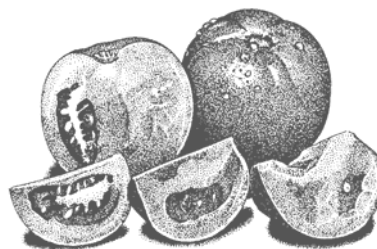
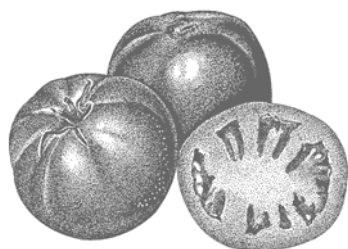


# FRESH MARKET TOMATO

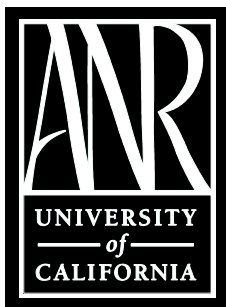


**2004**

## **Variety Trials In San Joaquin and Stanislaus Counties**

*Including Results From*

**THE STATEWIDE FRESH MARKET TOMATO  
COMBINED VARIETY TRIALS**



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Cooperative Extension  
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Stockton, CA 95205**

**2004**  
**SAN JOAQUIN AND STANISLAUS COUNTIES**  
**FRESH MARKET TOMATO VARIETY TRIALS**

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The need to find fresh market tomato varieties with disease and nematode resistance, as well as improved horticultural characteristics (fruit size, firmness, color, smoothness, easy stemming or jointless stems, small blossom and stem scars, less fruit cracking and better flavor), along with yield potential, continues to be of great importance to fresh market tomato growers and shippers in both San Joaquin and Stanislaus Counties.

Contributing to this increased need is the fact that all of the suitable ground for tomatoes has been cropped to either fresh market or processing tomatoes at one time or another over the years and particularly over the past few seasons. Resistance of varieties to both Races 1 and 2 *Fusarium* wilt is very common. Virtually all lines have resistance to Race 1 of *Verticillium* wilt, but there is no known resistances to *Verticillium* wilt Race 2. Presence of the disease in local fresh market tomato fields has been limited but is increasing. Potential loss of soil fumigation materials has caused seed breeders to develop nematode resistance in most of their newer lines. Many of the newer lines also possess tobacco mosaic, *Alternaria* and *Stemphyllim* resistance, and a few have bacterial speck resistance. Additional concerns by growers and shippers relate to effective management of powdery mildew and Phytophthora late blight, particularly with anticipated and actual losses of fungicides due to recent and proposed legislation and voluntary withdrawal of some fungicides by chemical manufacturers, as well as current pathogen resistance to some existing fungicides. Possible loss of certain insecticides increased the need for varietal resistance efforts in this area. Insect resistance to insecticides is a continuing concern as well.

Another source of concern to growers is the nagging uncertainty of an adequate labor force to harvest the crop. Acreage in the San Joaquin-Stanislaus district has stabilized, after increasing dramatically over the past few years. Interest is high in developing varieties that will retain good horticultural and yield characteristics and yet lend themselves to hand picking and/or mechanical harvest. With this in mind, a number of varieties from private seed company breeding programs have been evaluated for both jointless or “arthritic” stem characteristics.

The bottom line in varietal development and acceptance revolves around having cultivars that yield and ship well enough to offset increased production costs, while providing the quality and flavor characteristics buyers and consumers demand.

## 2004 Variety Trials

During 2004, two fresh market tomato variety trials (one evaluating standard commercial Round lines and the other looking at commercial “Roma-type” cultivars) were cooperatively conducted in the northern San Joaquin Valley with Triple “E” Produce (Nate and Joe Esformes and Tom Guido) southeast of Stockton, California near Farmington off Highway 4. Additional monetary support for conducting the trials was provided by the California Tomato Commission and its President, Ed Beckman, Chairman, Jeff Dolan, and Research Coordinator, John Le Boeuf, as well as participating seed companies. Input from the field managers and shed owners of a number of fresh market shippers in the San Joaquin Valley on selection of varieties evaluated in the trials was most appreciated.

The trial of Round varieties contained eight replicated lines with an additional 17 cultivars in single replication observation plots. The “Roma-type” trial contained six replicated lines with another six varieties in observation plots. Transplants for both trials were produced by Craven Transplants (Todd and Grant Craven) near Crows Landing, California. The field variety around the trials was Bobcat.

Both trials were transplanted on June 9, 2004, under warm, almost ideal, climatic conditions. The field was drip irrigated and an application of water to the trial area of the field occurred about three days after transplanting. The soil type at the trial field was a Landlow adobe clay. Stand survival and plant growth in the two trials was excellent throughout fruit set and development. A low area in a portion of the third replication of both the Round and “Roma-type” trials experienced some water damage and subsequent reduced yields in that area on a few of the varieties. The trials were hand harvested on August 31, 2004 for the “Roma-type” trial and on September 1, 2004 for the Round variety trial. Yields were very good to excellent with many of the lines tested. A minimal to moderate amount of worm damage occurred in some lines along with a spotty infection of Powdery Mildew. Fruit samples were taken from every plot in both trials to get an accurate picture of both crop maturity and fruit size.

Complete data on yield and fruit size for the Replicated Round varieties are given in **Table 1**. The best yield of marketable red and green fruit was achieved by QualiT 23 at 34.4 tons/acre, followed by QualiT 21 (33.3 tons/acre), Bobcat (31.1 tons/acre) and Catalyst (30.9 tons/acre). Fruit size was predominantly extra large and large for all of the replicated varieties. Figures are also provided on non-market yield (small size fruit and culls), as well as percent red fruit at harvest.

In the single replication Observation Round variety block, the highest yield of marketable red and green fruit was produced by RFT 500311 at 40.1 tons/acre, followed by BHN 654 and AT 37, both at 35.2 tons/acre, RFT 500312 (34.0 tons/acre), BHN 682 (31.0 tons/acre), L-311 (28.0 tons/acre), Sunbrite (27.4 tons/acre), BHN 681 (26.1 tons/acre) and RFT 500305 (26.0 tons/acre). As with the replicated trial most observation lines had predominantly extra large and large size fruit. **Table 2** provides complete yield and fruit sizing data, as well as percent red fruit at harvest, for Round lines in the observation block.

Fruit quality characteristics such as varietal maturity, fruit shape and size, fruit smoothness and firmness, fruit set, stemability of fruit, along with observations on vine cover and other field notes are provided in **Table 3A** for the Replicated Round varieties and **Table 3B** for the Observation Round lines.

In the “Roma-type” fresh market tomato variety trial, the best yield, among the replicated lines, of marketable red and green fruit occurred with Miroma at 22.6 tons/acre, followed by RFT 8109 (22.2 tons/acre), BHN 523 (18.3 tons/acre) and Monica (18.0 tons/acre). Yield, crop maturity and fruit sizing data are contained in **Table 4**. The majority of the varieties in the Replicated Roma block produced greater than 65 percent large and medium size fruit.

In the Observation Roma trial area, the best yield of marketable red and green fruit was reached by HA 3824 at 20.3 tons/acre, followed by HA 3811 (19.6 tons/acre). The remaining lines produced lower yields and had generally smaller fruit. HA 3513 and HA 3512 were high lycopene lines that were very late maturing with resultant high levels of green and small fruit. **Table 5** gives data on yield, crop maturity and fruit size for all of the lines in the “Roma” observation block.

Observations on crop maturity, fruit shape, fruit smoothness and firmness, fruit set and size, stemability of fruit, along with notes on vine cover and other variety field comments are shown in **Table 6A** and **Table 6B** for both the replicated and observation “Roma-type” cultivars in the trial.

From the standpoint of overall fruit quality, the leading Round replicated lines were QualiT 23, Bobcat and Catalyst, while the best Round observational varieties were RFT 500311, BHN 654, BHN 682, RFT 500312 and AT 37. Best overall fruit quality in the “Roma-type” replicated trials was achieved by Miroma, RFT 8109 and BHN 523, while in the observation Roma trial, the best overall fruit quality lines were HA 3811, HA 3824 and HA 3513.

A comprehensive report by Marita Cantwell, Extension Postharvest Specialist at UC Davis, on postharvest evaluation of fruit from replicated lines and selected observation cultivars in the four variety trials (three Round and one Roma) that were conducted this year by farm advisors in Tulare/Kings, Merced and San Joaquin/Stanslaus Counties is included in this research progress report. Factors such as fruit color, firmness, soluble solids (°Brix), titrateable acidity and fruit composition at the mature green and vine-ripe stage of maturity were evaluated.

### **MANY THANKS**

Many thanks to Tom Guido, Nate and Joe Esformes and Mike Guido (Triple “E” Produce Co. and Farms) for their participation and cooperation in the two variety trials conducted in 2004. Thanks also to Ed Beckman and John Le Boeuf and the other members of the California Tomato Commission Research Committees for their continued support of variety evaluation and pest management research. Thanks also to Marita Cantwell (UC Cooperative Extension Postharvest Specialist at UC Davis) and her crew for their continued and tireless help in postharvest evaluation of the fruit from many of the cultivars tested in the variety trials. Also, a special thanks to Michelle Le Strange (Farm Advisor in Tulare and Kings Counties) for the outstanding Statewide Combined Variety Trial report she prepares. It takes a great deal of time to combine the data from the three Round variety trials conducted in 2004 in the San Joaquin Valley and to statistically analyze the results. Finally, thanks also to the participating seed companies for providing the basic materials for the trials as well as their continued financial support to the UC Farm Advisor Statewide Fresh Market Tomato Variety Evaluation project.

