease control. From mid-June through early August, black rot and powdery mildew were controlled with applications of Manzate 200DL (mancozeb at 2 lb/acre) + Quadris (azoxystrobin at 6.4 oz/acre) alternating at 10-day intervals with Manzate 200DL (mancozeb at 2lb/acre) + Bravo (chlorothalonil at 2 pt/acre). In 2002, these treatments also controlled anthracnose that developed on the seedlings in the cold frame before setting in the field.

Insect control. At Windsor in 2000-2002, Asana XL (esfenvalerate at 9.6 oz/acre) was applied at 10-day intervals from mid-May through early August (five applications) to control vine borers and cucumber beetles. At Mt. Carmel in 2001 and 2002, no insecticides were applied.

Weed control. At Windsor, weeds were controlled with a post-plant application of Strategy, a mixture of Command ME (clomozone) and Curbit (ethalfuralin) at 3 qt/acre. At Mt. Carmel, weeds were controlled by cultivation. Weeds germinating in the 4-week period following planting were rototilled under until the vines completely covered the spaces between the rows and suppressed further weed germination.

Irrigation. In 2000 at Windsor, no irrigation was needed. In 2001, the crops at both sites were irrigated twice with 0.5-1.0 inches of water in mid-May and late-July. In 2002 at Windsor, the crop was irrigated once (mid-July) while the crop at Mt. Carmel was irrigated twice (July and August) with 1.0 inch of water.

Harvest of fruit. Tropical pumpkin 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, especially those of long-vine cultivars. Special care was taken to determine the source of each fruit. Individual fruit were weighed and judged for maturity. As the fruit matured, the color of the rind changed from green or green-cream mottled to tan or tan-cream mottled. 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. All runners greater than 5 feet long that branched from the crown were severed and their length measured. The distance

Table 2. Departure of monthly rainfall (inches) from normal during May-October at Windsor and Mt. Carmel 2000-2002.

	30-year.	WINDSOR			30-year	MT CARMEL	
	avg.	2000	2001	2002	avg.	2001	2002
May	3.4	1.4	0.6	2.7	3.7	2.6	2.2
June	3.2	3.2	2.5	1.8	2.5	2.5	2.3
July	2.6	2.8	-1.5	0.3	3.2	-1.4	-1.5
August	3.4	-1.1	1.0	0.0	3.9	0.8	-0.2
September	3.4	1.0	0.3	0.6	4.2	-0.9	1.6
October	3.0	-2.1	-2.3	1.1	3.3	-1.4	1.1

from the crown to the location of mature fruit along the runner was also measured. Runners shorter than 5 feet were always barren.

Rainfall. Rainfall distribution at Windsor and Mt. Carmel throughout the tropical pumpkin growing seasons (May through October) for 2000-2002 is shown in Table 2. The inches of rainfall in each column represents the departure from the mean monthly rainfall for Hartford (near Windsor) and Mt. Carmel reported by the National Weather Service. Total rainfall at Windsor during the 2000, 2001, and 2002 growing seasons was 24.3, 19.6, and 25.6 inches, respectively, compared to a 30-year average of 19.0 inches. Total rainfall at Mt. Carmel during the same period was 29.2, 23.0, and 26.3 inches, respectively, compared to a 30-year average of 20.8 inches.

In 2000 at Windsor, rainfall during the growing season was 5.3 inches above normal. Most of the excess occurred between May and July when 16.6 inches of rain fell, accompanied by lower-than-average temperatures. August and October had deficits of 1.1 and 1.2 inches, respectively.

In 2001 at Windsor, total rainfall during the growing season was 19.6 inches or 0.6 inches above normal. Deficits occurred in July (-1.5 inches) and October (-2.3 inches). Although the total rainfall for the growing season appeared normal, the crop was irrigated in May to maintain growth of newly planted seedlings and in July when the plants began to extend their runners. At Mt. Carmel, total rainfall throughout the growing season was 23.0 inches, or 2.2 inches above normal. Although total rainfall for the growing season appeared normal, deficits occurred in July (-1.4 inches), September (-0.9 inches) and October (-1.4 inches). The crop was irrigated twice in July to maintain active growth of vines.

