

Yield, Income, and Quality of Staked Tomato Cultivars in Central Kentucky

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Kentucky growers currently produce about 1200 acres of staked, vine-ripe tomatoes for local and national markets. Kentucky tomatoes have an excellent quality reputation among buyers in several midwestern states. We continue to test new and existing commercial fresh market tomato cultivars to support the existing industry and to identify any cultivars that might be featured in supermarkets as a premium “Kentucky Tomato”. We evaluated cultivars for yield, appearance, firmness, and taste and compared them with well-established cultivars like Mountain Spring and Mountain Fresh. We were looking specifically for the following characteristics in the “Kentucky Tomato”:

1. large slicer that tastes good
2. ships reasonably well (firm, but not necessarily the most firm among cultivars)
3. high yields of extra-large and jumbo size classes
4. low frequency of fruit defects

Some of the varieties identified as superior in 1998-99 trials were again evaluated for these traits (except for taste) in 2004 and 2005. Three varieties included in the 2005 trial (Quincy, Amelia, and BHN 444) claim to have resistance to tomato spotted wilt virus (TSWV), which has become a major problem in some neighboring states. See the tomato cultivar trial report from eastern Kentucky for more detailed descriptions of the varieties tested.

Materials and Methods

A carefully selected group of 14 determinate tomato varieties from several seed companies was evaluated at Lexington in central Kentucky and at Quicksand in eastern Kentucky (see separate report). Two popular cultivars, Mountain Spring and Mountain Fresh Plus, were included for comparison with new cultivars. Mountain Fresh Plus is essentially the same variety as the old Mountain Fresh but with the addition of root knot nematode resistance. All trial entries were seeded in the greenhouse at the Horticultural Research Farm in Lexington on 23 March and subsequently transferred to 72-cell plastic trays. Cultivars were transplanted to the field on 12 May. Cultivars were planted in a randomized complete block design with four replications. Plots consisted of eight plants spaced 18 in. apart in single rows on 6-in. high raised beds spaced 6 ft. apart with black plastic mulch and drip irrigation.

Drip irrigation was applied as needed according to tensiometers used to monitor soil moisture. Plants were staked and tied using the Florida weave system and pruned to two main stems except for SunShine which was not pruned. Sixty pounds/acre of nitrogen, no phosphorus, and 103 lbs/acre of potassium (K₂O) were applied prior to bed formation. A total of 122 lbs/acre of supplemental N (from ammonium nitrate) was fertigated in 11 applications during the season; an additional 40 lbs/acre of potassium (from potassium nitrate) was fertigated in a single application. Plots were sprayed weekly with protectant fungicides (fixed copper plus Maneb, alternated with copper plus either Bravo or Quadris). Four insecticide sprays (Pounce,

Baythroid, or SpinTor) were required during the season for Colorado potato beetle and tobacco hornworm control.

Ten harvests were made from 11 July until 22 Aug. Fruit were graded into the following size classes prior to counting and weighing: Jumbo (>3.5 in. diameter), extra-large (>3 in. but ≤ 3.5 in.), large (>2.5 in. but ≤3 in.), medium and small (≤2.5 in) and cull. Fruits were also sorted according to U.S. No. 1 or U.S. No. 2 grades. In order to approximate the present marketing situation in Kentucky, “marketable yield” included only the “large” and above size classes. Yields of the “medium” size class are reported together with the small class as they are not considered worth marketing by most grower/shippers in the state. All yields reported are of U.S. No. 1 fruit unless otherwise indicated. Yields of No. 2 fruits, although marketable in most years, were not included in “marketable yield” and are reported in separate columns in the tables. Means of all variables were compared using Waller-Duncan’s K-ratio T-test (P = 0.05).

Income-per-acre. In addition to reporting yields in pounds or cartons per acre, variety performance is also expressed as income per acre. We used 2003 wholesale prices received by Cumberland Farm Products cooperative (Table 1) which were similar to those from 1999-2002. These weekly market prices were multiplied by yields from the different size classes for each variety. Higher prices used for the first three weeks of harvests favor earlier-maturing varieties. Higher prices were also obtained for the “extra large/jumbo” size class. Yields of No. 2 fruits were also used in these calculations but usually with lower prices than No. 1 fruits. We consider the incomes per acre together with fruit quality observations to provide the best indication of overall variety performance.

