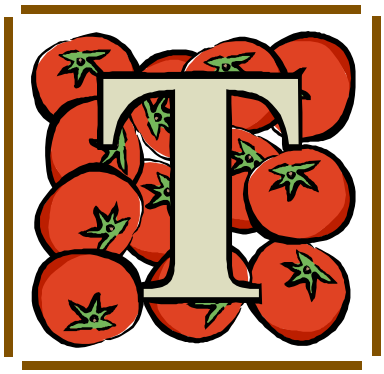

FRESH MARKET AND PROCESSING TOMATO RESEARCH TRIALS

2002 Research Progress Report

Scott Stoddard, Farm Advisor
Bill Weir, Farm Advisor Emeritus
Merced and Madera Counties

University of California Cooperative Extension
Merced County Office
2145 Wardrobe Ave.
Merced, CA 95340
(209) 385-7403

TOMATO RESEARCH TRIALS

2002 Research Progress Report
Merced and Madera Counties

TABLE OF CONTENTS

1. Fresh Market Tomato Variety Trial 3
2. Fresh Market Tomato Postharvest Evaluation 14
3. Processing Tomato Regional Variety Trial 25
4. Ditera Nematicide Trial 31
5. Sidedress N on Processing Tomatoes 35
6. Worm Monitoring Results 38

FRESH MARKET TOMATO VARIETY TRIAL

2002 Research Progress Report

Scott Stoddard, Farm Advisor
Bill Weir, Farm Advisor Emeritus
Merced/Madera Counties

INTRODUCTION

Fresh market tomato trials are conducted by UCCE in Kings/Tulare (Michelle LeStrange), Merced (Scott Stoddard), and San Joaquin (Bob Mullen) counties. These trials assist in evaluation of the performance of new varieties and breeding lines from commercial plant breeding programs. To assess performance under various climatic conditions, soil types, and cultural practices, the same varieties are planted at each location but with different transplant dates (early, mid, and late for Kings, Merced, and San Joaquin, respectively).

Two tests are conducted at the same time and location. A replicated test consists of varieties or lines which have previously been in trials and grown commercially. An observed test evaluates the plant breeder's most promising lines for California's commercial growing conditions and markets. This report summarizes both the replicated and observed variety tests conducted in Merced County in 2002.

METHODS

The 2002 Fresh Market Variety Trial was conducted in the tomato growing area south of Le Grand, in Merced County. Seeds were planted in the greenhouse on March 21 and transplants were set in the field at Live Oak Farms on May 15, 2002. Specific information about the field and trial is presented in Table 1.

Eleven varieties were replicated four times, and 30 varieties were observed in single plots. Variety names and sources of seeds are listed in Table 2. The trial was irrigated using sub-surface drip and grown using grower's standard cultural practices. All plots were harvested on August 7 and 7, 83 days after transplanting.

Ten consecutive feet of row were harvested from each plot, although plot size was about 45 feet. On the day of harvest, all fruit were sorted for size and quality. Red fruits were weighed separately before they were sorted by size with the mature green fruit. Market yield and grades of the replicated and observed varieties are shown in Tables 3 and 5, while fruit and vine quality characteristics are summarized in Tables 4 and 6.

Many of the observed lines were Roma types. These were sized based on weight.

Reported yields may appear high compared to commercial averages. This is due to a number of reasons. Nonetheless, the relative differences between varieties are valid and do give a good indication of their potential yield and performance under field conditions.

SUMMARY

Replicated Trial.
Marketable yields for the replicated trial ranged from nearly 2200 boxes/A for Bobcat (Syngenta) to 1570 boxes/A for SRT6710 (Sunseeds) (Table 3). The standard, Shady Lady, produced 1929 boxes/A. These averages are significantly different at the 95% confidence level. See Figure 1 for a yield breakdown by size.

Quali T 21, T-23 (Syngenta) and B 807 (LSL Seeds) had the most XL fruit, around 50%. Significant differences were observed for culls, ranging from 11 to 23 tons/A. At harvest, Shady Lady and BHN 503 had the highest red percentage, near 30%. This trial was harvest slightly late, as several very hot days in 2002 contributed to faster fruit development than average.

Observation Trial

The best marketable yields for the observation trial were generally about as good as the replicated trial, however, there was a far greater spread between the best variety (BHN 499 at 2300 boxes/A) and worst (GV 51995 at 146 boxes/A) (Table 5). The Roma types from Golden Valley Seed did not perform very well in this trial—most fruit were medium to small. Some were also very early relative to the others (GV 1029 was 68% red at harvest). Like the yield data, fruit and vine characteristics were very variable, with some varieties having large wild vines. Few disease problems were noted this year, and insect pressure was low. Vine and fruit descriptions are presented in Table 6.

REGIONAL TRIAL RESULTS

Yield results for the replicated varieties in all three counties where this trial was conducted are shown in Tables 7 & 8. Note that many of the varieties that did well in Merced (Quali T 21 & 23, Bobcat) also did well in at least one of the other locations.

POSTHARVEST EVALUATION

Postharvest samples were taken from all three trials and evaluated for color, firmness, and composition at mature green and table-ripe stages. A complete summary follows starting on page 14.

ACKNOWLEDGEMENTS

We would like to acknowledge our appreciation to Daniel Acevedo, with LaBar's Greenhouse in Gustine, CA, for raising the transplants for this test; Mr. Bob Giampaoli and Mike Marchini, of Live Oak Farms in LeGrand for their help with planting and field maintenance, individual seed companies; the California Tomato Commission for financial support; and County Agriculture Technician Larry Burrow and field technicians Samantha Souza and Kerry Hedberg.

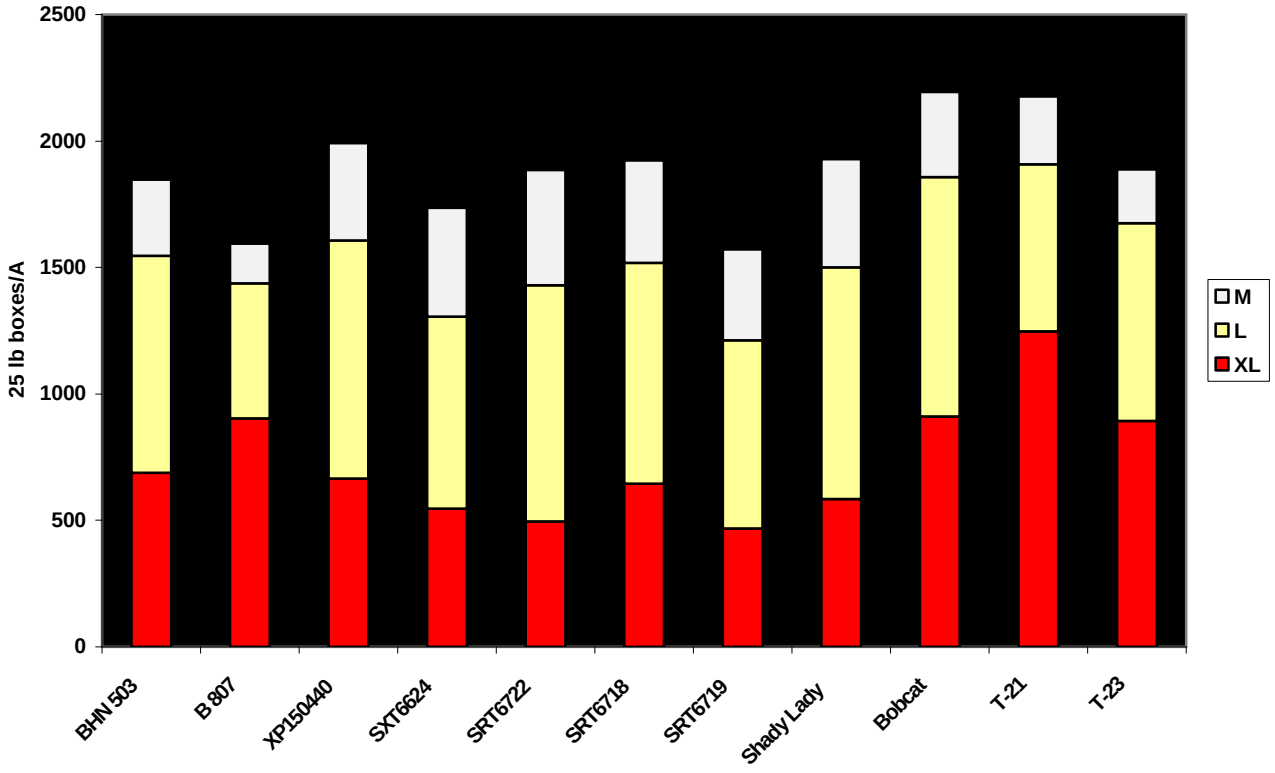

Figure 1. Yield of XL, L, and M size fruit, in 25 lb boxes per acre, for each of the replicated varieties in Merced County, 2002

Table 1. Trial background information and protocol.

Cooperator: Bob Giampaoli

Location: Live Oak Farms near LeGrand, CA. On Minturn Rd about ½ mile south of Buchanon Hollow Rd.