In 2002 at Windsor, total rainfall throughout the growing season was 25.5 inches or 6.5 inches above normal. Only one irrigation was necessary in mid-July to maintain active growth of vines. At Mt. Carmel, total rainfall throughout the growing season was 26.3 inches or 5.5 inches above normal. Although total rainfall was above normal, deficits in July (-1.5 inches) and August (-0.2 inches) required two irrigations to maintain active vine growth.

YIELD OF FRUIT

2000 Crop. Little can be said about the yield of tropical pumpkin at Windsor, the only trial site. The arrival of seed from the Connecticut Department of Agriculture in late June was beyond the normal planting date (early June) for direct seeding. Direct seeding of the three cultivars resulted in poor germination (20-46%) and low plant density. Harvest in October, following a vine-killing frost, revealed that most of the fruit, averaging 6-7 lb, were immature. The rinds of most fruit were green or mottled green and had not attained the tan color of maturity. The color of the flesh was yellow to yellow orange instead deep orange. Despite the relative small size of fruit, about 12% of Compact Hybrid 1, 20% of G38-2-22sem, and 14% of La Primera exceeded 10 lb. G38-2-22sem bore the most fruit/plant (5.6), followed by Compact Hybrid 1 (4.8) and La Primera (2.3). Total yield/acre of immature fruit of 38G-2-22sem and Compact Hybrid 1 was estimated to be 2.7 tons/acre. Poor germination and lack of mature fruit in the preliminary trial suggested that transplants be used in future trials instead of direct seeding.

2001 Crop. At Windsor, average yield of three cultivars was 38.3 tons/acre compared to 42.5 tons/acre at Mt. Carmel, an 11% difference (Table 3). The greater yield at Mt. Carmel, compared to Windsor, was due to a greater average number of fruit/plant (2.9 vs. 2.5, respectively). At both sites, the Unknown cultivar had the greatest yield, exceeding 50 tons/acre largely due to the greatest number of fruit/plant (3.0-3.6).

At Windsor, G38-2-22sem had the heaviest fruit (avg. 14.8 lb) while Unknown had the heaviest fruit at Mt. Carmel (avg. 12.8 lb). The median weight (50th percentile) of G38-2-22sem at Windsor was in the 5-10 lb range while the median weights of Unknown and La Primera were in the 10-15 lb range (Table 4). Eight percent of La Primera's fruit exceeded 20 lb. At Mt. Carmel, the median weights of all cultivars were in the 10-15 lb range. Twelve percent of G38-2-22sem's fruit exceeded 20 lb, among them the heaviest fruit among all cultivars at both sites (27.3 lb).

2002 Crop. At Windsor, average yield of four cultivars

Table 3. Yield of mature tropical pumpkin at Windsor and Mt. Carmel, 2001-2002.

	WINDSOR				MT. CARMEL			
	Plants harvested %	Fruit/ plant #	Avg. wt./fruit lb	Total est. yield** T/A	Plants harvested %	Fruit/ plant #	Avg. wt./fruit #	Total est. yield** T/A
2001								
G38-2-22 sem	100	2.5	10.0	30.1	100	2.5	12.4	37.4
La Primera	100	2.0	14.8	34.8	100	2.6	11.5	36.8
Unknown cv.*	100	3.0	13.6	50.1	95	3.6	12.8	53.3
2002								
PR Shortvine	100	2.3	10.0	28.4	95	3.0	10.1	34.9
La Estrella	100	1.7	15.2	31.3	100	1.4	12.7	20.8
El Dorado	100	3.6	9.3	38.0	100	2.5	10.6	32.1
La Primera	100	3.1	12.9	48.5	100	2.8	10.4	34.6

* Seed extracted from fruit purchased at a local supermarket.