**2004 Fresh Market Tomato Varieties  
Round Lines**

<b>Replicated</b>	<b>Observation</b>		<b>Seed Company</b>
BHN 580	BHN 654 BHN 681	BHN 682	BHN Seed Company
L-312	L-310	L-311	LSL Plant Science
Shady Lady	SRT 6762 SRT 6763	SRT 6764 SRT 6765	Sunseeds
SVR 2935	Sunbrite		Seminis Seed Company
Bobcat Catalyst	QualiT 21 QualiT 23	RFT 500305 RFT 500312	RFT 500311 Syngenta Seed (Rogers Brand)
	AT 37		American Takii
	HA 3613 HA 3641	HA 3640	Hazera Genetics Ltd.

**Table 1.**

2004 Fresh Market Tomato Variety Trial  
Triple "E" Produce - Farmington, California  
Replicated Round Varieties

Variety	Market Yield/Acre <sup>1</sup>		% Market Yield <sup>1</sup>			Non Market Yield <sup>1</sup>		Total Yield <sup>1</sup>	% Red <sup>1</sup>
	Tons	Boxes	X-Large	Large	Medium	Small T/A	Culls T/A	T/A	
QualiT 23	34.4	2,754	57.7	32.8	9.5	4.7	2.8	41.9	8.9
QualiT 21	33.3	2,660	66.1	32.2	1.7	4.9	5.5	43.7	6.8
Bobcat	31.1	2,490	63.8	32.8	3.4	4.7	4.2	40.0	7.0
Catalyst	30.9	2,470	61.7	35.0	3.3	3.8	4.0	38.7	9.8
L-312	25.2	2,018	65.8	32.6	1.6	5.9	7.0	38.1	15.2
Shady Lady	24.6	1,966	48.0	37.3	14.7	4.6	2.8	32.0	15.3
BHN 580	24.0	1,922	49.2	44.3	6.5	6.0	4.6	34.6	9.5
SVR 2935	22.0	1,756	55.0	40.1	4.9	5.5	3.4	30.9	9.5
Average:	28.2	2,256							
LSD @ 0.05:	8.1	648							
C.V.:	19.5%	19.5%							

<sup>1</sup> Average of four replications

**Table 2.**

2004 Fresh Market Tomato Variety Trial  
Triple "E" Produce - Farmington, California  
Observation Varieties

Variety	Market Yield/Acre <sup>1</sup>		% Market Yield <sup>1</sup>			Non Market Yield <sup>1</sup>		Total Yield <sup>1</sup>	% Red <sup>1</sup>
	Tons	Boxes	X-Large	Large	Medium	Small T/A	Culls T/A	T/A	
RFT 500311	40.1	3,208	63.8	34.6	1.6	2.6	2.8	45.5	8.1
BHN 654	35.2	2,816	50.8	46.3	2.9	5.2	3.3	43.7	13.1
AT 37	35.2	2,816	64.9	33.5	1.6	7.3	5.8	48.3	15.5
RFT 500312	34.0	2,720	49.4	40.1	10.5	6.5	5.3	45.8	12.0
BHN 682	31.0	2,480	43.0	38.5	18.5	4.6	0.9	36.5	5.5
L-311	28.0	2,240	58.2	35.2	6.6	6.1	4.3	38.4	25.6
Sunbrite	27.4	2,192	58.6	27.6	13.8	4.8	3.0	35.2	17.1
BHN 681	26.1	2,088	42.4	37.6	20.0	3.7	3.9	33.6	23.2
RFT 500305	26.0	2,080	48.3	32.5	19.2	3.7	1.0	30.7	11.3
L-310	24.4	1,952	53.8	42.8	3.4	5.3	8.5	38.2	7.9
HA 3640	22.7	1,816	59.7	34.7	5.6	5.7	2.8	31.2	44.4
HA 3613	22.5	1,800	39.0	45.4	15.6	4.8	2.2	29.5	35.3
SRT 6763	22.0	1,760	42.9	39.3	17.8	4.8	2.0	28.8	13.1
SRT 6762	18.5	1,480	39.4	35.0	25.6	9.4	3.5	31.4	7.9
SRT 6765	16.6	1,328	24.4	31.1	44.5	7.6	0.9	25.1	13.9
HA 3641	16.5	1,320	48.9	35.0	16.1	9.6	7.1	33.2	25.8
SRT 6764	16.3	1,304	34.5	48.3	17.2	7.4	2.8	26.5	20.5

<sup>1</sup> Average of only one replication

**Table 3A.**

2004 Fresh Market Tomato Variety Trials  
 Triple "E" Produce - Farmington, California  
 Replicated Trial – Round Lines

Variety	Maturity <sup>1</sup>	Fruit <sup>2</sup> Shape	Fruit <sup>3</sup> Smoothness	Fruit <sup>4</sup> Firmness	Fruit Set	Stem- <sup>5</sup> ability	Vine Cover	Fruit <sup>6</sup> Size	Other Notes
QualiT 23	M	FR-G	4.0	4.0	Good	3.0	Good	ML-XL	Some worm damage
QualiT 21	M-ML	FR-G	3.5	3.5	Good	3.0	Good	ML-XL	Some sunburn and worm damage, some fruit a bit rough with sutures
Bobcat	M-ML	FR-G	3.5	4.0	Good	3.0	Pretty Good	ML-XL	Some worm damage and a few rough fruit
Catalyst	M-ML	FR	3.5	3.5	Fair to Good	3.5	Fair	M-XL	Some worm damage and a few catface fruit
L-312	M	FR	2.5	3.5	Good	3.5	Fair to Good	M-XL	Some high shoulder fruit and some catface and worm damage
Shady Lady	M	FR	3.5	4.0	Fair to Good	3.0	Fair to Good	M-L	Some worm and sunburn damage and some rough fruit
BHN 580	M-ML	FR	4.0	4.0	Fair to Good	3.0	Fair to Good	M-L	Worm damage and some rough fruit, some catface fruit and high shoulder
SVR 2935	M-ML	FR	4.0	3.5	Good	3.0	Fair	S-XL	Some sunburn and worm damage and some rough fruit and some small fruit

<sup>1</sup> M = Midseason Maturity; E = Early Maturity; L = Late Maturity; EM = Early to Midseason Maturity; ML = Mid Late Maturity

<sup>2</sup> Fruit Shape: FR = Flat Round; G = Globe

<sup>3</sup> Fruit Smoothness: 1 = bad; 5 = excellent

<sup>4</sup> Fruit Firmness: 1 = soft; 5 = very firm

<sup>5</sup> Stemability: 1 = hard stemming (many stems attached to fruit); 5 = stems easily

<sup>6</sup> Fruit Size: M = Medium; ML = Medium Large; L = Large; XL = Extra Large

**Table 3B.**

2004 Fresh Market Tomato Variety Trials  
Triple "E" Produce - Farmington, California  
Observation Trial – Round Lines

Variety	Maturity <sup>1</sup>	Fruit <sup>2</sup> Shape	Fruit <sup>3</sup> Smoothness	Fruit <sup>4</sup> Firmness	Fruit Set	Stem- <sup>5</sup> ability	Vine Cover	Fruit <sup>6</sup> Size	Other Notes
RFT 500311	M-ML	FR-G	4.0	3.5	Good	3.5	Fair	M-XL	Floppy vine with a little worm damage; excellent yield, smooth fruit
BHN 654	M	FR	4.0	4.0	Good	3.0	Fair	S-XL	Lot of stems, pretty smooth, some small fruit
AT 37	M	FR	3.0	3.5	Good	2.5	Fair	M-XL	Lot of stems, floppy vine, some high shouldered fruit, some worm damage
RFT 500312	M-ML	FR-G	4.0	3.5	Good	2.5	Fair to Good	S-XL	Lot of stems and some small fruit, pretty smooth fruit
BHN 682	ML	G	3.5	3.5	Fair to Good	3.0	Fair to Good	S-XL	Lot of stems and some small fruit; pretty smooth fruit
L-311	EM	FR	3.0	3.5	Fair to Good	2.5	Poor to Fair	M-XL	Some fruit rough with sutures, lots of stems and floppy vine
Sunbrite	M	FR	3.5	3.0	Good	3.5	Fair	M-XL	Floppy vine, some small fruit and some open sinus fruit
BHN 681	EM	G	3.5	3.5	Good	3.5	Good	S-XL	Lot of stems, some small fruit, some high shouldered fruit
RFT 500305	M-ML	FR	3.5	3.0	Fair to Good	3.0	Good	M-XL	Fair to good yield, pretty smooth fruit, floppy vine
L-310	M-ML	FR-G	3.5	4.0	Fair to Good	2.5	Poor to Fair	M-XL	Some Powder Mildew, floppy vines, lot of stems, some catface and worm damage
HA 3640	E	FR	3.0	2.5	Good	3.5	Poor to Fair	M-XL	Some worm damage and rough fruit, soft fruit, floppy vine
HA 3613	E	FR	3.0	3.0	Fair to Good	3.0	Poor to Fair	S-XL	Some sunburn and rough fruit, lots of stems, open and floppy vine
SRT 6763	M	FR	3.0	3.5	Fair	3.0	Poor to Fair	S-XL	Some rough fruit and some small fruit, open, floppy vine; lot of stems
SRT 6762	M-ML	FR	2.5	3.0	Fair to Good	3.0	Fair	S-XL	Some sunburn damage and high shouldered fruit, smallish fruit
SRT 6765	M	FR-G	3.5	3.5	Fair to Good	3.0	Fair to Good	S-L	Smallish fruit and floppy vine, poor yield and some worm damage
HA 3641	EM	FR	2.5	3.0	Fair to Good	2.5	Fair	M-XL	Poor yield, rough fruit, some worm damage, catface and high shouldered fruit, floppy vine, lot of stems
SRT 6764	EM	FR-G	3.0	3.5	Fair to Good	2.5	Poor to Fair	S-XL	Poor yield, sunburn damage, small rough fruit

<sup>1</sup> M = Midseason Maturity; E = Early Maturity; L = Late Maturity; EM = Early to Midseason Maturity; ML = Mid Late Maturity

<sup>2</sup> Fruit Shape: FR = Flat Round; G = Globe

<sup>3</sup> Fruit Smoothness: 1 = bad; 5 = excellent

<sup>4</sup> Fruit Firmness: 1 = soft; 5 = very firm

<sup>5</sup> Stemability: 1 = hard stemming (many stems attached to fruit); 5 = stems easily

<sup>6</sup> Fruit Size: M = Medium; ML = Medium Large; L = Large; XL = Extra Large

**2004 Fresh Market Tomato Varieties  
“Roma” Lines**

<b>Replicated</b>	<b>Observation</b>	<b>Seed Company</b>
Monica Mariana		Sakata Seed
Miroma RFT 8109		Syngenta Seed (Rogers Brand)
SD 257	SD 256	LSL Plant Science
BHN 523	C9008	BHN Seed
	HA 3824                      HA 3512 HA 3811                      HA 3513	Hazera Genetics Ltd.