Soil Type: San Joaquin loam and San Joaquin-Alamo complex (Alamo is darker with higher clay content, both have a hard pan and are shallow).

Previous Crop: Tomatoes

Experimental design (replicated): Randomized complete block with four replications.

PLOT DESCRIPTION AND SIZE:

One row plots, 30 plants per plot; about 45 ft long. 60" beds. 16" spacing. Drip irrigated, drip tube in 2nd year.

PROTOCOL:

Seeding date: 3/21/2001

Transplant date and method: May 15, 2001 with a commercial 3-row transplanter.

Fertility (lb/A NPK preplant and fertigated): P and K PPI, nitrogen through the drip tube.

Insect control: Lannate and Avaunt for armyworm, corn earworm control

Irrigation: subsurface drip irrigation

Weed control: hand hoe and mechanical cultivation.

Harvest date(s) and method(s): destructive hand harvest, one pick, 10 ft of plot, beginning August 7, 2001 (83 days after transplanting).

Table 2. 2002 varieties and seed companies.

Replicated	*Observed*	
1. BHN 503	21. AM TAKII AT 48	36. SUNSEEDS CLASSY LADY
2. LSL B-807	22. AMTAKII AT 89	37. UNITED GENETICS FAIR LADY
3. SEMINIS XP 150440	23. BHN SEED BHN 464	38. GOLDEN VALLEY SEED 51993
4. SUNSEEDS SXT 6624	24. BHN SEED BHN 499	39. GOLDEN VALLEY SEED 51178
5. SUNSEEDS XRT 6722	25. BHN SEED BHN 500	40. GOLDEN VALLEY SEED 51182
6. SUNSEEDS XRT 6718	26. BHN SEED BHN 524	41. GOLDEN VALLEY SEED 51535
7. SUNSEEDS XRT 6719	27. HARRIS MORAN MOUNTAIN FRESH	42. GOLDEN VALLEY SEED 51644
8. SUNSEEDS SHADY LADY	28. HARRIS MORAN HMX 2807	43. GOLDEN VALLEY SEED 51643
9. SYNGENTA BOBCAT	29. HAZERA HA 3603	44. GOLDEN VALLEY SEED 51995
10. SYNGENTA T-21	30. HAZERA HA 3638	45. GOLDEN VALLEY SEED 1021
11. SYNGENTA T-23	31. HAZERA HA 3640	46. GOLDEN VALLEY SEED 1022
	32. LSL SEEDS LSL B-812	47. GOLDEN VALLEY SEED 1030
	33. SEMINIS PX 150410	48. GOLDEN VALLEY SEED 1031
	34. SEMINIS EX 1981574	49. GOLDEN VALLEY SEED 1029
	35. SUNSEEDS SRT 6728	50. GOLDEN VALLEY SEED 1020

Table 3. Fresh market tomato variety trial yield and grade results, 2002.
Replicated varieties, Merced County.

			Market Yield					XL	L	M	S	Culls	total	Red
Var #	Variety	Company	Tons/A	Boxes/A				% of marketable yield			tons/A	tons/A	tons/A	%
9	Bobcat	Syngenta	27.42	2193.60	a			41.53	43.12	15.35	2.28	20.81	50.51	14.9
10	T-21	Syngenta	27.21	2176.80	a			57.32	30.38	12.31	2.16	10.76	40.13	16.6
3	XP150440	Seminis	24.90	1992.00	a	b		33.36	47.33	19.31	3.07	23.09	51.06	23.2
8	Shady Lady	Sunseeds	24.11	1928.80	a	b	c	30.36	47.46	22.18	2.13	16.20	42.44	29.1
6	SRT6718	Sunseeds	24.05	1924.00	a	b	c	33.53	45.36	21.10	3.80	11.67	39.52	5.7
5	SRT6722	Sunseeds	23.58	1886.40	a	b	c	26.25	49.50	24.25	3.98	13.04	40.60	13.3
11	T-23	Syngenta	23.58	1886.40	a	b	c	47.38	41.40	11.21	1.86	16.88	42.32	20.1
1	BHN 503	BHN Seed	23.09	1847.20	a	b	c	37.24	46.45	16.32	2.22	19.28	44.59	27.6
4	SXT6624	Sunseeds	21.71	1736.80		b	c	31.52	43.70	24.78	3.51	12.91	38.13	17.8
2	B 807	LSL	19.91	1592.80			c	56.74	33.41	9.84	1.65	22.54	44.10	13.0
7	SRT6719	Sunseeds	19.65	1572.00			c	29.76	47.38	22.87	4.05	11.28	34.98	15.1
	Average		23.56	1885.16				38.64	43.23	18.14	2.79	16.22	42.58	17.85
	LSD 0.05		4.80	384				9.1	7.4	6.8	1.2	5.72	7.8	5.5
	CV (%)			14.1				16.2	11.9	26	29.6	24.4	12.5	21.1

Market yield = XL + L + M size fruit, average of four replications. One box = 25 lbs.
XL, L, M% = weight of respective fruit sizes divided by marketable yield.
Red% = weight of all red fruit divided by total yield. Indicates relative maturity among tested varieties.
Culls, tons per acre: Any fruit so disfigured (due to rot, cat facing, insect damage, etc.) as to be unmarketable.

XL = 3 inches and larger in diameter
L = 2.5 to 3"
M = 2.25 to 2.5"
S = 2 to 2.25" Fruit smaller than 2" were not harvested.

LSD 0.05 = least significant difference at the 95% probablility level.
Yields followed by the same letter are not significantly different.
NS = not significant at the 95% probability level.
CV = coefficient of variation, a measure of the variability in the experiment.

Table 4. Fresh market tomato fruit and vine characteristics. Merced County, 2002
REPLICATED varieities.

Var #	Variety	Vine Size	Leaf cover	Leaf roll	Fruit shape	Rough-ness	Blossom end	Cat-facing	Growth Cracks	Sun-burn	Zip-pers	Disease	Maturity
1	BHN 503	ML	OK	S	G/FG	S/M	T	SL	Y	N	SL	N	Early
2	B 807	M	P	S	FG	M/R	M	SL	N	S	SL	Y	
3	XP150440	L	OK/P	SL	G/FG	S/M	M	S	S	S	SL	N	Early
4	SXT6624	L	G	N	G/FG	M	SL	S	N	S	S	N	
5	SRT6722	L/VL	G	N	G/D	S	SL	SL	N	N	N	N	Late
6	SRT6718	L/VL	G	N	G/FG	S/M	SL	SL	N	SL	SL	N	
7	SRT6719	L	OK	SL	G	Rough-	SL	SL	SL	S	SL	N	
8	Shady Lady	L	OK	N	G	M/R	T	S	N	S	SL	N	Early
9	Bobcat	M/L	G	N	G	M	T	S	SL	SL	SL	N	
10	T-21	L	G	N	G	M	SL	SL	N	SL	SL	N	
11	T-23	M	G	N	G	S	SL	SL	N	N	SL	N	

Vine Size:	M = medium	ML = medium large	L = large	VL = very large
Leaf Cover:	P = poor	OK = adequate	G = good	
Leaf Roll:	N = none	SL = slight	S = some	
Fruit Shape:	DG = deep globe	G = globe	FG = flat globe	
Shoulder roughness	S = smooth	M = medium	MR = medium rough	R = rough
Blossom End:	T = tight	SL = slight scar	M = medium size scar	
Cat Facing:	N = none	SL = slight	S = some	
Growth Cracks:	N = none	SL = slight	S = some	
Sunburn:	N = none	SL = slight	S = some	
Zippers:	N = none	SL = slight	S = some	
Stem:	J = joint	NJ = no joint	SJ = semi joint	
Disease:	N = none	Y = some symptoms seen		

Table 5. Fresh market tomato variety trial yield and grade results, 2002.
Observational varieties, Merced County.