** Estimated yield = $\frac{\text{avg. wt./fruit} \times \text{fruit/plant} \times 2420 \text{ plants/A (spacing } 6' \times 3') \times \% \text{ plants harvested}}{2000}$

Table 4. Percent weight distribution in pounds of mature tropical pumpkin at Windsor and Mt. Carmel, 2001-2002.

	WINDSOR				MT. CARMEL			
	5-10	10-15	15-20	20+	5-10	10-15	15-20	20+
2001								
G38-2-22 sem	60	18	18	4	36	36	16	12
LA Primera	5	51	36	8	23	58	19	0
Unknown cv.	18	43	34	5	26	46	24	4
2002								
PR Shortvine	59	28	9	4	61	30	9	0
La Estrella	38	32	27	3	19	52	22	7
El Dorado	71	26	3	0	38	62	-	-
La Primera	44	45	11	0	49	38	11	2

was 36.6 tons/acre compared to 30.6 tons/acre at Mt. Carmel, a 20% difference (Table 3). The greater yield at Windsor was due to greater average fruit/plant (2.7 vs. 2.4) and a greater average weight/fruit (11.8 lb vs. 11.0 lb). At Windsor, long-vine La Primera had the greatest estimated yield (48.5 tons/acre). At Mt. Carmel, estimated yields of La Primera and PR Shortvine exceeded 34.0 tons/acre. At both sites, La Estrella had the fewest fruit/plant (1.4 and 1.7) but their fruit were heaviest (12.7 lb and 15.2 lb). At Windsor, El Dorado had the greatest number of fruit/plant (3.6) but the lowest average weight/fruit (9.3 lb) compared to all other cultivars.

At Windsor, the median weight of PR Shortvine and El Dorado was in the 5-10 lb range while the median weight of La Estrella and La Primera was in the 10-15 lb range (Table 4). At Mt. Carmel, the median weight of PR Shortvine was in

the 5-10 lb range while all others were in the 10-15 lb range. About 30% of La Estrella's fruit exceeded 15 lb at both sites, among them the heaviest fruit (27.1 lb)

FRUIT AND PLANT CHARACTERISTICS

Fruit size. In 2002 at both sites, mature fruit were randomly sampled and measured for fruit diameter and seed cavity diameter to determine the thickness of the flesh. At Windsor, the difference in the average fruit diameter of each cultivar varied less than 1 inch (Table 5). The average diameter of La Estrella was largest (8.3 inches) and El Dorado the smallest (7.5 inches). At Mt. Carmel, the average fruit diameter among all cultivars varied nearly 3 inches. La Estrella had the largest diameter (9.7 inches) and PR Shortvine had the smallest diameter (6.7 inches).

Table 5. Average fruit characteristics of mature tropical pumpkins at Windsor and Mt. Carmel, 2002.

	WINDSOR			MT. CARMEL		
	Fruit dia. inches	Seed cavity dia. inches	Flesh thickness inches	Fruit dia. inches	Seed cavity dia. inches	Flesh thickness inches
PR Shortvine	7.9	4.1	1.9	6.7	3.8	1.4
La Estrella	8.3	5.3	1.5	9.7	6.0	1.9
El Dorado	7.5	3.9	1.8	7.7	4.1	1.9
La Primera	8.0	4.9	1.6	7.2	4.0	1.6

At Windsor, average diameter of the seed cavity of each cultivar ranged from 3.9-5.3 inches, at Mt. Carmel from 3.8 to 6.0 inches (Table 5). At Windsor and Mt. Carmel, La Estrella had the largest seed cavity (5.0 and 6.0 inches, respectively). The average thickness of the flesh was determined by: fruit diameter minus seed cavity diameter divided by 2. At Windsor, La Estrella had the smallest flesh thickness, but, at Mt. Carmel, its thickness was among the greatest of all cultivars because the fruit diameter was also large. At Windsor, PR Shortvine and El Dorado had relatively small seed cavities and thick flesh. At Mt. Carmel, seed cavities of PR Shortvine, El Dorado, and La Primera varied only 0.3 inches. El Dorado had thick flesh at both sites (1.8-1.9 inches).