**Table 4.**

2004 Fresh Market Tomato “Roma” Variety Trial  
Triple “E” Produce - Farmington, California  
Replicated Varieties

Variety	Market Yield/Acre <sup>1</sup>		% Market Yield <sup>1</sup>				Non Market Yield <sup>1</sup>		Total Yield <sup>1</sup>	% Red <sup>1</sup>
	Tons	Boxes	X-Large	Large	Medium	Small	Immature T/A	Culls T/A	T/A	
Miroma	22.6	1,808	5.3	22.6	47.4	24.7	3.3	2.5	28.4	9.9
RFT 8109	22.2	1,776	12.2	22.5	46.8	18.5	2.9	2.4	27.5	17.6
BHN 523	18.3	1,466	1.3	11.6	65.5	21.6	3.1	2.6	24.0	23.1
Monica	18.0	1,436	1.9	11.8	56.6	29.7	3.8	2.4	24.2	12.5
SD 257	17.3	1,386	0.6	18.6	57.1	23.7	3.3	1.7	22.3	11.1
Mariana	16.8	1,346	7.8	17.8	49.0	25.4	2.7	1.6	21.1	8.2
Average:	19.2	1536					“Roma” Sizing Criteria: Extra Large > 165 grams; Large 130 to 165 grams; Medium 90 to 130 grams; Small 50 to 90 grams			
LSD @ 0.05:	3.8	304								
C.V.:	13.1%	13.1%								

<sup>1</sup> Average of four replications

**Table 5.**

2004 Fresh Market Tomato "Roma" Variety Trial  
Triple "E" Produce - Farmington, California  
Observation Varieties

Variety	Market Yield/Acre <sup>1</sup>		% Market Yield <sup>1</sup>				Non Market Yield <sup>1</sup>		Total Yield <sup>1</sup>	% Red <sup>1</sup>
	Tons	Boxes	X-Large	Large	Medium	Small	Immature T/A	Culls T/A	T/A	
HA 3824	20.3	1,624	2.5	5.8	77.1	14.6	1.7	2.3	24.3	40.5
HA 3811	19.6	1,568	0.0	12.1	64.8	23.1	2.8	1.3	23.7	26.3
C 9008	14.5	1,160	2.1	9.1	72.2	16.6	2.5	1.3	18.3	35.9
HA 3513	12.8	1,024	0.0	0.0	55.1	44.9	4.7	0.7	18.2	8.7
SD 256	12.6	1,008	0.0	11.3	70.0	18.7	2.1	0.4	15.1	21.7
HA 3512	11.0	880	0.0	0.0	50.6	49.4	4.1	0.8	15.9	4.4

"Roma" Sizing Criteria:

Extra Large > 165 grams; Large 130 to 165 grams;  
Medium 90 to 130 grams; Small 50 to 90 grams

<sup>1</sup> Average of only one replication

2004 Fresh Market Tomato Variety Trials  
Triple "E" Produce; Farmington, California

**Table 6A.**

**Replicated Trial – "Roma" Lines**

Variety	Maturity <sup>1</sup>	Fruit Shape	Fruit <sup>2</sup> Smoothness	Fruit <sup>3</sup> Firmness	Fruit Set	Stem- <sup>4</sup> ability	Vine Cover	Fruit <sup>5</sup> Size	Other Notes
Miroma	M-ML	Blocky pear	3.5	3.5	Good	4.0	Fair to Good	S-L	Slightly open vine; some sunburn and Powdery Mildew, some worm damage
RFT 8109	M	Blocky pear	3.0	4.0	Good	4.0	Fair	S-XL	Some stems and worm damage, a little blossom end rot, some small fruit
BHN 523	EM	Blocky pear	3.5	4.0	Good	4.0	Fair to Good	S-L	Slightly open vine, some Powdery Mildew; sunburn and a little worm damage; lot of blossom end rot
Monica	M-ML	Blocky long pear	3.5	4.0	Good	3.5	Fair	S-L	Some fruit sunburn and Powdery Mildew, smallish fruit, lot of stems, worm damage, some blossom end rot
SD 257	M-ML	Blocky long pear	3.5	4.0	Good	4.0	Good	S-L	Smallish fruit, lot of stems, some worm damage, some blossom end rot
Mariana	ML	Blocky semi-long pear	3.5	4.0	Fair to Good	4.0	Good	S-L	Some Powdery Mildew and sunburn fruit, lot of stems and blossom end rot, smallish fruit, some worm damage

<sup>1</sup> M = Midseason Maturity; E = Early Maturity; L = Late Maturity; EM = Early to Midseason Maturity; ML = Mid Late Maturity

<sup>2</sup> Fruit Smoothness: 1 = bad; 5 = excellent

<sup>3</sup> Fruit Firmness: 1 = soft; 5 = very firm

<sup>4</sup> Stemability: 1 = hard stemming (many stems attached to fruit); 5 = stems easily

<sup>5</sup> Fruit Size: S = Small; M = Medium; L = Large; XL = Extra Large

2004 Fresh Market Tomato Variety Trials  
Triple "E" Produce; Farmington, California

**Table 6B.**

**Observation Trial – "Roma" Lines**

Variety	Maturity <sup>1</sup>	Fruit Shape	Fruit <sup>2</sup> Smoothness	Fruit <sup>3</sup> Firmness	Fruit Set	Stem- <sup>4</sup> ability	Vine Cover	Fruit <sup>5</sup> Size	Other Notes
HA 3824	E	Blocky fat pear	4.0	3.0	Good	3.5	Fair	M	Slightly open vine, some Powdery Mildew, some worm damage
HA 3811	EM	Blocky Pear	4.0	4.0	Good	3.5	Fair to Good	M	Some Powdery Mildew, some small fruit, some worm damage
C 9008	E	Square pear	3.0	3.0	Very good	4.0	Fair	M	Some small fruit and blossom end rot, non-traditional fruit shape
HA 3513	ML	Long pear	3.0	4.5	Fair	4.0	Good	SM	High Lycopene line, small fruit, very firm fruit, some Powdery Mildew
SD 256	EM	Blocky pear	4.0	3.0	Good	2.5	Fair	S	Small fruit, lot of stems, open vine, some Powdery Mildew, variable fruit shape
HA 3512	L	Blocky short pear	2.5	4.0	Fair	4.0	Good	S	High Lycopene line, late maturity, small fruit, some Powdery Mildew and fruit sunburn, some rough fruit

<sup>1</sup> M = Midseason Maturity; E = Early Maturity; L = Late Maturity; EM = Early to Midseason Maturity; ML = Mid Late Maturity

<sup>2</sup> Fruit Smoothness: 1 = bad; 5 = excellent

<sup>3</sup> Fruit Firmness: 1 = soft; 5 = very firm

<sup>4</sup> Stemability: 1 = hard stemming (many stems attached to fruit); 5 = stems easily

<sup>5</sup> Fruit Size: S = Small; M = Medium; L = Large; XL = Extra Large

**2004 Statewide Fresh Market Tomato  
Combined Variety Trials Results**

University of California Agriculture and Natural Resources  
Research Project FINAL REPORT  
To the CALIFORNIA TOMATO COMMISSION  
December 22, 2004

***Fresh Market Tomato  
Uniform Variety Trials:  
FIELD and POSTHARVEST  
Evaluations***

Project Year: 2004-2005

**Project Leaders:**

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**Cooperating Personnel:**

Scott Stoddard, Bob Mullen (emeritus) and Jan Mickler  
UCCE Farm Advisors, Merced/Madera, San Joaquin and Stanislaus Counties

Relevant AES/CE Project Number: LeS-3-04D

# Statewide FRESH MARKET TOMATO Variety Trials FIELD EVALUATIONS for 2004

*Michelle Le Strange, Scott Stoddard, Bob Mullen (Emeritus), and Jan Mickler  
Farm Advisors, Tulare & Kings, Merced & Madera, San Joaquin, and Stanislaus Counties*

## Introduction

Fresh market tomato variety trials are conducted in major tomato-growing regions in California to evaluate the performance of new varieties and breeding lines from commercial plant breeder programs and universities. Variety trials provide the opportunity to evaluate and compare fruit quality characteristics and yield under the same field conditions.

It is important to test the varieties in several areas to assess performance under different climatic conditions and soils. The objective is to identify dependable, higher yielding and higher quality variety releases that can be grown over a wide geographic area under varying environmental conditions.

To determine which varieties/lines are tested, growers/packers/shippers and seed company representatives are surveyed throughout the state. Replicated varieties have been previously tested in grower fields in California. Observed lines usually represent the plant breeder's most promising lines for California's commercial growing conditions and markets.

## Trial Locations

County farm advisors conduct the statewide variety trials in a uniform fashion so that local results can be compared with other locations. Three round variety trials and two roma variety trials were grown and harvested in 2003.