				Market Yield	XL	L	M	S
Var #	Variety	Company	Tons/A	Boxes/A	% of marketable yield			tons/A
21	AT 48	Amercan Takii	24.92	1993.3	34.00	46.77	19.23	2.27
22	At 89	American Takii	23.09	1846.9	39.72	40.09	20.19	1.39
23	BHN 464	BHN Seed	27.55	2204.1	45.30	34.62	20.08	1.79
24	BHN 499	BHN Seed	28.97	2317.4	32.11	49.77	18.12	1.94
25	BHN 500	BHN Seed	20.21	1616.9	50.75	37.39	11.85	1.26
26	BHN 524	BHN Seed	25.37	2029.9	46.52	41.37	12.10	1.15
27	Mt. Fresh	Harris Moran	18.88	1510.7	21.34	53.75	24.91	3.40
28	HMX 2807	Harris Moran	8.58	686.5	20.56	55.84	23.60	3.57
29	HA 3603	Hazera	22.13	1770.3	49.21	42.42	8.37	1.79
30	HA 3638	Hazera	11.35	907.8	25.53	49.33	25.14	1.33
31	HA 3640	Hazera	15.44	1235.4	48.52	33.00	18.48	1.50
32	LSL B 812	LSL Seeds	18.77	1501.9	36.66	37.35	25.99	1.85
33	PX150410	Seminis	24.96	1996.8	41.36	46.86	11.78	1.59
34	EX1981574	Seminis	18.88	1510.7	37.83	39.10	23.07	0.65
35	SRT 6728	Sunseeds	18.12	1449.7	19.59	53.13	27.28	4.36
36	Classy Lady	Sunseeds	24.79	1982.9	38.22	43.67	18.10	1.79
37	Fair Lady	United Genetics	23.48	1878.3	38.31	52.69	9.00	1.46
38	GV 51993	Golden Valley Seed	12.48	998.4	18.67	48.87	32.46	4.70
39	GV 51178	Golden Valley Seed	19.51	1561.2	27.12	50.00	22.88	2.81
40	GV 51182	Golden Valley Seed	19.32	1545.5	43.52	47.01	9.47	1.26
41	GV 51535	Golden Valley Seed	11.94	954.8	27.92	45.99	26.09	4.09
42	GV 51644	Golden Valley Seed	13.07	1045.4	9.00	48.67	42.33	5.66
43	GV 51643	Golden Valley Seed	18.32	1465.4	23.07	29.73	47.21	2.98
44	GV 51995	Golden Valley Seed	1.83	146.4	0.00	0.00	100.00	13.46
45	GV 1021	Golden Valley Seed	3.48	278.8	0.00	10.00	90.00	6.64
46	GV 1022	Golden Valley Seed	12.98	1038.5	7.89	23.83	68.29	6.49
47	GV 1030	Golden Valley Seed	9.10	728.3	0.00	8.61	91.39	12.65
48	GV 1031	Golden Valley Seed	6.29	503.6	0.00	0.00	100.00	9.50
49	GV 1029	Golden Valley Seed	6.23	498.3	0.00	6.99	93.01	19.30
50	GV 1020	Golden Valley Seed	6.53	522.7	0.00	9.33	90.67	10.41

Average	**16.55**	**1324.22**	**26.09**	**36.21**	**37.70**	**4.44**

Market yield = XL + L + M size fruit, average of four replications. One box = 25 lbs.
XL, L, M% = weight of respective fruit sizes divided by marketable yield.
Red% = weight of all red fruit divided by total yield. Indicates relative maturity among tested varieties.
Culls, tons per acre: Any fruit so disfigured (due to rot, cat facing, insect damage, etc.) as to be unmarketable.

XL = 3 inches and larger in diameter
L = 2.5 to 3"
M = 2.25 to 2.5"
S = 2 to 2.25" Fruit smaller than 2" were not harvested.

Varieties 44 - 50 Roma type. Sizing based on weight:
XL = > 165 g
L = 130 - 165 g
M = 90 - 130 g
S = 50 - 90 g

Table 6. Fresh market tomato fruit and vine characteristics. Merced County, 2002
OBSERVATIONAL varieities.

Var #	Variety	Vine Size	Leaf cover	Leaf roll	Fruit shape	Rough-ness	Blossom end	Cat-facing	Growth Cracks	Sun-burn	Zippers	Stem	Disease
21	AT 48	L	G	N	G	R	SL	SL	N	N	N		N
22	At 89	M/L	OK	SL	G/DG	M	T	S	N	S	SL		N
23	BHN 464	M/L	OK	N	G/FG	M	SL	S	N	S	SL		N
24	BHN 499	L	OK	N	G	S	SL	S	N	S	N		N
25	BHN 500	L/VL	G	N	G/FG	M	SL	SL	N	SL	SL	NJ	N
26	BHN 524	M/L	OK	N	G	M	SL	S	N	S	S		N
27	Mt. Fresh	VL	OK	N	G/FG	S	T	SL	N	S	SL		N
28	HMX 2807	L	G	N	G	S	SL	SL	N	SL	N		N
29	HA 3603	VL	OK	N	G	M	M	S	S	S	S	NJ	N
30	HA 3638	L	OK	N	G/FG	M/R	SL	S	SL	S	SL		Y
31	HA 3640	L	G	N	FC	MR	SL	S	N	N	N		Y
32	LSL B 812	L	P	N	G	M	SL	SL	N	SL	N	NJ	N
33	PX150410	L	P	N	G	MR	SL	SL	N	S	SL		N
34	EX1981574	M/L	G	SL	G	S	T	SL	N	N	N		N
35	SRT 6728	M/L	OK	SL	G/FG	S	T	SL	N	N	SL	J	N
36	Classy Lady	L	OK	N	G/FG	M	SL	SL	SL	SL	SL	J	N
37	Fair Lady	L	OK	N	G/FG	R	M	SL	N	SL	SL	J	N
38	GV 51993	VL	OK	N	G	R	M	S	N	S	SL		Y
39	GV 51178	L	G		G/DG		T	SL	SL	S	SL	SJ	N
40	GV 51182	VL	OK	N	G	S	T	SL	S	SL	SL	SJ	N
41	GV 51535	L	OK	N	FG	M	SL	S	N	SL	SL	J	N
42	GV 51644	VL	OK	S	G	S	SL	SL	SL	SL	SL		Y
43	GV 51643	L	OK	N	G/FG	S	SL	SL	N	S	SL	JL	N
44	GV 51995	VL	G	N	R	M	T	N	N	SL	SL	JL	N
45	GV 1021	VL	G	N	R	M	T	N	N	N	N	JL	N
46	GV 1022	L	OK	N	R	S	T	N	N	SL	N	JL	N
47	GV 1030	M/L	OK	N	R	S	T	SL	N	SL	SL	JL	N
48	GV 1031	VL	G	N	R	S	T	N	N	N	N	JL	N
49	GV 1029	L	OK	N	R	R	T	N	N	SL	N		N
50	GV 1020	VL	OK	SL	R	S	T	N	SL	SL	SL		Y

Table 7. Three county summary of the marketable yields (in tons and 25 lb boxes per acre) in the repl

Variety	Company	Combined Market Yield/Acre			Kings Co. (early season)		Merced Co. (midseason)	
		Tons		Boxes	Tons	Boxes	Tons	Boxes
Bobcat	Syngenta	**31.5**	a	**2521**	32.1	2569	27.4	2194
QualiT 21	Syngenta	**30.9**	a	**2468**	31.6	2524	27.2	2177
SXT 6624	Sunseeds	**29.7**	ab	**2376**	28.8	2303	21.7	1737
SRT 6718	Sunseeds	**29.5**	ab	**2355**	29.8	2380	24.1	1924
Shady Lady	Sunseeds	**29.2**	ab	**2334**	27.1	2170	24.1	1929
QualiT 23	Syngenta	**29.2**	ab	**2334**	25.9	2075	23.6	1886
PS 150440	Seminis	**28.0**	b	**2239**	27.8	2220	24.9	1992
BHN 503	BHN	**27.8**	b	**2222**	26.7	2138	23.1	1847
SRT 6722	Sunseeds	**27.6**	b	**2204**	27.6	2205	23.6	1886
B-807	LSL Plant Sci.	**27.4**	b	**2190**	28.9	2313	19.9	1593
SRT 6719	Sunseeds	**27.3**	b	**2185**	28.7	2294	19.7	1572
Average		**28.9**		**2312**	**28.6**	**2290**	**23.6**	**1885**
LSD .05		2.8		225	4.0	320	4.8	384
CV %		12.0		12.0	9.6	9.6	14.1	14.1
Variety x Location Interaction		NS						

Variety x Location Interaction - When this statistic is significant then the varieties behaved differently at ea

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

Table 8. Summary of the three fresh market tomato trials size grades for the replicated varieties in 20

Variety	Company	COMBINED RESULTS % Market Yield XL	L	Med	Kings Co. (early season) % Market Yield XL	L	Med	Merced Co. (midseason) % Market Yield XL	L	Med	S XL
Bobcat	Syngenta	**47.2**	**35.2**	**17.6**	59.8	30.2	10.0	41.5	43.1	15.4	40.
QualiT 21	Syngenta	**55.8**	**29.8**	**14.4**	59.2	31.7	9.1	57.3	30.4	12.3	50.
SXT 6624	Sunseeds	**32.8**	**41.7**	**25.5**	35.9	44.2	19.9	31.5	43.7	24.8	30.
SRT 6718	Sunseeds	**31.9**	**42.9**	**25.2**	32.2	42.3	25.6	33.5	45.4	21.1	30.
Shady Lady	Sunseeds	**34.0**	**44.5**	**21.5**	34.6	43.4	22.0	30.4	47.5	22.2	37.
QualiT 23	Syngenta	**47.7**	**38.1**	**14.3**	54.0	35.5	10.6	47.4	41.4	11.2	41.
PS 150440	Seminis	**37.1**	**43.4**	**19.5**	42.9	40.8	16.3	33.4	47.3	19.3	34.
BHN 503	BHN	**46.7**	**38.1**	**15.2**	57.7	33.3	9.0	37.2	46.5	16.3	45.
SRT 6722	Sunseeds	**29.1**	**46.8**	**20.7**	29.0	45.8	15.2	26.3	49.5	24.3	32.
B-807	LSL Plant Sci.	**57.1**	**31.5**	**11.4**	64.5	29.9	5.6	56.7	33.4	9.8	50.
SRT 6719	Sunseeds	**29.5**	**45.7**	**24.8**	32.7	47.8	19.6	29.8	47.4	22.9	26.
Average		**40.8**	**39.8**	**19.1**	**45.7**	**38.6**	**21**	**38.6**	**43.2**	**18.1**	**38.**
LSD .05		5.8	4.5	4.2	8.8	6.3	6	9.1	7.4	6.8	12.
CV %		17.4	14	27.2	13.1	11.3	27.9	16.3	11.9	25.9	23.
Variety x Location Interaction		NS	NS	NS							