Vine length. At Mt. Carmel, vine characteristics were determined for randomly selected plants in each cultivar. The vines began to run 3-4 weeks after transplanting. Among the plants selected, the crown divided into 2-11 runners within 1 foot of the crown. PR Shortvine had the greatest average number of runners (6.9/plant), followed by El Dorado (6.3/plant) (Table 6). La Estrella and La Primera developed the fewest runners (5.6/plant). 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 (Table 6). Few, if any, mature fruit of short-vine cultivars developed near the crown, as reported by Maynard et al. (2002) in Florida.

Not all runners that branched from the crown produced fruit. La Primera, whose average number of fruit/plant was low, produced mature fruit on more than 60% of its runners. PR Shortvine produced mature fruit on 50% of its runners. Productive runners of El Dorado (39%) and La Estrella (35%) were lowest. Among the 71 runners measured for length, one runner produced two mature fruit, one runner produced two immature fruit, 29 runners produced one mature fruit, three runners produced one immature fruit, and 37 runners were barren.

MANAGEMENT STRATEGIES

Direct seeding vs. transplants. In 2000, direct seeding of three cultivars of tropical pumpkin on June 30 resulted in poor germination (20-47%) and stand density. The fruit, harvested 117 days later on October 24, were smaller than normal and mostly immature. Direct seeding in early-June and at a time when soil moisture was abundant may have increased germination and allowed greater time for the fruit to mature before the first frost. To eliminate the uncertainties of weather for optimum germination, transplants were used in 2001 and 2002. Seeds were started in a greenhouse in mid-May and transplanted in the field in mid-June. This tactic not only provided optimum plant density but also the plants were already 30 days on their path to maturity by the time they reached the field. At harvest, in early-October, most fruit were fully mature with suitable color, texture, and taste for the table. The use of transplants is essential for long-vine cultivars such as La Primera because its maturity is reported to be about 115 days (Volin 1979). Direct seeding of the new short-vine cultivars El Dorado, La Estrella, and PR Shortvine in early-June is possible because their maturities have been reported to be about 80-90 days (Maynard and Wessel-Beaver, personal communications)

Cultivar selection. Short-vine cultivars may be preferred

Table 6. Vine length, distance of fruit from planting site, and percent of vines producing at least one fruit in four cultivars of calabaza at Mt. Carmel, 2002.

	Avg. vines/plant no.	Avg. length ft.	Avg. dist. in ft. to first fruit	Fruit bearing vines %
P.R. Short-vine	6.9	10.9	6.5	50
La Estrella	5.6	16.2	10.0	35
El Dorado	6.3	11.8	8.2	39
La Primera	5.6	24.0	15.2	61

because of their lower space requirements. Although the trials did not include spacing requirements, the initial spacing of 6x3 feet (a population of 2,420 plants/acre), irrespective of vine length, created yields in excess of 30 tons/acre. Long-vine cv. La Primera consistently had the greatest yields but some plants produced fruit whose shapes were oblate or oblong instead of spherical. Short-vine La Estrella produced the largest fruit on vines of intermediate length. Its productivity was lowest among all cultivars because it set the fewest fruit/plant. El Dorado produced the greatest number of fruit/plant. Their fruit were smaller than other cultivars, but the seed cavities were also small. The flesh of the uniformly round fruit was nearly 2 inches thick and a desirable deep-orange color. The yields of short-vine cv. PR Shortvine were quite variable. It had the greatest yield among all cultivars at Mt. Carmel (35 tons/acre) and the lowest yield at Windsor (28 tons/acre). The fruit was mostly in the 5-10 lb range with a deep orange color and small seed cavity. Its vines were shortest among all cultivars (avg. 10.9 feet) and its fruit formed closest to the crown (avg. 6.5 feet). The fruit had a variety of shapes (spherical, oblate, or oblong) that was consistent with its open-pollinated heritage. The seed stock received for trial was not in its final form before its commercial release (Wessel-Beaver, personal communication).