- **Fresno County: April 16 - July 17** (92 days) at UC Westside Research & Extension Center, round and roma trial (*Michelle Le Strange*).
- **Merced County: May 5 – July 23** (79 days) with Live Oak Farms in Le Grand (*Scott Stoddard*).
- **San Joaquin County: June 9 - Sept. 1** (82 days) with Tom Guido (grower) and Triple "E"

Produce; round and roma tomato variety trials (*Bob Mullen and Jan Mickler*).

Approximately 10 varieties were replicated and 13-27 lines/varieties were grown under single plot observation at each site, representing ten commercial seed companies.

The three round tomato variety trials had 5 replicated and 8 observed (non-replicated) varieties in common at 3 locations and 3 replicated and 5 observed varieties in 2 locations. These are listed on the next page. Production results are presented in a series of tables which are described below.

Postharvest samples from all replicated varieties were collected from all trials at the time of harvest and transported to the Mann Laboratory at UC Davis for color, firmness, and composition evaluations at the table-ripe stage. Fruit were harvested as mature greens, but some cultivars were also harvested as vine ripe. A complete summary of postharvest results follows this field report.

Each farm advisor prepares a research progress report that lists the production and postharvest performance of the varieties in their county location. These reports are mailed to the tomato industry and interested persons. They are available upon request and should be obtained and consulted with regard to variety performance in market yield, fruit sizing data, and fruit quality observations for that particular trial location.

## Varieties in Common at WSREC, Merced, and San Joaquin Counties 2004 Fresh Market Tomato Uniform Trials

Seed Company	Replicated	Observed
<b><u>3 Locations</u></b>		
BHN	BHN 580 (VFFN)	BHN 654 (VFFT) BHN 681 (VFF) BHN 682 (VFF)
LSL Plant Science		L-310 (VFFN) L-311 (VFFT)
Nunhems	SVR 2935 (VF2NAscStSwTy)	
Syngenta	Bobcat (VFFSt) Catalyst (VFF St) QualiT 21 (VFFNTMVSt)	RFT 500305 RFT 500311 RFT 500312
<b><u>2 Locations</u></b>		
American Takii		AT 37
LSL Plant Science	L-312 (VFFNT)	
Nunhems	Shady Lady (VFF)	SRT 6762 SRT 6763 (VFFNASTMV) SRT 6764 (VFFNASTMV) SRT 6765 (VFNA)
Syngenta	QualiT 23 (VFFTMVSt)	

Verticillium, Fusarium race 1, Fusarium race 2, Nematode, T or TMV Tobacco Mosaic Virus, Alternaria, Stemphylium leafspot

### Results

#### Combined Summary Tables

Tables 1 and 2 summarize the data. Tables A-B-C contain equivalent information and rank the varieties from highest to lowest. Tables 1-D and 2-D reflect the size grade percentages of marketable yield. Figures 1 and 2 depict size grades as boxes of marketable yield in bar graph format.

#### Replicated Varieties (3 locations)

- Table 1: Yield and Maturity Summary
- Table 1-A: Market Yield  
Tons/Acre and Boxes/Acre
- Table 1-B: Total Yield  
Tons/Acre and Boxes/Acre
- Table 1-C: Percent Reds
- Table 1-D: Size Grades - % Market Yield
- Figure 1: Market Yield  
Boxes/Acre and Fruit Sizes

#### Observed Varieties (3 locations)

- Table 2: Yield and Maturity Summary
- Figure 2: Market Yield  
Boxes/Acre and Fruit Sizes

#### Roma Trial (2 locations)

##### Replicated & Observed Varieties

- Table 3: Results – San Joaquin County
- Table 4: Results – West Side Research and Extension Center

*The summary tables are included as an aid to assess and compare performances among varieties at the different locations. In this report the same data is sorted and presented in many different ways. This is at the request of the California Tomato Commission, since individuals select a variety for different reasons*

## REPLICATED VARIETIES

**Market Yield – Tables 1, 1A, & Figure 1:** Market yield of the replicated varieties ranged from 36.5 to 23.0 tons (2917 to 1837 boxes) per acre. The average marketable yield at all locations was 32.7 tons/acre (2625 boxes). The same five varieties averaged 34.3 tons in Fresno, 35.5 in Merced, and 28.2 tons per acre in San Joaquin County.

QualiT 21 yielded more marketable fruit than the other four varieties in 3 locations. QualiT 23 yielded more marketable fruit than the other 2 varieties at 2 locations.

**Total Yield – Tables 1 and 1B:** Total yield of the replicated varieties ranged from 47.1 to 34.6 tons per acre and averaged 42.7 tons (3414 boxes) for varieties at all 3 locations. Total yield includes all small sized and culled fruit. L-312 had the most unmarketable fruit.

QualiT 21 was the top producer in Merced and San Joaquin Counties, whereas SVR 2935 yielded highest in Fresno County. There was not a very wide spread in total yield between the five varieties in the three locations. Because not all varieties were tested in all location there are not as many comparisons to make. Refer to the tables and figures for results.

**Percent Reds – Table 1 and 1C:** Shady Lady was the earliest variety and QualiT 21 was the latest variety to mature over locations.

**Percent Size Grades- Table 1, 1D & Figure 1:** Whether tested in 2 or 3 locations all the replicated varieties averaged approximately 50-40-10% extra large, large, and medium size fruit, respectively. This held true in Fresno and San Joaquin, but was closer to 40-40-20 in Merced. San Joaquin County averaged the largest amount of extra large fruit and the smallest percentage of medium size fruit. Large fruit size was abundant this season. Refer to Figure 1 for a good visual representation.

## OBSERVED VARIETIES

Eight observed varieties were in common at all 3 locations and these were combined and analyzed. Five observed varieties were only tested in 2 locations. Their averages are shown, but these were not analyzed. There is always more variability within varieties with single plot observations between locations, so the results should be viewed with less confidence than replicated tests.

**Market Yield – Table 2 and Figure 2:** Market yield of the 8 observed varieties ranged from 37.5 tons (3000 boxes) to 26.5 tons (2120 boxes) and averaged 32.6 tons (2608 boxes) per acre. Because there is variability within varieties and only 3 locations (replications) the statistics indicate that it takes a 6.5 ton difference to recognize a real market yield difference.

**Total Yield – Table 2:** As in the replicated test small sizes and culled fruit accounted for approximately 10 tons of fruit per variety. Total yield ranged from 46.7 to 32.0 tons (3736 to 2560 boxes) per acre. Merced county had the highest total yields (48.3 tons average), followed by Fresno (42.2 tons) and San Joaquin (39.1 tons). In other words the average number of unmarketable fruit was 16.4, 7.1, and 8.5 T/A for Merced, Fresno, and San Joaquin, respectively. RFT 500305 had the lowest total yield in San Joaquin, almost the highest yield in Merced, and was average in Fresno county. L-310 and BHN 681 had more than ten tons of unmarketable fruit.

**Percent Red Fruit at Harvest – Table 2:** There was a lot of variability between trials in % red fruit at harvest. When combined at all 3 locations L-310 and BHN 681 were the earliest (16%) and BHN 682 and RFT 500211 were the latest (8%).

## ROMA TRIALS

### San Joaquin County- Table 3

Performance results of the 6 replicated and 6 observed varieties are listed in Table 3. For a complete report and discussion of this trial please contact Bob Mullen in San Joaquin County or Jan Mickler in Stanislaus County.

### Replicated Varieties

Market yield of the replicated varieties ranged from 22.6 to 16.8 tons with an average of 19.2 tons (1536 boxes) per acre. The vast majority of fruit were medium and small sizes. Immature fruit averaged 3.2 tons and culls averaged 2.2 tons per acre.

Total yield ranged from 28.4 to 21.1 tons (2272 to 1688 boxes) per acre. Percent red fruit at harvest ranged from 23.1 to 8.2% and averaged 13.7%. BHN 523 had the most red fruit and Mariana had the least.

### **Observed Varieties**

The market yield of the six observed lines ranged from 20.3 tons (1624 boxes) to 11.0 tons (880 boxes) per acre. HA 3512 and HA 3513 were the earliest lines and perhaps this explains why there were no extra large or large fruit harvest whereas earlier lines had substantial amounts. HA 3824, C9008, and HA 3811 appear to be the earliest lines in the whole trial. The rest of the results run par with the replicated trial.

### **Fresno County- Table 4**

Four roma varieties were replicated and 8 roma lines were observed, but only 7 were harvested. One line had greenhouse stand establishment problems and so only a few plants were grown. Although there was little difference in marketable and total yield between the replicated varieties

there were differences in fruit shape. The fruit was not graded to size (next year!). It was noted that the roma varieties also showed more zippers and blossom end rot than the round lines.

This trial was evaluated very differently from the San Joaquin Trial and efforts will be made to follow a more similar and consistent reporting method next season.