Variety by Location Interaction - When this statistic is significant, it means that the varieties did not behave consister

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

FRUIT SIZES:

XL = 2 7/8 to 3 15/16 inches diameter
L = 2 17/32 to 2 7/8 "
M = 2 9/32 to 2 17/32 "
S = 2 1/8 to 2 9/32 "

Statewide Tomato Variety Trials
POSTHARVEST EVALUATIONS for 2002

Marita Cantwell, Postharvest Specialist, Vegetable Crops Dept., UC Davis
Xunli Nie, Research Associate, Mann Laboratory, Dept. Veg. Crops, UC Davis
Paula Freitas, Student Assistant, Mann Lab, Dept. Vegetable Crops, UC Davis
Michelle LeStrange, Scott Stoddard, and Bob Mullen
Farm Advisors, Tulare & Kings, Merced & Madera, and San Joaquin Counties

Objective of Research

To evaluate the most important quality characteristics of ripened fresh market tomatoes from known varieties and new experimental lines.

Executive Summary

We evaluated 12 round tomato varieties from 3 fresh market tomato trials (Kings, Merced and San Joaquin Counties) for color, firmness and composition at the table-ripe stage. We also evaluated 6 Roma varieties from the San Joaquin County Trial. Fruit were harvested as mature-greens and vine-ripes (30-40% color).

The quality measurements conducted are described in Tables 1-3. Data for the individual trials are presented in Tables 4 -7. Summaries comparing cultivars in the 3 trials are in Tables 8-11. Table 11 provides an overall ranking of the varieties based on color, firmness and composition values for 2002 evaluations.

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 one roma variety trial were grown and harvested in commercial fields in 2002.

Kings County: April 18 - July 11 with Jones Farms (O.P. Murphy & Sons) near Kettleman City (Michelle Le Strange).

Merced County: May 15 - August 8 with Live Oak Farms, LeGrand (Scott Stoddard).

San Joaquin County: June 4 - Sept. 4 with Lagorio Farms (Ace Tomato Co.) near Collegeville; round and roma tomato variety trials (Bob Mullen).

Experimental Procedures

Fruit Sampling:

We harvested mature-green (MG) fruit from the 3 variety trials for 11 or 12 replicated varieties. For 2 of the 3 trials, vine-ripe (VR) fruit were harvested with 30-50% 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 the **table-ripe stage** or color stage 6 on the USDA scale + 1-2 days. This 1-2 day interval does not affect results.

Quality Measurements Tables 1-3:

The minimum quality evaluation of different tomato varieties should include data on firmness, color and composition at the table-ripe stage (Table 1). Flavor can be estimated measuring soluble solids (sugars) and acid contents. Table 1 describes the measurements useful to assess the postharvest potential of

different fresh market tomato varieties. 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 measurements are described in Table 2 and Table 3.

Table 1. Ripe tomato quality measurements for 2002 variety trials.

Attribute	Measurement	Additional Information
1. Color	Objective color values using a Minolta Color meter	Data reported as "Hue"; this is a calculated color value and the most useful single value to compare tomato color; see **Table 2** for typical values for a range of tomato stages. Hue values from 35-40 usually indicate good red color.
2. Texture	2a. Compression test: compression of the fruit with a given load.	A compression test simulates hand/finger compression when consumers test tomatoes; the higher the mm of compression, the softer the fruit. **Table 3** describes typical values.
	2b. Compression test: the force to compress the fruit a distance of 5 mm is measured	Computerized texture analyzer equipped with a 25 mm flat cylinder moving at 0.5 mm/sec ; value is inversely related to values in 2a. Data expressed in Newtons (1 N =9.81 kg-force or 4.45 lb.-force) ; typical range 15-25 N (**Table 3**).
3. Composition	3a. 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%.
	3b. 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
Mature-Green	1	62.7	-16.0	34.4	37.9	115.0
Breaker	2	55.8	-3.5	33.0	33.2	83.9
Pink-Orange	4	49.6	16.6	30.9	35.0	61.8
Orange-Red	5	46.2	24.3	27.0	36.3	48.0
Bright Red; Table-ripe	6	41.8	26.4	23.1	35.1	41.3
Dark Red	6+	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	Manual Firmness (mm compression)[1]	Texture Analyzer Newtons Force[2]
Very Firm	Fruit yields only slight to considerable pressure	0.5-1.0	>25
Firm	Fruit yields slightly to moderate pressure	1.0-1.5	18-25
Moderately Firm	--	1.5-2.0	15-18
Moderately Soft	--	2.0-2.5	12-15
Soft	Fruit yields readily to slight pressure	2.5-3.0	8-12
Very Soft	Fruits yields very readily to slight pressure	>3.0	<8

[1]Measured by placing a 500 g weight for 10 seconds on the equator of the fruit; see 2a in Table 1.

[2] 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.

Kings Co. Trial Summary - Table 4.

Only mature-green (MG) fruit were harvested in this trial. Fruit all had acceptable red color as indicated by Hue color values in the mid 30s. However fruit of B-807 and BHN 503 had less red color at the table-ripe stage.

QualiT 21 had significantly firmer fruit than other cultivars; Bobcat, QualiT 23, BHN358, and PS 150440 all had similar firmness values. The remaining 7 cultivars had fruit with similar firmness values.

The % soluble solids were highest in BHN 503 (4.8%), but was not significantly different from that of SRT 6718 (4.7%), SRT 6719 (4.6%) or SRT 6722 (4.6%). The cultivars B-807, BHN 358, Bobcat, PS 150440, and SXT 6624 had the lowest %SS, varying from 4.2 to 4.3%. Titratable acidity was highest in Shady Lady but similar to values in fruit of BHN 358 and SRT 6722. B-807, SRT 6718 and SRT 6719 had the lowest % titratable acidity (0.25-0.26%).

Using Bobcat as a reference cultivar, 2 cultivars had significantly better red color, 1 cultivar was firmer, 4 cultivars had higher % soluble solids and 1 cultivar had significantly more acidity.

Merced Co. Trial Summary - Table 5.

Eleven cultivars of round tomatoes were harvested at both the MG and VR stages and ripened to the table-ripe stage. In this trial, the average quality characteristics of MG-harvested fruit and VR-harvested fruit were similar (no significant differences in color, firmness or composition). Overall average red color (hue values) were similar for 9 cultivars, but fruit of B-807 and BHN 503 were less red at the table-ripe stage.

The firmest fruit were from B-807, followed by PS 150440, and Bobcat. The least firm fruit were from cultivars BHN 503, Shady Lady and SXT 6624.

Average soluble solids values (5.0%) were highest in this trial. Cultivars QualiT 21 (5.6%), SRT 6718 (5.45%), and SRT 6719 (5.35%) had the highest soluble solids, while cultivars PS 150440 (4.4%) and B-807 (4.55%) had the lowest.

P.S. 150440 and B-807 also had low average acidity levels (0.25% for B-807 fruit and 0.23% titratable acidity for PS 150440 fruit). Cultivars SRT 6718, SXT 6624 and QualiT 21 had the highest average acidity values at table-ripe stage.

Using Bobcat as reference cultivar, 2 cultivars were significantly firmer, 1 cultivar was significantly redder, 7 cultivars had higher soluble solids, and 6 cultivars had higher titratable acidity.

San Joaquin Co. Summary - Table 6.

Average quality characteristics in the 11 cultivars evaluated in this trial were not different between the MG- and VR-harvested fruit. Composition of BHN 503 fruit harvested VR was significantly different from composition of the MG-harvested fruit although color and firmness were similar.

Fruit from cultivar Bobcat in the trial were compared with the grower's Bobcat fruit and were not different in any quality characteristic. Using Bobcat as a reference cultivar, 6 cultivars had similar red color and 4 cultivars had significantly less red color development (B-807, BHN 503, QualiT 21 and QualiT 23).

Bobcat was one of the firmer cultivars with only PS 150440 having higher average firmness. B-807, BHN 503, Shady Lady, SRT 6718, SRT 6722 and SXT 6624 had significantly softer fruit.

Bobcat had 4.2% soluble solids and 8 cultivars had higher soluble solids contents. The highest soluble solids were found in SRT 6718 (4.9%) and SXT 6624 (4.55%). Acidity was generally similar among the 11 cultivars and was generally higher for VR-harvested fruit than MG-harvested fruit.

Summary 2002 San Joaquin County Roma Tomato Trial - Table 7.