For the 2003 growing season, a limited amount of seed of La Estrella is available commercially (Rupp Seeds, 17919 County Road, Wauseon, OH 43567). For the 2004 growing season, both El Dorado and La Estrella should be available from the same source. Most growers of long-vine varieties in the Caribbean Islands and Florida harvest seed from their current crop for future plantings. These seeds, however, are subject to genetic contamination (Maynard 2002). Seed from long-vine varieties may also be salvaged from calabaza purchased at local grocery stores and supermarkets, when available. The fruit is generally sold in halves or quarters with the seed intact. The seed, extracted from the cavity, washed, and thoroughly dried is usually viable if the fruit is fully mature when harvested.

Plant density. Recommended spacing for long-vine cultivars is 6-12 feet between rows and 4-6 feet within rows (Cuniowski et al. 1998). For short-vine cultivars, spacing is 5-6 feet between rows and 3-4 feet within rows (Wessel-Beaver, personal communication). Although spacing requirements were not investigated in these trials, a spacing of 6x3 feet was shown to be adequate. At this spacing, the field became rapidly carpeted with vines about 6 weeks after transplanting and discouraged germination and growth of weeds.

Fertilization. Nutrient requirements for tropical pumpkin should follow recommendations offered for pumpkin and squash listed in the 1998-1999 New England Vegetable Management Guide (Ferro, et al. 1999). In these trials, the fertilizer applied was based on soil tests. In the sandy, easily-

leached soil at Windsor, 1000 lb/acre of 10-10-10 was applied, pre-plant, followed by a sidedress application of calcium nitrate just as the vines began to run (4 weeks after transplanting). In the heavier loamy soil at Mt. Carmel, a single pre-plant application of 1300 lb/acre of 10-10-10 maintained adequate nutrient supplies throughout the growing season.

Weed control. Weeds were controlled by a pre-plant application of herbicide (Windsor) or mechanical cultivation before the vines begin to run (Mt. Carmel). No further control was necessary after the vines formed a carpet in the areas between the rows. Growth of long-vine cultivars is very aggressive. For example, in 2001, the vines of Le Primera climbed a 3-foot high snow fence located 15 feet from the row to deter deer from browsing sweet potato vines in an adjacent plot. Several tropical pumpkin fruit were harvested among the sweet potatoes.

Disease control. Tropical pumpkin is susceptible to powdery mildew and downy mildew. Control is essential to prevent late-season defoliation of leaves that support growing fruit. Without control, only the first-formed fruit will mature and reach marketable size. The materials listed previously under *Culture* adequately controlled both mildews. Tropical pumpkin plants are tolerant of watermelon mosaic virus and bacterial wilt spread by cucumber beetles (Cuniowski et al. 2001)

Insect control. Cucumber beetles that carry bacterial wilt were present in the tropical pumpkin plots at both sites in 2001 and 2002 but caused no damage to the crop. A long-vine winter squash cultivar, Mexicana, used as a guard row in 2001 and 2002, was highly susceptible to bacterial wilt in both years at Mt. Carmel (no insecticides used) but not at Windsor where insecticides were used to control cucumber beetles.

Harvesting. As tropical pumpkin matures, the color of the rind changes from green or green-cream mottled to buff or buff-cream mottled. The initial shiny rind of the immature fruit gradually develops a waxy coating when mature. To prolong storage, the fruit should be harvested with at least 1 inch of stem remaining. Under ideal conditions, fruit stored at 50F temperature and 50% relative humidity should last several months. Cracked, damaged, or stemless fruit will last only a week or two. Fruit exposed to freezing temperatures will lose their waxy coating and deteriorate rapidly. In local markets, tropical pumpkin is usually halved or quartered, wrapped in clear plastic film, and displayed with its seeds intact. The color and thickness of the internal flesh is highly important to the consumer. Dark-yellow to deep-orange colors are preferred. Light yellow flesh may signify immaturity. Cut tropical pumpkin, tightly wrapped in clear film, can be held up to 2 weeks in a refrigerator. Cooked tropical pumpkin may be stored in a freezer up to a year.

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