Fruit quality ratings. All ripe fruits of each variety harvested on 22 Aug. (final harvest) were laid out on tables for careful examination and quality ratings on 23 Aug. All cultivars were rated for smoothness, blossom scar size, extent of cracking, firmness, and internal color. The overall appearance rating took most of these factors into account.

Results and Discussion

The 2005 growing season was abnormally hot and dry. Very cool night temperatures occurred just after transplanting which led to relatively low fruit appearance ratings and a greater than normal amount of cull fruit (21-53%) due to catfacing and other defects from the earlier harvests. Late harvests were affected by bacterial canker (*Clavibacter michiganensis*) which had spread to almost all plots in the field by mid-August. The occurrence of this disease late in the season probably resulted in lower than expected yields from some of the main season and later maturing varieties.

Yields and Incomes. Yields and incomes per acre were low this year because of the impact of bacterial canker resulting in fewer harvests. Because of the effects of this disease, no firm conclusions should be drawn using these data. Under these conditions, the highest yielding and highest income cultivar by far was the very early-maturing SunShine (Table 2). This variety escaped most of the yield loss due to canker and its early yields obtained the highest market prices. Debut was also very early resulting in the second highest income per acre. The main season variety Mountain Spring Plus had the second highest yields of jumbo and extra large fruits and was third highest in income. Incomes ranged from \$6000/acre for SunShine to \$1525/acre for RFT 6153 (Table 2).

Fruit quality. Among the group of varieties with the highest incomes, Sunguard, Mtn.

Fresh Plus, and Quincy had the highest fruit appearance scores (Table 3). SunShine could not be rated for appearance since too few fruits were available late in the season when the varieties were evaluated. Debut, while in a high income group, had a very low appearance score at this late harvest. Poor quality late in the season has been noted in other trials for other very early varieties including SunShine and SunStart. Other varieties with high appearance scores of 6 or above were SunGuard, Biltmore, Soraya, Crista, Mtn. Spring, Mtn. Crest, BHN 543, and RFT 6153. SunGuard and Mtn. Crest had the best overall appearance scores while Applause and Debut had the worst (Table 3).

All things considered. Given the problem with bacterial canker that affected most varieties, it is difficult to come to any firm conclusions regarding variety performance from the yield and income data in this trial. As has been shown in previous trials, very early varieties like SunShine, SunStart and Debut can produce high returns per acre when early season prices are high; however, fruit quality deteriorates rapidly as the season progresses. Debut should be compared with SunShine and other varieties for fruit appearance early in the season in 2006. Most of the varieties tested in 2005 look promising and will be tried again in 2006. As for as fruit appearance and quality, SunGuard was again one of the best cultivars in this trial and in trials conducted in 2003 and 2004 (see 2003 and 2004 Research Reports). Mountain Crest, a new variety with extended shelf life and dark red internal color, also rated highest for fruit appearance in 2004 and 2005.

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Table 1. Actual farm gate prices paid by Cumberland Farm Products Cooperative in 2003. Yields of each size class/grade were multiplied by these prices for the appropriate harvest dates to calculate "income per acre" for each cultivar.

Week ending	#1 Jumbo & X-large	#1 Large	#2's (Jumbo,X- lg,Lg,Med)
	-----price per pound-----		
22 July	\$0.34	\$0.21	\$0.22
29 July	0.30	0.17	0.22
5 Aug	0.29	0.15	0.19
12 Aug	0.20	0.11	0.09
19 Aug	0.12	0.09	0.08
20 Aug-28 Sept ^z	0.10	0.05	0.06

^zCumberland Farm Products Cooperative discontinued packing on 19 August. We used prices slightly lower than their 19 Aug prices for income calculations for all trial harvests after that date.

Table 2. Yields, fruit size, and income from staked tomato cultivars at Lexington, Kentucky, 2005; all data are means of four replications.