### ***Final Remarks***

*Determining what variety to plant for a complex fresh market industry is outside the scope of this evaluation. The purpose of this research is to assist growers, packers, shippers, and the seed industry with variety selections and evaluations.*

*The strength of the farm advisors' variety trial is in side-by-side comparisons of yields and quality characteristics in a commercial setting across a range of conditions. The ultimate test of variety performance is commercial scale success on individual farms over a number of seasons.*

Table 1  
**YIELD & MATURITY\* of Fresh Market Tomatoes - REPLICATED Varieties**  
**Results Summary of Three Fresh Market Tomato Trials - 2004**  
**SORTED BY MARKETABLE YIELD**

Variety      Company		Combined Results			Fresno Co. (early season)			Merced Co. (midseason)			San Joaquin Co. (late season)		
		Yield T/A	%	Reds	Yield T/A	%	Reds	Yield T/A	%	Reds	Yield T/A	%	Reds
3 LOCATIONS													
<b>QualiT 21</b>	Syngenta	36.5	47.1	7.9	33.7	43.3	9.2	42.5	54.5	7.5	33.2	43.7	6.9
<b>SVR 2935</b>	Nunhems	32.2	44.1	8.9	38.1	46.0	9.0	36.5	55.3	8.1	22.0	30.9	9.5
<b>Bobcat</b>	Syngenta	32.1	42.3	11.6	32.3	38.5	17.2	33.0	48.5	10.7	31.1	40.0	7.0
<b>Catalyst</b>	Syngenta	32.1	41.0	10.5	32.5	38.2	16.6	33.1	46.1	5.1	30.9	38.7	9.8
<b>BHN 580</b>	BHN	30.6	38.9	10.1	35.1	43.0	14.9	32.7	48.2	6.0	24.0	25.5	9.5
	<b>Average</b>	<b>32.7</b>	<b>42.7</b>	<b>9.8</b>	<b>34.3</b>	<b>41.8</b>	<b>13.4</b>	<b>35.5</b>	<b>50.5</b>	<b>7.5</b>	<b>28.2</b>	<b>35.7</b>	<b>8.5</b>
	LSD .05	3.9	5.3	3.8									
	CV %	14.6	15.1	46.5									
Variety x Location Interaction		s	s	ns									
2 LOCATIONS													
<b>QualiT 23</b>	Syngenta	34.2	41.5	15.5	25.2	41.2	22.1				34.4	41.9	9.0
<b>Shady Lady</b>	Nunhems	26.8	34.6	19.4	28.9	37.2	23.5				24.6	32.0	15.3
<b>L-312</b>	LSL	23.0	40.8	10.7				20.7	43.4	6.1	25.2	38.1	15.2
	<b>Average</b>	<b>28.0</b>	<b>39.0</b>	<b>15.2</b>	<b>27.1</b>	<b>39.2</b>	<b>22.8</b>	<b>20.7</b>	<b>43.4</b>	<b>6.1</b>	<b>28.1</b>	<b>37.3</b>	<b>13.2</b>
	LSD .05	5.4	6.8	3.7									
	CV %	17.9	16.1	22.3									
Variety x Location Interaction		ns	ns	ns									

Variety by Location Interaction - When this statistic is significant, it means that the varieties did not behave consistently at each location.

S = significant difference    NS = not significantly different

\* Market Yield = average weight in pounds of four replications converted to tons and boxes per acre of all marketable extra large, large, and medium sized fruit. Small fruit were considered unmarketable this year.

TOTAL Yield = Marketable Yield plus small sized and cull fruit.

Percent Red = % reds by weight of TOTAL yield including culls to indicate maturity relative to all tested varieties.

**Figure 1**  
**Fresh Market Tomato Combined Averages - 2004**

Table 1-A  
**Marketable Yield (TONS/Boxes per Acre)\* - REPLICATED Varieties**  
**Summary of Three Fresh Market Tomato Trials - 2004**

Variety	Company	Combined Market Yield/Acre		Fresno Co. (early)		Merced Co. (mid)		San Joaquin Co. (late)		
		Tons	Boxes	Tons	Boxes	Tons	Boxes	Tons	Boxes	
3 LOCATIONS										
<b>QualiT 21</b>	Syngenta	36.5	2917	a	33.7	2694	42.5	3398	33.2	2660
<b>SVR 2935</b>	Nunhems	32.2	2574	b	38.1	3050	36.5	2915	22.0	1756
<b>Bobcat</b>	Syngenta	32.1	2571	b	32.3	2584	33.0	2639	31.1	2490
<b>Catalyst</b>	Syngenta	32.1	2572	b	32.5	2599	33.1	2646	30.9	2470
<b>BHN 580</b>	BHN	30.6	2491	b	35.1	2810	32.7	2616	24.0	2047
	<b>Average</b>	<b>32.7</b>	<b>2625</b>		<b>34.3</b>	<b>2747</b>	<b>35.5</b>	<b>2843</b>	<b>28.2</b>	<b>2285</b>
	LSD .05	3.9	312							
	CV %	14.6	14.6							
Variety x Location Interaction		s	s							
2 LOCATIONS										
<b>QualiT 23</b>	Syngenta	34.2	2739	a	25.2	2723			34.4	2754
<b>Shady Lady</b>	Nunhems	26.8	2140	b	28.9	2313			24.6	1966
<b>L-312</b>	LSL	23.0	1837	b			20.7	1657	25.2	2018
	<b>Average</b>	<b>28.0</b>	<b>2239</b>		<b>27.1</b>	<b>2518</b>	<b>20.7</b>	<b>1657</b>	<b>28.1</b>	<b>2246</b>
	LSD .05	5.4	432.0							
	CV %	17.9	17.9							
Variety x Location Interaction		ns	ns							

Variety by Location Interaction - When this statistic is significant, it means that the varieties did not behave consistently at each location.  
 S = significant difference    NS = not significantly different

\* Market Yield = average weight in pounds of four replications converted to tons and boxes per acre of all marketable extra large, large, and medium sized fruit. Small fruit were considered unmarketable this year.

Table 1-B  
**TOTAL Yield (TONS/Boxes per Acre)\* - REPLICATED Varieties**  
**Summary of Three Fresh Market Tomato Trials - 2004**

Variety	Company	Combined TOTAL Yield/Acre		Fresno Co. (early)		Merced Co. (mid)		San Joaquin Co. (late)		
		Tons	Boxes	Tons	Boxes	Tons	Boxes	Tons	Boxes	
3 LOCATIONS										
<b>QualiT 21</b>	Syngenta	47.1	3768	ab	43.2	3456	54.5	4360	43.7	3496
<b>SVR 2935</b>	Nunhems	44.1	3528	ab	46.0	3680	55.3	4424	30.9	2472
<b>Bobcat</b>	Syngenta	42.3	3384	ab	38.4	3072	48.5	3880	40.0	3200
<b>Catalyst</b>	Syngenta	41.0	3280	b	38.2	3056	46.1	3688	38.7	3096
<b>BHN 580</b>	BHN	38.9	3112	b	43.0	3440	48.2	3856	25.5	2040
	<b>Average</b>	<b>42.7</b>	<b>3414</b>		<b>41.8</b>	<b>3341</b>	<b>50.5</b>	<b>4042</b>	<b>35.8</b>	<b>2861</b>
	LSD .05	5.3	424							
	CV %	15.1	15.1							
Variety x Location Interaction										
2 LOCATIONS										
<b>QualiT 23</b>	Syngenta	41.5	3323	a	41.2	3296			41.9	3352
<b>L-312</b>	LSL	40.8	3262	a			43.4	3472	38.1	3048
<b>Shady Lady</b>	Nunhems	34.6	2767	ab	27.2	2076			32.0	2560



Table 2

**YIELD & MATURITY\* of Fresh Market Tomatoes - OBSERVED Varieties**  
**Combined Results of Three Fresh Market Tomato Trials - 2004**  
**Sorted by Market Yield**

Variety	Company	Combined Results			Fresno Co. (early season)			Merced Co. (midseason)			San Joaquin Co. (late season)		
		Yield T/A Market	% Total	% Reds	Yield T/A Market	% Total	% Reds	Yield T/A Market	% Total	% Reds	Yield T/A Market	% Total	% Reds
3 LOCATIONS													
RFT 500312	Syngenta	37.5	46.7	13.7	40.5	47.3	14.2	38.1	47.1	14.9	34.0	45.8	12.0
BHN 654	BHN	36.4	46.2	12.0	36.9	44.4	15.1	37.2	50.5	7.8	35.2	43.7	13.1
RFT 500311	Syngenta	35.5	43.4	8.3	33.4	38.6	9.8	33.0	46.1	7.1	40.1	45.5	8.1
RFT 500305	Syngenta	34.0	42.0	9.0	37.6	41.8	6.0	38.5	53.5	9.6	26.0	30.7	11.3
BHN 682	BHN	33.8	44.6	7.4	36.6	41.6	10.6	33.7	55.6	6.2	31.0	36.5	5.5
L-310	LSL	28.6	43.6	16.3	34.3	42.8	33.4	27.0	49.8	7.6	24.4	38.2	7.9
L-311	LSL	28.3	39.8	12.6	29.9	39.6	12.1	27.0	41.5	0.0	28.0	38.4	25.6
BHN 681	BHN	26.5	39.2	16.1	31.8	41.7	13.8	21.6	42.2	11.4	26.1	33.6	23.2
	Average	<b>32.6</b>	<b>43.2</b>	<b>11.9</b>	<b>35.1</b>	<b>42.2</b>	<b>14.4</b>	<b>32.0</b>	<b>48.3</b>	<b>8.1</b>	<b>30.6</b>	<b>39.1</b>	<b>13.3</b>
	LSD .05	6.5	ns	ns									
	CV %	11.4	10.5	60.5									
2 LOCATIONS													
AT 37	Am Takii	34.2	44.3	20.6	33.1	40.3	25.7				35.2	48.3	15.5
SRT 6762	Nunhems	29.9	39.7	16.7	41.2	48.0	25.5				18.5	31.4	7.9
SRT 6765	Nunhems	24.4	33.7	10.5	32.2	42.3	7.0				16.6	25.1	13.9
SRT 6764	Nunhems	22.8	32.0	25.1	29.3	37.4	29.7				16.3	26.5	20.5
SRT 6763	Nunhems	22.7	32.3	15.6	23.3	35.8	18.0				22.0	28.8	13.1
	Average	<b>26.8</b>	<b>36.4</b>	<b>17.7</b>	<b>31.8</b>	<b>40.8</b>	<b>21.2</b>				<b>21.7</b>	<b>32.0</b>	<b>14.2</b>

\* Market Yield = average weight in pounds of four replications converted to tons and boxes per acre of all marketable extra large, large, and medium sized fruit. Small fruit were considered unmarketable this year.  
 TOTAL Yield = Marketable Yield plus small sized and cull fruit.  
 Percent Red = % reds by weight of TOTAL yield including culls to indicate maturity relative to all tested varieties.