Six cultivars of Roma tomatoes were harvested at the MG and VR stages. There were no significant differences in average final quality characteristics for MG-harvested and VR-harvested fruit except for titratable acidity (higher for VR-harvested fruit).

Four cultivars had similar final red color, but red color development was significantly less for Mariana and HA 35133. The latter two cultivars were also, on average, significantly firmer than the other 4 cultivars.

Soluble solids were highest in Monica (4.65%) and significantly higher than the average content in the other 5 cultivars. Average titratable acidity was highest in CTRI 1605, but similar among the other 5 cultivars.

Three Trial Summary - Tables 8 -11.

Excluding B-807 and BHN 503 because of poorer color development, the final red color of MG-harvested fruit (Table 8) with hue values 33.3-35.3, and VR-harvested fruit (Table 9) with hue values of 32.2-36.0, varied little among cultivars. All cultivars except the two mentioned achieved good red color at the table-ripe stage.

Cultivars varied significantly in firmness and differences were greater in the MG-harvested fruit than the VR-harvested fruit.

The soluble solids contents varied considerably (range 4.3-5.0% for MG-harvested; 4.2-5.2% for VR-harvested). Acidity also varied significantly among cultivars (range 0.27-0.30 % titratable acidity for MG-harvested fruit and 0.26-0.32% for VR-harvested fruit).

Red color development was, on average, very good in all three trials for both MG-harvested and VR-harvested fruits (Table 10).

Table 11 provides an overall ranking of the varieties based on color, firmness and composition values for 2002 evaluations. Cultivar Bobcat was ranked the highest in overall quality, and B-807 and BHN 503 ranked the lowest.

Results in Tables

Kings County Trial – Harvested July 11, 2002

Table 4. Quality characteristics of fresh market tomatoes harvested **MG** from the 2002 Kings Co. Trial and ripened at 20°C (68°F). Fruit were treated with ethylene for 3-4 days and were evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements; lower color values indicate redder fruits, lower firmness values indicate softer fruits. Varieties are listed in alphabetical order.

Cultivar & Company		Stage at Harvest	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
B-807	(LSL)	MG	38.1	16.0	4.2	4.48	0.25
BHN 358	(BHN)	MG	37.3	18.6	4.3	4.45	0.31
BHN 503	(BHN)	MG	38.2	15.3	4.8	4.35	0.30
Bobcat	(Syngenta)	MG	35.9	19.4	4.3	4.27	0.30
PS 150440	(Seminis)	MG	35.3	18.9	4.3	4.38	0.28
QualiT 21	(Syngenta)	MG	36.5	20.8	4.5	4.47	0.29
QualiT 23	(Syngenta)	MG	35.2	18.8	4.4	4.40	0.30
Shady Lady	(Sunseeds)	MG	33.9	16.2	4.4	4.43	0.34
SRT 6718	(Sunseeds)	MG	35.0	16.1	4.7	4.42	0.26
SRT 6719	(Sunseeds)	MG	35.2	16.0	4.6	4.47	0.25
SRT 6722	(Sunseeds)	MG	34.5	15.8	4.6	4.46	0.31
SXT 6624	(Sunseeds)	MG	36.1	15.1	4.3	4.48	0.29
	Average	**MG**	**35.9**	**17.3**	**4.5**	**4.42**	**0.29**
	LSD.05		1.5	1.4	0.5	0.07	0.04

Color & firmness data are from 3 reps of 15 fruit; composition data are from 3 reps of composite samples of 15 fruit

Merced County Trial – Harvested August 8, 2002

Table 5. Quality characteristics of fresh market tomatoes harvested **MG** and **VR** from the 2002 Merced Co. Trial and ripened at 20°C (68°F). MG-harvested fruit were treated with ethylene for 3-4 days. Fruit were evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements; lower color values indicate redder fruits, lower firmness values indicate softer fruits. Varieties are listed in alphabetical order.

Cultivar & Company	Stage at Harvest	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
B-807	MG	42.2	20.5	4.7	4.41	0.26
(LSL)	VR	39.6	17.0	4.4	4.56	0.25
BHN 503	MG	41.9	13.7	5.0	4.26	0.27
(BHN)	VR	37.0	15.4	4.9	4.42	0.29
Bobcat	MG	34.0	17.3	4.7	4.53	0.26
(Syngenta)	VR	34.5	15.6	4.7	4.52	0.25
PS 150440	MG	35.6	18.8	4.4	4.41	0.23
(Seminis)	VR	34.8	17.3	4.4	4.54	0.23
QualiT 21	MG	33.8	16.8	5.5	4.48	0.28
(Syngenta)	VR	34.3	16.6	5.7	4.46	0.31
QualiT 23	MG	35.1	16.4	4.7	4.42	0.27
(Syngenta)	VR	34.9	16.7	4.9	4.41	0.27
Shady Lady	MG	33.2	14.8	4.7	4.50	0.29
(Sunseeds)	VR	33.8	14.4	4.6	4.45	0.27
SRT 6718	MG	34.4	14.1	5.3	4.43	0.30
(Sunseeds)	VR	33.0	16.5	5.6	4.49	0.31
SRT 6719	MG	32.8	15.4	5.2	4.49	0.28
(Sunseeds)	VR	30.7	16.0	5.5	4.39	0.29
SRT 6722	MG	33.8	15.9	5.0	4.46	0.28
(Sunseeds)	VR	33.0	16.0	5.0	4.53	0.27
SXT 6624	MG	34.2	14.2	5.0	4.43	0.30
(Sunseeds)	VR	34.0	14.4	5.1	4.48	0.28
Average	**MG**	**35.5**	**16.0**	**4.9**	**4.44**	**0.28**
Average	**VR**	**34.5**	**16.2**	**5.0**	**4.48**	**0.28**
LSD.05		2.6	1.2	0.4	0.07	0.02

Color and firmness data are from 3 reps of 15 fruits for MG and 3 reps of 8-15 fruits for VR.
Composition data are from 3 reps of composite samples of 15 fruit for MG and 8-15 fruits for VR.

San Joaquin County Trial – Harvested September 4, 2002

Table 6. Quality characteristics of fresh market tomatoes harvested **MG** and **VR** from the 2002 San Joaquin Co. Trial and ripened at 20°C (68°F). MG-harvested fruit were treated with ethylene for 3-4 days. Fruit were evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements; lower color values indicate redder fruits, lower firmness values indicate softer fruits. The Bobcat** samples were taken from the grower's field outside the trial. Varieties are listed in alphabetical order.

Cultivar & Company	Stage at Harvest	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
B-807	MG	38.2	17.6	4.1	4.38	0.30
(LSL)	VR	37.1	14.3	4.4	4.38	0.32
BHN 503	MG	36.4	14.3	4.0	4.35	0.29
(BHN)	VR	36.7	14.5	4.6	4.29	0.35
Bobcat	MG	33.6	20.2	4.1	4.34	0.29
(Syngenta)	VR	34.5	18.5	4.1	4.44	0.31
Bobcat**	MG	33.6	19.8	4.2	4.42	0.29
	VR	34.5	18.7	4.3	4.37	0.32
PS 150440	MG	34.6	21.8	4.1	4.35	0.27
(Seminis)	VR	35.5	20.6	4.2	4.25	0.34
QualiT 21	MG	35.6	17.9	4.2	4.42	0.26
(Syngenta)	VR	37.8	16.8	4.3	4.34	0.28
QualiT 23	MG	35.4	20.0	4.4	4.39	0.28
(Syngenta)	VR	36.0	16.0	4.3	4.31	0.31
Shady Lady	MG	32.7	15.5	4.3	4.42	0.31
(Sunseeds)	VR	34.7	17.0	4.3	4.41	0.32
SRT 6718	MG	33.6	16.0	4.9	4.37	0.32
(Sunseeds)	VR	34.4	16.1	4.9	4.38	0.33
SRT 6719	MG	34.3	18.5	4.4	4.41	0.31
(Sunseeds)	VR	33.6	16.3	4.5	4.42	0.32
SRT 6722	MG	33.2	15.5	4.4	4.38	0.29
(Sunseeds)	VR	33.5	16.7	4.5	4.43	0.32
SXT 6624	MG	33.2	14.7	4.6	4.29	0.30
(Sunseeds)	VR	35.0	16.1	4.5	4.33	0.34
Average	**MG**	**34.5**	**17.9**	**4.3**	**4.38**	**0.29**
Average	**VR**	**35.1**	**17.1**	**4.4**	**4.36**	**0.32**
LSD.05		1.6	2.1	0.4	0.08	0.04

Color and firmness data are from 3 reps of 15 fruits for MG and 3 reps of 8-15 fruits for VR.
Composition data are from 3 reps of composite samples of 15 fruit for MG and 8-15 fruits for VR.

San Joaquin County Trial – Harvested September 4, 2002 – ROMA Lines

Table 7. Quality characteristics of fresh market **Roma** tomatoes harvested **MG** and **VR** from the 2002 San Joaquin Co. Trial. MG fruit were treated with ethylene and ripened at 20°C (68°F), and fruit were evaluated at the table-ripe stage. See Tables 1-3 for explanation of measurements; lower color values indicate redder fruits, lower firmness values indicate softer fruits.