Entry (Seed Co.)	--#1 Jumbo + XL ¹ --		Total mkt ² (thousand lbs/acre)	#2's ³	Culls ⁴ (%)	Avg. fruit wt. (oz.)	Income (\$/acre)
	(boxes/acre)	(%)					
Sunshine (SM)	1446	63	57.4	12.4	23	10.2	6000
Min. Fresh Plus (HM)	1333	73	46.8	8.5	21	11.3	3491
Biltmore (SM)	1233	90	34.8	7.1	34	13.7	2682
Quincy (SM)	1128	74	37.6	6.0	29	11.7	3401
Soraya (RG)	1032	79	32.6	5.0	31	11.4	2725
Debut (SM)	999	82	30.0	13.1	33	12.1	3831
Amelia (HM)	986	83	29.2	12.2	32	12.4	3018
Crista (HM)	975	83	29.3	4.9	37	12.5	2963
Mtn. Spring (HM)	927	82	28.0	8.8	37	12.3	3056
Sunguard (SM)	856	69	30.4	6.9	29	10.7	3108
Indy (RG)	839	63	33.1	14.0	27	10.4	3179
Mtn. Crest (HM)	791	78	25.2	8.3	40	11.3	2552
Applause (SM)	647	80	20.2	11.0	48	11.9	2479
BHN 543 (BHN)	612	67	22.6	8.0	48	10.7	1730
RFT 6153 (RG)	546	60	23.0	5.0	42	9.8	1525
BHN 444 (BHN)	512	71	18.6	12.4	53	10.5	1756
<i>Waller-Duncan</i> <i>LSD (P = 0.05)</i>	288		9.0	4.0	11	1.1	805

¹Yields of USDA No. 1 fruit of jumbo (>3.5 in. diameter) *plus* extra large (>2.75 in. but ≤ 3.5 in.) size classes:

boxes/acre = number of 25 lb cartons per acre: "%" = percentage of the total of these two size classes of the *total marketable yield*.

²Total marketable yield = yield of No. 1 fruit of jumbo + extra large + large size classes; mediums not included.

³Yield of USDA No. 2 fruit from all size classes.

⁴Percentage of culled fruit in total yield.

⁵Average fruit weight; includes jumbo, extra large, and large only.

Table 3. Fruit quality characteristics; observations from all fruits harvested from four replications on 22 August, 2005. Cultivars ranked in order of yield of #1 Jumbo + Extra Large fruits.

Cultivar (Seed Co.)	Shape	Blossom scar ²	Smooth-ness ³	Cracking ⁴	Appearance ⁵	Firmness ⁶	Internal Color ⁷	Comments
SunShine (SM)	do	s	2	-	-	-	4	sample size too small at late harvest
Mtn. Fresh Plus (HM)	g	s-m	3	2	6	m	5	
Baltimore (SM)	do-g	s	3	2.5	6	m	4	some weather checking on shoulders
Quincy (SM)	dg	m	3	1.5	6	m	3	
Soraya (RG)	g	s	2	1.5	6	f	3	
Debut (SM)	o	s-m	3	4	3	m	4	badly cracked at this harvest
Amelia (HM)	do	m	3	2	5	f	3	
Crista (HM)	do	s	3	2	6	f	3	badly cracked and catfaced
Mtn. Spring (RG)	do	s	3	2	6	m	3	
SunGuard (SM)	dg	s	2	1	7	m	3.5	
Indy (RG)	dg	s	3	2	5	m	3	
Mtn. Crest (SU)	g	s	2	1	7	f	4	
Applause (SM)	o	s-m	4	4	2	S	3	
BHN 543 (BHN)	dg	S	2	3	6	M	3	
RFT 6153 (RG)	g	s-m	3	2	6	M	4	
BHN 444 (BHN)	dg	S	2	3	5	M	3	

¹Fruit shape: 0=oblate; do=deep oblate (diameter somewhat greater than height); g=globe (spherical); dg=deep globe.

²Blossom scar size: s=small (< .5 in. diameter), m=medium (.5 to 1 in.), lg=large (5/16 to 7/16 in.).

³Smoothness of fruit shoulders: 1=smooth, 5=rough (ribbed on top of fruit).

⁴Fruit cracking: 1=none, 5=severe.

⁵Overall fruit appearance rating: 1=worst, 9=best.

⁶Fruit firmness by feel: s=soft, m=medium firm, f=very firm.

⁷Internal fruit color: 1=whitish (worst), 5=uniformly deep red (best).