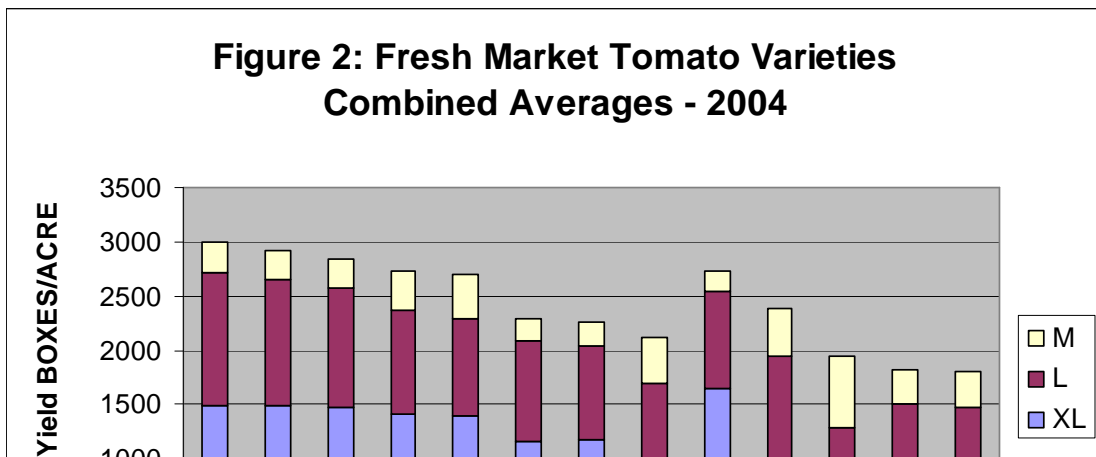


Table 3

ROMA Variety Trial - San Joaquin County - 2004  
Summary of Results

Replicated Varieties	Market Yield/Acre		% Market Yield				Nonmarket Yield Tons/Acre		Total Yield	
	Tons	Boxes	X-L	Large	Med	Small	Immature	Culls	T/A	% Reds
<b>Miroma</b>	22.6	1808	5.3	22.6	47.4	24.7	3.3	2.5	28.4	9.9
<b>RFT 8109</b>	22.2	1776	12.2	22.5	46.8	18.5	2.9	2.4	27.5	17.6
<b>BHN 523</b>	18.3	1466	1.3	11.6	65.5	21.6	3.1	2.6	24.0	23.1
<b>Monica</b>	18.0	1436	1.9	11.8	56.6	29.7	3.8	2.4	24.2	12.5
<b>SD 257</b>	17.3	1386	0.6	18.6	57.1	23.7	3.3	1.7	22.3	11.1
<b>Mariana</b>	16.8	1346	7.8	17.8	49.0	25.4	2.7	1.6	21.1	8.2
<b>average</b>	<b>19.2</b>	<b>1536.3</b>	<b>4.9</b>	<b>17.4</b>	<b>53.7</b>	<b>23.9</b>	<b>3.2</b>	<b>2.2</b>	<b>24.6</b>	<b>13.7</b>
LSD .05	3.8	304								
% CV	13.1%	13.1%								
<b>Observation Varieties</b>										
<b>HA 3824</b>	20.3	1624	2.5	5.8	77.1	14.6	1.7	2.3	24.3	40.5
<b>HA 3811</b>	19.6	1568	0.0	12.1	64.8	23.1	2.8	1.3	23.7	26.3
<b>C 9008</b>	14.5	1160	2.1	9.1	72.2	16.6	2.5	1.3	18.3	35.9
<b>HA 3513</b>	12.8	1024	0.0	0.0	55.1	44.9	4.7	0.7	18.2	8.7
<b>SD 256</b>	12.6	1008	0.0	11.3	70.0	18.7	2.1	0.4	15.1	21.7
<b>HA 3512</b>	11.0	880	0.0	0.0	50.6	49.4	4.1	0.8	15.9	4.4
<b>Averages</b>	<b>5.2</b>	<b>409</b>	<b>0.8</b>	<b>6.4</b>	<b>64.9</b>	<b>27.9</b>	<b>3.0</b>	<b>1.1</b>	<b>19.3</b>	<b>22.9</b>

Roma Sizing Criteria:

Extra Large - >165 grams

Large = 130 to 165 grams

Medium = 90 to 120 grams

Small = 50 to 90 grams

Table 4

**TOMATO FRUIT & VINE CHARACTERISTICS**  
**2004 Replicated Varieties**  
**South San Joaquin Valley - UC WSREC, Fresno County**

Code	Variety	Fruit shape	Shoulder smooth	Blossom end	Vine size	Vine cover	Overall	Comments
3	<b>SVR 2935</b>	FG-G	F-Sm	1-2	ML-L	VG	G	Uniform, big yield
1	<b>BHN 580</b>	FG-G	F-Sm	2	ML	G	G	Smooth, uniform
6	<b>QualiT 23</b>	G-DG	F-Sm	3-4	ML-L	F	F-G	Variable
5	<b>QualiT 21</b>	G	F-Sm	1-2	L	VG	F-G	Good green color
8	<b>Catalyst</b>	G	F-Sm	1-3	ML	F	F-G	Some zippers
7	<b>Bobcat</b>	G	F-Sm	1-3	M-ML	G	F-G	Many small fruit
2	<b>L-311</b>	FG-G	F	1	S-M	P	F	Rough shape, not uniform, pointed ends, low yield
4	<b>Shady Lady</b>	FG-G	F	2-5	ML	F	F-G	Variable

- |                          |                                  |                 |                              |                               |
|--------------------------|----------------------------------|-----------------|------------------------------|-------------------------------|
| 1 - Fruit Shape:         | FG = flat globe                  | G = globe       | DG = deep globe              | var = variable                |
| 2 - Shoulder Smoothness: | Vsm = very smooth                | sm = smooth     | med = medium                 | r = rough                     |
| 3 - Blossom End:         | 1 = tight                        | 2 = slight scar | 3 = medium scar              | 4 = big scar                  |
| 4 - Stem Scar:           | small = great, hardly noticeable |                 | med = ok                     | large = hugely noticeable     |
| 5 - Vine Size:           | VL = very large                  | L = large       | M = medium                   | s = small, relative to others |
| 6 - Leaf Cover:          | XLNT - excellent cover of fruit  |                 | VG = very good               | G = good                      |
|                          | F = fair                         |                 | P = poor, much exposed fruit |                               |
| 7 - Overall appearance:  | VG = very good                   | G = good        | F = fair                     | P = poor                      |

## Statewide Tomato Variety Trials POSTHARVEST EVALUATIONS for 2004

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### Objective of Research

To evaluate quality characteristics of ripened fresh market tomatoes (round and roma types) from commercial varieties and new lines.

### Executive Summary

In 2004, we evaluated 7 and 8 **round** fresh market tomato varieties from the replicated trials in Fresno and San Joaquin Counties, respectively, for color, firmness and composition at the table-ripe stage.

Fruit were harvested as mature-greens (MG) and vine-ripes (VR, 30-40% color). We also evaluated an additional 13 varieties (harvested MG) from the observational trial in Fresno County.

**Roma** fresh market tomato varieties were harvested from both the Fresno (4 varieties) and San Joaquin County (6 varieties) trials at the MG and VR stages.

The quality measurements carried out on fruit at the table-ripe stage are described in **Tables 1-3**.

Results for **round** tomato varieties are presented in **Tables 4-6**. The 2004 round variety fruit generally had lower soluble solids (4.2% average for all varieties and both trials) than 2003 fruit (4.9% average), whereas % titratable acidity values were in the usual range of 0.3-0.4%. VR harvested fruit generally have the same % soluble solids but higher % titratable acidity than MG harvested fruit.

Fruit in 2004 were firmer on average than fruit evaluated in 2003. Shady Lady was consistently low in firmness but had good color development, whereas L-311 or L-312 fruit were consistently firmer but had poorer red color development.

**Roma** tomato variety results are summarized in **Tables 7-9**. The soluble solids averaged slightly less than 4.2% for 2004 Roma fruit, whereas the average for fruit evaluated in 2003 was 5.4%. The % titratable acidity was also lower in 2004 than 2003 for the Roma varieties. Red color and firmness were generally good for all varieties evaluated, although VR harvested fruit were not as firm as the ripened MG fruit.

### Trial Locations

County farm advisors conduct these variety trials in a uniform fashion so that local results can be compared with other locations. Three round variety trials and two roma variety trials were grown and harvested in 2004. Postharvest evaluations were conducted on fruit from the round and roma trials in Fresno and San Joaquin Counties.

**Fresno County: April 16 – July 15** (90 days) at the UC WSREC in Five Points, round and roma variety trials (Michelle Le Strange).

**San Joaquin County: June 9 – Sept 1** (82 days) with Triple “E” Produce southeast of Stockton, round and roma variety trials (Bob Mullen and Jan Mickler).

### Experimental Procedures

**Fruit Sampling:** We harvested mature-green (MG) fruit from the 2 variety trials for 7 replicated varieties. For both trials, vine-ripe (VR) fruit were harvested with 30-40% color. Typically 80 MG fruit or more were harvested in buckets, placed in plastic trays for transport to the lab, and well-formed large (5x5 or 5x6) fruit were selected for ripening and evaluation. A minimum of 45 fruit (3 reps of 15 each) were ripened under standard conditions: 3-4 days 100 ppm ethylene at 20°C (68°F) and high relative humidity followed by placement on plastic-wrapped trays to complete ripening at 20°C. Fruit that did not show color change within 3-4 days of ethylene treatment were discarded. Fruit were evaluated when they reached **table-ripe stage** (color stage 6 on USDA scale +/- 1-2 days).