Cultivar	Stage at Harvest	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
Monica	MG	31.9	21.4	4.7	4.25	0.29
	VR	34.3	17.4	4.6	4.39	0.33
Mariana	MG	35.7	26.6	4.4	4.20	0.30
	VR	34.6	20.9	4.3	4.31	0.32
CTRI 1605	MG	31.4	19.0	4.3	4.25	0.32
	VR	34.4	19.2	4.4	4.22	0.39
BHN 523	MG	33.3	19.6	4.2	4.28	0.28
	VR	34.2	20.5	4.2	4.30	0.32
BHN 621	MG	35.0	19.9	4.3	4.32	0.28
	VR	34.1	19.3	4.2	4.34	0.31
HA 35133	MG	39.3	22.7	4.1	4.39	0.28
	VR	34.9	25.9	4.5	4.41	0.32
Average	**MG**	**34.5**	**21.5**	**4.3**	**4.28**	**0.29**
Average	**VR**	**34.4**	**20.5**	**4.4**	**4.33**	**0.33**
LSD.05		1.9	2.6	0.3	0.09	0.04

Color and firmness data are from 3 reps of 15 fruits for MG and 8-10 fruits for VR.
Composition data are from 3 reps of composite samples of 15 fruit each for MG and 8-10 fruit for VR.

Summary Table 8. Quality characteristics of fresh market tomatoes harvested MG from three uniform variety trials in 2002. See Tables 1-3 for explanation of measurements.

Cultivar	Trial	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
B-807 (LSL)	Kings	38.1	16.0	4.2	4.48	0.25
	Merced	42.2	20.5	4.7	4.41	0.26
	San Joaq.	38.2	17.6	4.1	4.38	0.30
	Ave.	***39.5±2.3***	***18.0±2.3***	***4.3±0.3***	***4.42±.05***	***0.27±.03***
BHN 503 (BHN)	Kings	38.2	15.3	4.8	4.35	0.30
	Merced	41.9	13.7	5.0	4.26	0.27
	San Joaq.	36.4	14.3	4.0	4.35	0.29
	Ave.	***38.8±2.8***	***14.4±0.8***	***4.6±0.5***	***4.32±.05***	***0.29±.02***
Bobcat (Syngenta)	Kings	35.9	19.4	4.3	4.27	0.30
	Merced	34.0	17.3	4.7	4.53	0.26
	San Joaq.	33.6	20.2	4.1	4.34	0.29
	Ave.	***34.5±1.2***	***19.0±1.5***	***4.4±0.3***	***4.38±.13***	***0.28±.02***
PS 150440 (Seminis)	Kings	35.3	18.9	4.3	4.38	0.28
	Merced	35.6	18.8	4.4	4.41	0.23
	San Joaq.	34.6	21.8	4.1	4.35	0.27
	Ave.	***35.2±0.5***	***19.8±1.7***	***4.3±0.2***	***4.38±.03***	***0.26±.03***
QualiT 21 (Syngenta)	Kings	36.5	20.8	4.5	4.47	0.29
	Merced	33.8	16.8	5.5	4.48	0.28
	San Joaq.	35.6	17.9	4.2	4.42	0.26
	Ave.	***35.3±1.4***	***18.5±2.1***	***4.7±0.7***	***4.46±.03***	***0.28±.02***
QualiT 23 (Syngenta)	Kings	35.2	18.8	4.4	4.40	0.30
	Merced	35.1	16.4	4.7	4.42	0.27
	San Joaq.	35.4	20.0	4.4	4.39	0.28
	Ave.	***35.2±1.5***	***18.4±1.8***	***4.5±0.2***	***4.40+.02***	***0.28±.02***
Shady Lady (Sunseeds)	Kings	33.9	16.2	4.4	4.43	0.34
	Merced	33.2	14.8	4.7	4.50	0.29
	San Joaq.	32.7	15.5	4.3	4.42	0.31
	Ave.	***33.3±0.5***	***15.5±0.7***	***4.5±0.2***	***4.45±.04***	***0.31±.02***
SRT 6718 (Sunseeds)	Kings	35.0	16.1	4.7	4.42	0.26
	Merced	34.4	14.1	5.3	4.43	0.30
	San Joaq.	33.6	16.0	4.9	4.37	0.32
	Ave.	***34.3±0.7***	***15.4±1.1***	***5.0±0.3***	***4.41±.03***	***0.29±.03***
SRT 6719 (Sunseeds)	Kings	35.2	16.0	4.6	4.47	0.25
	Merced	32.8	15.4	5.2	4.49	0.28
	San Joaq.	34.3	18.5	4.4	4.41	0.31
	Ave.	***34.1±1.2***	***16.6±1.6***	***4.7±0.4***	***4.46±.04***	***0.28±.03***
SRT 6722 (Sunseeds)	Kings	34.5	15.8	4.6	4.46	0.31
	Merced	33.8	15.9	5.0	4.46	0.28
	San Joaq.	33.2	15.5	4.4	4.38	0.29
	Ave.	***33.8±0.6***	***15.7±0.2***	***4.7±0.3***	***4.43±.05***	***0.29±.02***
SXT 6624 (Sunseeds)	Kings	36.1	15.1	4.3	4.48	0.29
	Merced	34.2	14.2	5.0	4.43	0.30
	San Joaq.	33.2	14.7	4.6	4.29	0.30
	Ave.	***34.2±1.5***	***14.7±0.4***	***4.6±0.4***	***4.40±.10***	***0.30±.05***

Color and firmness data are from 3 reps of 15 fruits; composition data are from 3 reps of composite samples of 15 fruit each.

Summary Table 9. Quality characteristics of fresh market tomatoes harvested VR from two of the three 2002 variety trials. See Tables 1-3 for explanation of measurements.

Cultivar	Trial	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
B-807 (LSL)	Merced	39.6	17.0	4.4	4.56	0.25
	San Joaq.	37.1	14.3	4.4	4.38	0.32
	Ave.	***38.4***	***15.6***	***4.4***	***4.47***	***0.28***
BHN 503 (BHN)	Merced	37.0	15.4	4.9	4.42	0.29
	San Joaq.	36.7	14.5	4.6	4.29	0.35
	Ave.	***36.8***	***15.0***	***4.8***	***4.36***	***0.32***
Bobcat (Syngenta)	Merced	34.5	15.6	4.7	4.52	0.25
	San Joaq.	34.9	16.7	4.9	4.41	0.27
	Ave.	***34.7***	***16.2***	***4.8***	***4.46***	***0.26***
PS 150440 (Seminis)	Merced	35.5	20.6	4.2	4.25	0.34
	San Joaq.	34.5	18.5	4.1	4.44	0.31
	Ave.	***35.0***	***19.6***	***4.2***	***4.34***	***0.32***
QualiT 21 (Syngenta)	Merced	34.3	16.6	5.7	4.46	0.31
	San Joaq.	37.8	16.8	4.3	4.34	0.28
	Ave.	***36.0***	***16.7***	***5.0***	***4.40***	***0.30***
QualiT 23 (Syngenta)	Merced	33.8	14.4	4.6	4.45	0.27
	San Joaq.	36.0	16.0	4.3	4.31	0.31
	Ave.	***34.9***	***15.2***	***4.4***	***4.38***	***0.29***
Shady Lady (Sunseeds)	Merced	33.8	14.4	4.6	4.45	0.27
	San Joaq.	34.7	17.0	4.3	4.41	0.32
	Ave.	***34.2***	***15.7***	***4.4***	***4.43***	***0.30***
SRT 6718 (Sunseeds)	Merced	33.0	16.5	5.6	4.49	0.31
	San Joaq.	34.4	16.1	4.9	4.38	0.33
	Ave.	***33.7***	***16.3***	***5.2***	***4.44***	***0.32***
SRT 6719 (Sunseeds)	Merced	30.7	16.0	5.5	4.39	0.29
	San Joaq.	33.6	16.3	4.5	4.42	0.32
	Ave.	***32.2***	***16.2***	***5.0***	***4.40***	***0.30***
SRT 6722 (Sunseeds)	Merced	33.0	16.0	5.0	4.53	0.27
	San Joaq.	33.5	16.7	4.5	4.43	0.32
	Ave.	***33.2***	***16.4***	***4.8***	***4.49***	***0.30***
SXT 6624 (Sunseeds)	Merced	34.0	14.4	5.1	4.48	0.28
	San Joaq.	35.0	16.1	4.5	4.33	0.34
	Ave.	***34.5***	***15.2***	***4.8***	***4.40***	***0.33***

Color and firmness data are from 3 reps of 8-15 fruits; composition data are from 3 reps of composite samples of 8-15 fruit each.

Summary Table 10. Average quality characteristics of fresh market tomatoes harvested MG or VR from three trials in 2001. MG fruit were treated with ethylene, completed ripening at 20°C (68°F), and were evaluated at the table-ripe stage (USDA Color Chart stage 6). See Tables 1-3 for explanation of measurements.

Trial	# cultivars	Red Color, Hue	Firmness, Newtons	% Soluble solids	pH	% Titratable acidity
Harvested MG						
Kings Co.	12	35.9	17.3	4.5	4.42	0.29
Merced Co.	11	35.5	16.0	4.9	4.44	0.28
San Joaq. Co.	11	34.5	17.9	4.3	4.38	0.29
Average		**35.3±0.7**	**17.1±1.0**	**4.6±0.3**	**4.41±.03**	**0.29±.01**
Harvested VR						
Kings Co.	0	--	--	--	--	--
Merced Co.	11	34.5	16.2	5.0	4.48	0.28
San Joaq.Co.	11	35.1	17.1	4.4	4.36	0.32
Average		**34.8±0.4**	**16.6±0.6**	**4.7±0.4**	**4.42±.08**	**0.30±.03**

Summary Table 11. Overall scores of ripe round tomato varieties (includes MG and VR harvested fruits) evaluated in 2002.

Variety	Number of Evaluations	% SS Score	% TA Score	Flavor Score (Max = 3)	Red Color Score (Max = 3)	Firmness Score (Max = 3)	Total Quality Score (Max =9)
Bobcat	7	2.0	1.9	**2.0**	2.9	2.7	**7.6**
SRT 6718	5	3.0	2.0	**2.5**	2.8	2.0	**7.3**
SRT 6719	5	2.4	1.8	**2.1**	2.8	2.2	**7.1**
SRT 6722	5	2.4	1.8	**2.1**	3.0	2.0	**7.1**
PS 150440	5	1.8	1.6	**1.7**	2.4	2.8	**6.9**
Shady Lady	5	2.2	2.0	**2.1**	2.8	1.8	**6.7**
QualiT 21	5	2.4	1.8	**2.1**	2.4	2.2	**6.7**
QualiT 23	5	2.4	1.6	**2.0**	2.2	2.4	**6.6**
SXT 6624	5	2.4	2.2	**2.3**	2.6	1.4	**6.3**
B-807	5	1.8	1.4	**1.6**	1.8	2.0	**5.4**
BHN 503	5	2.4	2.0	**2.2**	1.8	1.4	**5.4**

Varieties are scored for each characteristic on a 3 point scale, where 1=low, 2=intermediate, and 3=high.

Red color:	score 1 = poor, with hue >40	score 2 = hue 35-40	score 3 = high with hue <35
Firmness:	score 1 = <15N force	score 2 = 15-18	score 3 = >18
Soluble solids:	score 1 = < 4.2 %SS	score 2 = 4.2-4.6 %SS	score 3 = >4.6 %SS
Acidity:	score 1 = < 0.28 %T.A.	score 2 = .28-.30 %TA	score 3 = >0.30 %T.A.

Flavor Score is the average of the soluble solids and titratable acidity scores.
Total score is based on the sum of the flavor, red color and firmness scores, and the higher the total score, the better the overall quality. Varieties are ordered based on total quality score (right column).

PROCESSING TOMATO VARIETY TRIAL

2002 Research Progress Report

Scott Stoddard, Farm Advisor
Bill Weir, Farm Advisor Emeritus
Merced/Madera Counties

INTRODUCTION

The University of California Cooperative Extension conducts field scale variety trials each year in several different counties throughout the state in the areas where processing tomatoes are grown. New varieties and breeding lines are compared to established varieties for their performance in yield, ?Brix, color, and pH. Both early and mid-season varieties are compared in separate tests.

Two or more tests are conducted in each location: replicated and observed. Additionally, some counties compare mid-season and early lines. In Merced County, the 2002 trial compared mid-season varieties on San Juan Ranch, north of Dos Palos in Merced County. Single row beds were direct seeded on February 28, 2002, using a five row commercial planter. Plot size was one bed (60") by 100 ft, replicated 4 times. Plants emerged around March 21 and were later thinned to 2-3 plants per foot. Seventeen replicated and 19 observational varieties were planted. Variety company and disease information is shown in Table 1.

Plots were machine harvested August 16 and 17, 2002 using a Johnson Tomato Harvester equipped with a mechanical sorter. The sorted fruit were conveyed to a weigh wagon so that each individual plot yield was determined (Fig. 1). Fruit samples at harvest were taken to the local PTAB grading station for pH, soluble solids, and color analysis. Yield and sample results for the replicated and observational trials are presented in Tables 2 and 3.

The summary report for the statewide results can be found on the Merced County UCCE website at http://cemerced.ucdavis.edu/Agriculture_and_Natural_Resources/Field_and_Vegetable_Crops.htm

RESULTS

Replicated Trial.

Best overall performers in the replicated trial (Table 2) were H9780, SUN 6324, PS849, HMX 830, and AP938, with yields ranging from 38.4 to 31.7 tons per acre. These varieties were not significantly different from each other, but were significantly better than the bottom six varieties in the test. Best ?Brix yield came from AP938 and H9780, at 1.95 and 1.93 tons/A, respectively. H9491 was used in place of AB2 and AB5.

Soluble solids were in general very good this year, ranging from 4.7% to 6.15%. AP938 had the best soluble solids at 6.15%. Significant differences were also found for pH and color. All of the varieties tested were below the pH 4.6 tolerance limit set for paste.

Observational Trial.

The observation varieties (Table 3) had greater yield spread than the replicated lines, ranging from 11 to almost 45 tons per acre. Six of those tested exceeded 33 tons per acre compared to only 3 lines in the replicated trial. H9995 had both highest yield and highest brix yield. Some of the very low yielding lines (less than 20 tons/A) had early season stand problems that was the main reason for the low yields. H9491 had a poor stand in this plot, which is why it yielded poorly here but well in the replicated trial.

As a whole, the observational lines had similar pH as the replicated lines, but slightly better color and soluble solids. Because there was no replication on the observed lines, statistical differences are not reported.

State Regional Yield Results

Yield results for the other counties participating in this trial with the replicated varieties are shown in Table 4. These type of data help to determine if a variety does well over a broad area. For the most part, the varieties that did well in Merced (H9780, PX849, SUN6324) also did very well at the other test locations. The significant variety by location interaction means, however, that some varieties yielded better in certain locations than others.

ACKNOWLEDGEMENTS

Many thanks to the following for their help and cooperation with this project: Mr. Dan Burns with San Juan Ranch in Dos Palos, the various seed companies, Fresno County Farm Advisor Jésus Valencia for loaning the weigh wagon, and county Agriculture Technician Larry Burrow.

Table 1. Mid- maturing test varieties.

Company	*Replicated*	*Varieties*	*Observational*	*Varieties*
AB			AB405	$VFFNP
CTRI	CTRI056	4VFFN		
Campbell	CXD215	$VFFF3NP	CXD207	$VFFN
	CXD221	$VFFF3NP	CXD208	$VFFN
	CXD222	$VFFNP		
Harris Moran	HM830	$VFFN	HMX1851	$VFFN
			HMX1852	$VFFN
Heinz	**H8892**	$VFFN	H1300	$VFFNP
	H9665	$VFFNP	H9995	$VFFNP
	H9998	$VFFNP	H2801	$VFFNP
	H2501	$VFFNP		
	H2601	$VFFNP		
	H9780	$VFFNP		
Lipton			U447	$VFFN
			U729	$VFFN
N Del Monte			NDM0098	$VFFN
Orsetti	**Hallev 3155**	$VFF	BOS24675	$VFFN
Rogers			**La Rossa**	$VFF
Seminis	PS849	$VFFNP	PS296	$VFFNP
	AP938	$VFFNP	Hypeel347	$VFFNP
Sunseeds	Sun 6324	$VFFNP	Sun6119	$VFFN
			Sun 6340	$VFFNP
United Genetics			ENP113	$VFFNP

$= Hybrid	FF= Fusarium Wilt Race I and II
4=open	FFF3 = Fusarium Wilt Race I,II, and III
V=Verticillium Wilt Race I Resistant	N = Root Knot Nematode Resistant
F=Fusarium Wilt Race I	P= Bacterial Speck

Bold = varietal standard

Table 2. Processing tomato mid-season variety trial, replicated varieties. Merced County 2002.

		fruit yield								Brix yield
	Variety	T/A						LED color	SS	pH	T/A
13	H9780	38.44	a					25.25	5.00	4.29	1.93
17	SUN 6324	34.09	a	b				22.25	5.25	4.46	1.79
2	H9491	33.76	a	b				22.00	4.70	4.38	1.59
15	PS 849	32.67	a	b	c			24.00	4.95	4.31	1.61
7	HMX 830	32.23	a	b	c	d		22.50	5.88	4.38	1.88
16	AP 938	31.69	a	b	c	d		22.50	6.15	4.36	1.95
8	H8892	31.15		b	c	d		22.25	5.13	4.44	1.60
3	CXD 215	30.60		b	c	d		24.00	5.40	4.42	1.66
5	CXD 222	29.62		b	c	d	e	23.00	5.48	4.35	1.60
14	3155	29.40		b	c	d	e	23.00	5.48	4.38	1.60
11	H2501	27.33		b	c	d	e	23.75	5.33	4.39	1.46
9	H9665	26.24			c	d	e	23.75	4.85	4.37	1.28
1	H9491	26.14			c	d	e	22.50	4.93	4.37	1.28
12	H2601	25.92			c	d	e	24.00	5.05	4.42	1.32
4	CXD 221	25.48				d	e	23.50	5.68	4.41	1.45
10	H9998	23.41					e	f	22.25	5.05	4.39	1.18
6	CTRI 1056	17.75						f	22.75	5.30	4.41	0.94
	Average	**29.2**							**23.3**	**5.3**	**4.4**	**1.5**
	LSD 0.05	**7.0**							**1.0**	**0.5**	**0.1**	**0.4**
	CV, %	**16.8**							**3.1**	**7.2**	**1.3**	**18.1**

LSD 0.05 = least significant difference at the 95% confidence level. Means separated by less than this amount are not significantly different. Yields with the same letter are not significantly different.