**Quality Measurements:** The minimum quality evaluation of different tomato varieties should include data on firmness, color and composition at the table-ripe stage. **Table 1** describes the measurements useful to assess the postharvest potential of different fresh market tomato varieties. Flavor can be estimated measuring soluble solids (sugars) and acid contents. For firmness, it would also be useful to evaluate fruits about 1 week after reaching table-ripe to determine which varieties maintain firmness during a simulated marketing period. Typical values for color and firmness are described in **Table 2** and **Table 3**.

**Table 1. Ripe tomato quality measurements for 2004 variety trials.**

Attribute	Measurement	Additional Information
<b>1. Color</b>	Objective color values using a Minolta Color meter	Data reported as Hue; this is the most useful single value to compare tomato color; see <b>Table 2</b> for typical values. Hue values from 35-40 usually indicate good red color.
<b>2. Texture</b>	Compression test: the force to compress the fruit a distance of 5 mm	Computerized texture analyzer equipped with a 25 mm flat cylinder moving at 0.5 mm/sec. Typical range 15-25 N ( <b>Table 3</b> ). 1 N =9.81 kg-force or 4.45 lb.-force.
<b>3. Composition</b>	<b>3a.</b> Soluble solids (SS) are measured on a refractometer	Fruit are quartered, blended. The juice is filtered and used. 5 min per fruit for sample preparation and measurements of SS and TA. Values can range from 3.5-7.0%.
	<b>3b.</b> Titratable acidity (TA); 10 mL juice are titrated with NaOH	pH of the juice is taken as a part of these measurements. Generally there is an inverse relationship between pH and T.A. Values can range from 0.2-0.6%.

**Table 2. Example of color changes during the ripening of fresh market tomato fruits.**

Stage of Development/Color	USDA Color Chart Stage	L*	a*	b*	chroma	hue
<b>Mature-Green</b>	<b>1</b>	62.7	-16.0	34.4	37.9	115.0
<b>Breaker</b>	<b>2</b>	55.8	-3.5	33.0	33.2	83.9
<b>Pink-Orange</b>	<b>4</b>	49.6	16.6	30.9	35.0	61.8
<b>Orange-Red</b>	<b>5</b>	46.2	24.3	27.0	36.3	48.0
<b>Bright Red; Table-ripe</b>	<b>6</b>	41.8	26.4	23.1	35.1	41.3
<b>Dark Red</b>	<b>6+</b>	39.6	27.5	20.7	34.4	37.0

L\* indicates lightness (high value) to darkness (low value); a\* changes from green (negative value) to red, b\* changes from blue to yellow (high value). Chroma and hue are calculated  $[(a^{*2} + b^{*2})^{1/2}]$  and  $\tan^{-1}(b^*/a^*)$  and indicate intensity and color, respectively. The lower the hue value, the redder the tomato. Hue is the single most useful color value.

**Table 3. Textural characteristics of tomatoes based on subjective and objective tests.**

Firmness Class	Description based on hand and finger pressure	Newtons-force
<b>Very Firm</b>	Fruit yields only slight to considerable pressure	>25
<b>Firm</b>	Fruit yields slightly to moderate pressure	18-25
<b>Moderately Firm</b>	Fruit yields moderately to moderate pressure	15-18
<b>Moderately Soft</b>	--	12-15
<b>Soft</b>	Fruit yields readily to slight pressure	8-12
<b>Very Soft</b>	Fruits yields very readily to slight pressure	<8

Measured by compressing fruit at the equator with a 25 mm flat cylindrical probe to a distance of 5 mm on a computerized texture analyzer. **1 Newton force = 9.81 kg-force or 4.45 pound-force.**

## ROUND Tomato Variety Trials' Results

### Fresno County Summary – Tables 4 & 5

**Replicated Trial** - Seven cultivars from the replicated trial were evaluated from both MG and VR harvested fruit (Table 4). Final red color was very good in the fruit ripened from MG stage except for variety L-311. In general, the VR-harvested fruit were evaluated with slightly less red color development (hue values 2-4 units above the threshold value of 40) than desired. This small difference in color development corresponded to firmness values being higher than if the fruit were evaluated at the desired hue value of 40. The VR harvested fruit had lower firmness than MG ripened fruit even when evaluated with less red color development. Shady Lady was the least firm of the 7 varieties. Although L-311 did not develop the same degree of redness as the other varieties, firmness values were in the same range as the other six cultivars. Soluble solids % varied little among varieties and were generally low (average = 4.2%). The % titratable acidity varied from 0.21 to 0.30% for the MG-harvested fruit and from 0.27 to 0.41% for the VR-harvested fruit.

**Observed Trial** - MG fruit were harvested from the observational trial (Table 5). At the table-ripe stage, all had good red color development, with the exception of L-310 (had the highest hue values indicating that the fruit were the least red among the 13 varieties in the observational trial). The L-310 variety was also the most firm. Three varieties had firmness values below 15 N, indicating soft fruit (see Table 3). The average % soluble solids was low (4.2%), but values ranged from 4.1 (cvs AT37, SRT6764) to almost 4.4% (L-310). The % titratable acidity averaged 0.30% and ranged from 0.22% (L-310) to 0.33% (AT37, SRT6762).

### San Joaquin County Summary - Table 6

**Replicated Trial** - In the San Joaquin trial, 8 cultivars were harvested at MG stage and 7 were harvested at the VR stage (Table 6). Final red color was good in all varieties except L-312 (higher hue values indicate less red color). All MG harvested fruit were very firm at the table-ripe stage and the L-312 fruit were extremely firm. Fruits of Shady Lady were the least firm. For the VR-harvested fruit, fruit were evaluated again at a slight higher color value (41-42) than the desired hue value of 40. The VR fruit also had good firmness at the table-ripe stage. Again Shady Lady was the least firm. The % soluble solids were generally low and averaged 4.2% for both the MG- and VR-harvested fruit. The % titratable acidity averaged slightly higher (0.38%) for the VR-harvested fruit MG-harvested (0.34% on average). Although there were significant differences in % soluble

solids and % titratable acidity among the varieties, the differences were small.

## ROMA Tomato Variety Trials' Results

### Fresno County Trial – Table 7

Four Roma varieties were harvested at the MG and VR stage in the Fresno County Trial and results are summarized in Table 7. The MG fruit all developed good color (hue <40), and had good firmness at the table-ripe stage. The cv Miroma was the least firm of the varieties. The % soluble solids were generally low, but BHN 523 had the lowest average % soluble solids (4.06%) and the highest average % titratable acidity (0.35%). PX2626 had the highest average % soluble solids (4.18%) with an average %T.A. of 0.30%. As with round tomatoes, VR harvested fruit had lower firmness than MG ripened fruit even when evaluated with less red color development. Also as with round tomatoes, the VR-harvested fruit averaged high % titratable acidity than the MG fruit although there were not differences in average % soluble solids.

### San Joaquin County Trial – Tables 8 & 9

Six cultivars of Roma tomatoes were harvested at the MG and VR stages (Table 8) in the replicated Roma trial. Final red color (hue color value) was similar among varieties and between the MG and VR harvested fruit. VR-harvested fruit from all 6 cultivars were less firm than the corresponding fruit harvested at MG stage and ripened. % soluble solids were similar among varieties and average values for MG fruit were the same as VR-harvested fruit. The % titratable acidity averaged higher (0.41%) in VR fruit than MG fruit (0.37%). The % soluble solids and % titratable acidity were higher in this trial than in the Fresno County Roma trial. One cultivar (Monica) was harvested at MG stage as well as three VR stages (2 or breaker, 3 or turning, and 4-5 or pink-orange (Table 9). The MG-harvested and ripened fruit were notable firmer than the VR-harvested fruit. The % titratable acidity was higher in the VR than the MG-harvested fruit. The % soluble solids were similar except for the low value for stage 2 fruit.

### ROUND Tomato Variety Results in Tables

**Table 4.** Quality characteristics of fresh market **round** tomatoes harvested **MG** and **VR** from the 2004 Fresno County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically.

Variety	Company	Maturity at Harvest	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %
<b>BHN 580</b>	BHN	MG	39.4	18.9	4.27	4.20	0.29
<b>Bobcat</b>	Syngenta	MG	38.9	20.2	4.17	4.13	0.30
<b>L-311</b>	LSL PI Sci.	MG	44.9	22.0	4.19	4.17	0.28
<b>QualiT 21</b>	Syngenta	MG	41.2	23.1	4.20	4.33	0.28
<b>QualiT 23</b>	Syngenta	MG	38.6	20.5	4.14	4.37	0.30
<b>Shady Lady</b>	Sunseeds	MG	38.0	16.2	4.16	4.03	0.30
<b>SVR 2935</b>	Seminis	MG	41.1	24.9	4.33	4.10	0.21
<b>BHN 580</b>	BHN	VR	44.0	19.0	4.16	4.63	0.41
<b>Bobcat</b>	Syngenta	VR	44.2	19.8	4.17	3.93	0.30
<b>L-311</b>	LSL PI Sci.	VR	46.1	19.2	4.18	3.80	0.27
<b>QualiT 21</b>	Syngenta	VR	44.4	17.9	4.15	4.20	0.32
<b>QualiT 23</b>	Syngenta	VR	43.6	18.1	4.12	4.33	0.35
<b>Shady Lady</b>	Sunseeds	VR	42.9	17.0	4.13	4.20	0.35
<b>SVR 2935</b>	Seminis	VR	44.0	20.6	4.22	4.10	0.34
	<b>LSD.05</b>		0.8	1.4	0.05	0.24	0.03
	<b>Average</b>	<b>MG</b>	<b>40.3</b>	<b>20.8</b>	<b>4.21</b>	<b>4.19</b>	<b>0.28</b>
	<b>Average</b>	<b>VR</b>	<b>44.2</b>	<b>18.8</b>	<b>4.16</b>	<b>4.17</b>	<b>0.33</b>

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit. Data were analyzed as 2-way ANOVA. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

**Table 5.** Quality characteristics of fresh market **round** tomatoes harvested **MG** from the 2004 Fresno County observational trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically.

Variety	Company	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %
<b>AT 37</b>	American Takii	39.7	14.6	4.13	4.43	0.33
<b>BHN 654</b>	BHN	40.2	18.5	4.26	4.47	0.30
<b>BHN 681</b>	BHN	39.3	17.7	4.16	4.50	0.32
<b>BHN 682</b>	BHN	39.9	14.1	4.24	4.30	0.27
<b>L-312</b>	LSL PI Sci.	41.2	20.6	4.22	4.53	0.28
<b>L-310</b>	LSL PI Sci.	46.3	25.4	4.39	4.43	0.22
<b>RFT 500305</b>	Syngenta	37.4	16.7	4.18	4.33	0.31
<b>RFT 500311</b>	Syngenta	38.0	18.6	4.21	4.00	0.27
<b>RFT 500312</b>	Syngenta	38.7	16.3	4.15	3.93	0.29
<b>SRT 6762</b>	Sunseeds	39.9	14.3	4.16	4.27	0.33
<b>SRT 6763</b>	Sunseeds	38.3	16.9	4.20	4.43	0.33
<b>SRT 6764</b>	Sunseeds	40.1	17.8	4.13	4.60	0.30
<b>SRT 6765</b>	Sunseeds	41.3	15.6	4.21	4.37	0.31
	<b>LSD.05</b>	0.8	1.2	0.07	0.24	0.04
	<b>Average</b>	<b>40.0</b>	<b>17.4</b>	<b>4.21</b>	<b>4.36</b>	<b>0.30</b>

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

**Table 6.** Quality characteristics of fresh market **round** tomatoes harvested **MG** and **VR** from the 2004 San Joaquin County replicated trial and ripened at 20°C (68°F) and evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically.

Variety	Company	Maturity at Harvest	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %
<b>BHN 580</b>	BHN	MG	41.6	25.6	4.30	5.43	0.36
<b>Bobcat</b>	Syngenta	MG	40.8	24.0	4.24	4.50	0.32
<b>Catalyst</b>		MG	40.9	26.0	4.21	4.70	0.38
<b>L-312</b>	LSL PI Sci.	MG	47.7	35.4	4.25	4.97	0.31
<b>QualiT 21</b>	Syngenta	MG	40.8	24.3	4.26	5.23	0.33
<b>QualiT 23</b>	Syngenta	MG	41.0	24.0	4.19	4.53	0.34
<b>Shady Lady</b>	Sunseeds	MG	40.4	22.0	4.25	5.03	0.35
<b>SVR2935</b>	Seminis	MG	40.0	26.0	4.32	5.17	0.32
	LSD.05		0.9	2.2	0.05	0.40	0.03
<b>BHN 580</b>	BHN	VR	42.3	25.2	4.28	4.97	0.36
<b>Bobcat</b>	Syngenta	VR	42.7	22.5	--	--	--
<b>Catalyst</b>		VR	42.7	23.7	4.22	4.43	0.35
<b>L-312</b>	LSL PI Sci.	VR	45.6	27.0	4.19	4.57	0.43
<b>QualiT 23</b>	Syngenta	VR	43.6	21.4	4.17	4.73	0.41
<b>Shady Lady</b>	Sunseeds	VR	42.3	19.7	4.25	4.70	0.38
<b>SVR2935</b>	Seminis	VR	41.4	24.1	4.25	5.27	0.36
	LSD.05		1.2	2.9	0.06	0.66	0.05
	<b>Average</b>	<b>MG</b>	<b>41.6</b>	<b>25.9</b>	<b>4.25</b>	<b>4.94</b>	<b>0.34</b>
	<b>Average</b>	<b>VR</b>	<b>42.9</b>	<b>23.4</b>	<b>4.23</b>	<b>4.78</b>	<b>0.38</b>

For MG fruit color and firmness data are from 3 replicates of 13 fruits; composition data are from 3 replicates of composite samples of 13 fruit. For VR fruit, fruit number varied from 13 to 20; composition data from 3 replicates comprised of 4-7 fruit. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

### Roma Tomato Variety Results

**Table 7.** Quality characteristics of fresh market **Roma** tomatoes harvested **MG** and **VR** from the 2004 Fresno County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically.

Variety	Company	Maturity at harvest	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %
<b>BHN 523</b>	BHN	MG	38.2	23.4	4.09	4.23	0.32
<b>Miroma</b>	Syngenta	MG	38.9	21.4	4.14	4.30	0.28
<b>PX 2626</b>	Seminis	MG	38.7	25.0	4.19	4.53	0.29
<b>SD 257</b>	LSL PI Sci	MG	37.2	22.4	4.12	4.27	0.31
<b>BHN 523</b>	BHN	VR	42.9	19.3	4.03	4.17	0.38
<b>Miroma</b>	Syngenta	VR	44.5	17.7	4.18	4.17	0.29
<b>PX 2626</b>	Seminis	VR	42.6	21.2	4.17	4.43	0.31
<b>SD 257</b>	LSL PI Sci	VR	42.6	20.1	4.10	4.23	0.36
	LSD.05		0.5	1.3	0.09	0.19	0.02
	<b>Average</b>	<b>MG</b>	<b>38.3</b>	<b>23.0</b>	<b>4.13</b>	<b>4.33</b>	<b>0.30</b>
	<b>Average</b>	<b>VR</b>	<b>43.1</b>	<b>19.6</b>	<b>4.12</b>	<b>4.25</b>	<b>0.34</b>

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit. Data were analyzed as 2-way ANOVA. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

**Table 8.** Quality characteristics of fresh market **Roma** tomatoes harvested **MG** and **VR** from the 2004 San Joaquin County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically.

Variety	Company	Maturity at harvest	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %
<b>BHN 523</b>	(BHN)	MG	39.1	29.7	4.17	5.37	0.38
<b>Mariana</b>	(Sakata)	MG	40.5	29.0	4.24	5.20	0.35
<b>Miroma</b>	(Syngenta)	MG	40.1	24.4	4.23	5.57	0.37
<b>Monica</b>	(Sakata)	MG	38.8	27.8	4.21	5.50	0.38
<b>RFT 8109</b>	(Syngenta)	MG	39.3	25.3	4.20	5.37	0.36
<b>SD 257</b>	(LSL PI Sci.)	MG	38.4	29.8	4.24	5.13	0.36
<b>LSD.05</b>			0.8	2.3	ns	ns	ns
<b>BHN 523</b>	(BHN)	VR	41.1	23.9	4.10	5.60	0.45
<b>Mariana</b>	(Sakata)	VR	40.3	23.3	4.25	5.47	0.41
<b>Miroma</b>	(Syngenta)	VR	40.7	20.9	4.21	5.43	0.43
<b>Monica</b>	(Sakata)	VR	39.3	18.7	4.26	5.67	0.42
<b>RFT 8109</b>	(Syngenta)	VR	41.1	19.7	4.20	5.40	0.38
<b>SD 257</b>	(LSL PI Sci.)	VR	40.6	22.3	4.29	5.50	0.38
	LSD.05		ns	2.4	0.07	ns	0.03
	<b>Average</b>	<b>MG</b>	<b>39.4</b>	<b>27.7</b>	<b>4.22</b>	<b>5.36</b>	<b>0.37</b>
	<b>Average</b>	<b>VR</b>	<b>40.5</b>	<b>21.5</b>	<b>4.22</b>	<b>5.51</b>	<b>0.41</b>

For MG fruit, color and firmness data are from 3 replicates of 10-13 fruits; composition data are from 3 replicates of composite samples of 10-13 fruit. For VR fruit, fruit number varied from 20-40; composition data from 3 replicates comprised of 7-13 fruit. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

**Table 9.** Quality characteristics of fresh market **Roma** tomatoes (cv **Monica**) harvested **MG** and at three stages of **VR** from the 2004 San Joaquin County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements.

Maturity at harvest	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titrateable acidity, %	
<b>MG</b>	38.8	27.8	4.21	5.50	0.38	
<b>VR Stage 2 (breaker)</b>	40.7	20.6	4.12	5.63	0.50	
<b>VR Stage 3 (turning)</b>	39.1	19.2	4.24	5.67	0.45	
<b>VR Stage 4-5 (pink-orange)</b>	39.3	18.7	4.26	5.67	0.42	
	LSD.05	ns	2.3	0.08	ns	0.04

Data are average of 40 MG fruit and 20 fruit for each VR stage. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

## DATA ANALYSIS TERMS

All data, such as total marketable yield, size grades, and vine and fruit characteristics, are statistically analyzed to determine significant differences between varieties. A significant difference is one that is too large to be the result of chance and that has a reasonably high probability of being a real difference.

A **Least Significant Difference (LSD)**, calculated from each set of data, indicates the smallest difference between treatment numbers that can be considered real. When two items differ by more than the LSD .05, we are 95 percent confident that the difference is real. If an LSD .01 is indicated then we are 99 percent confident that the difference is real and not just due to chance.

**Not Significant (NS)** indicates there is no significant difference between treatment numbers. OR There is no significance in the interaction between location and varieties, i.e. varieties followed similar trends in all locations. When the interaction is not significant then an LSD can be calculated and used to separate the varieties.

**Significant (S)** indicates there is a significant difference between varieties and a LSD is calculated. S also indicates there is significance in the interaction between variety and location, i.e. varieties did not follow similar trends in all locations. In this situation it is illogical to separate the varieties with an LSD.

**The Coefficient of Variation (CV)** is a measure of the variation among the data. The greater the variation in the data, the larger the differences must be to be considered significant. A coefficient of variation less than or equal to 10 is considered good.

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