CV = coefficient of variation, a measure of the variability in the experiment.

LED Color: lower values indicated darker red fruit.

Table 3. Processing tomato mid-season variety trial, observation varieties. Merced County 2002.

		fruit yield	LED			Brix yield
	Variety	T/A	color	SS	pH	T/A
28	H9995	44.6	23.0	5.6	4.31	2.50
32	NDM 0098	36.6	22.0	5.6	4.40	2.05
35	HyPeel 347	36.2	23.0	5.1	4.31	1.84
31	U922	34.8	21.0	5.6	4.42	1.95
39	ENP 113	33.5	23.0	5.8	4.37	1.95
30	U729	33.1	23.0	5.2	4.41	1.72
37	SUN 1340	30.1	22.0	6.0	4.20	1.80
34	PS296	28.7	24.0	5.8	4.20	1.67
33	BOS 24675	27.8	23.0	5.4	4.35	0.75
26	H1300	27.4	21.0	5.6	4.35	1.54
27	H2801	25.3	22.0	6.6	4.37	1.67
29	U447	24.4	23.0	5.8	4.48	1.41
38	LaRossa	22.7	22.0	5.4	4.43	1.22
36	SUN 6119	22.3	25.0	5.2	4.30	1.16
24	HMX 1851	17.9	25.0	5.9	4.53	1.05
25	HMX 1852	15.7	23.0	7.0	4.45	1.10
23	CXD 208	12.6	22.0	6.4	4.52	0.81
22	CXD 207	12.2	21.0	6.7	4.55	0.82
21	H9491	11.3	22.0	6.4	4.36	0.72
	Average	**26.2**	**22.6**	**5.8**	**4.4**	**1.5**

Yield is from machine harvested and sorted fruit from one plot only.
SS = soluble solids.
LED color: lower values indicate darker red fruit.

Table 4. Average fruit yields (in tons per acre) for the mid-maturity replicated varieties (all nine test locations) in 2002.

VARIETY	9 locations	Sutter	Yolo1	Yolo2	San Joaquin	Fresno 1	Fresno 2	Kern	Colusa	Merced
	tons/acre									
H9780	43.0	36.2	48.1	46.3	42.5	29.1	45.1	46.9	54.3	38.4
PX849	42.5	41.3	54.1	56.5	44.7	22.7	44.9	27.7	58.0	32.7
H8892	42.5	36.2	47.4	51.7	57.0	30.3	44.4	26.8	57.6	31.1
SUN6324	41.0	37.2	46.7	47.6	50.3	25.3	44.9	27.1	56.3	34.1
H9665	40.5	35.7	42.6	53.6	49.3	24.7	44.9	29.5	58.3	26.2
CXD222	40.5	39.5	50.2	41.9	44.7	24.0	39.2	35.7	59.7	29.6
CXD215	39.5	43.3	45.5	46.0	51.3	22.6	39.1	21.6	55.7	30.6
Halley3155	37.7	34.9	47.1	50.9	49.4	23.2	38.4	15.6	50.6	29.4
H2601	37.7	26.9	27.9	52.6	50.7	29.0	41.7	36.4	48.2	25.9
HM0830	37.0	31.0	42.6	47.0	52.1	25.0	34.3	22.2	46.7	32.2
H2501	36.9	32.5	36.6	52.0	46.5	28.8	33.9	26.0	48.2	27.3
CXD221	35.5	37.9	35.9	39.3	45.5	20.1	34.6	22.7	57.8	25.5
AP938	34.3	28.3	34.6	44.5	43.5	20.7	30.6	25.4	49.4	31.7
H9998	31.8	26.9	23.1	45.1	38.0	33.4	31.4	29.0	36.1	23.4
CTRI1056	26.0	26.0	23.0	33.9	44.7	21.1	25.9	21.6	37.5	17.8
MEAN	37.9	34.3	40.4	47.3	47.3	25.3	38.2	27.6	51.6	29.1
LSD@0.05=	2.7	5.2	2.7	4.2	8.9	N.S.	4.8	13.1	10.9	6.9
C.V.=	15.2	10.6	4.8	6.3	13.2	30.0	8.9	33.1	14.7	16.6
Variety X Location LSD@ 0.05=	8.0									

LSD = Least Significant Difference at the 95% confidence level. Means separated by less than this amount are not significantly different.

CV = coefficient of variation, a measure of the variability in the experiment.

Variety X location LSD = the least significant difference for comparing the same variety at different locations.

DITERA NEMATICIDE ON PRECESSING TOMATOES
2002 Research Progress Report

Scott Stoddard, Farm Advisor
Merced/Madera Counties

OBJECTIVE: To evaluate the efficacy of Ditera on processing tomato yield and control of root knot nematodes.

SITE LOCATION AND COOPERATOR: Bob Giampaoli. Field located on Road 15 near Chowchilla, in Madera County. Soil type was Madera sandy loam.

TREATMENTS:

1. UTC
2. D1 Ditera, 2 galA every two weeks for a total of 4 applications
3. D2 Ditera, 3 gal/A
4. Vydate, 4 pts/A (grower supplied), 2 applications

FIELD TREATMENT RANDOMIZATION:

Vydate	Vydate	D1	D2	D1	UTC	D2	UTC	D2	D1	UTC	Vydate

Plot size: 9 beds x 500 ft, sub-surface drip irrigated
Variety: H9665 transplanted end of May

PROTOCOL:
Injection ports added to each irrigation line. Ditera was mixed with water and injected while field was being irrigated. Injected using piston pump for 15 minutes per line.
- 1st application on 6/7/2002
- 2nd application on 6/24/2002
- 3rd application on 7/8/2002
- 4th application on 7/22/2002
- Vydate applied by grower, 2 applications

- Soil samples for nematodes in May and July 22.
- Root gall samples taken in September.
- tomatoes harvested on 9/24/2002
- the tomatoes were hand picked 13 ft at 2 locations within each plot

RESULTS

Initial nematode samples in the soil were taken in may 15, 2002 to determine the best place to put the trial for greatest control from root knot nematodes. Nematode counts were 216, 198, and 36 per 500 cc of soil for the East, West, and South samples, respectively. We chose the east side of the field for the test, where the soil was considerably sandier and had higher counts.

Mid season nematode counts, late season root galls, and yield are shown in Table 1. Nematode samples were taken July 22, 2002 and sent to Western Diagnostic Labs for analysis. Samples were taken from each plot to 18" and combined for each treatment. Because they were composite samples, no statistics could be run and the results merely reflect the composite average for each treatment. Only a partial root gall count was done, and no stats are performed on these data either.

The Ditera was injected into the drip lines by adding a T-port to the buried line at the beginning of each bed (Fig 1.) Applications of Ditera began June 7, almost immediately after the field was transplanted. The correct amount of Ditera was measured, then premixed with water and injected into each line using a battery operated piston pump. Injection times occurred while the grower was at the end on an irrigation set and typically lasted 15 minutes. Each Ditera treatment was injected every 2 weeks for a total of 4 applications (Figs 2 and 3).

While there appeared to be substantially less nematodes in the July sampling with the Ditera treatments, especially the 3 gal per acre rate, there was no significant difference in yield between any of the treatments. Overall yields were good, averaging 42.5 tons/A. The untreated control had the best yield, at 46.7 tons/A (Fig. 4). The main reason for the lack of yield was probably because the variety used, H9665, is a processing type with nematode resistance. Very little galling was found on any of the plants, regardless of nematode treatment.

ACKNOWLEDGEMENTS

Many thanks to Bob Giampaoli of Live Oak Farms and Tino Lopez of Valent for their help and cooperation in this trial.

Table 1. Nematode counts and processing tomato yield as affected by nematode treatment. Madera County, 2002.

Treatment	*RKN counts*[1] *#/500 cc*	*Root galls #/10 plants*	*Yield Tons/A*	*%red*
1. UTC	342	4	46.7	90.0
2. Ditera 2 gpa	180	2	42.4	90.5
3. Ditera 3 gpa	36	2	40.7	87.3
4. Vydate 4 pts/A	234	0	40.3	90.1
LSD 0.10	--------	--------	NS	NS
CV, %	--------	--------	11.4	5.9

[1] RKN = Root knot nematode (*Meloidigyne incognita*) larvae per 500 cc of soil in upper 18" of soil. Composite sample across all plots in each treatment.
LSD 0.10 = Least significant difference at the 90% confidence level. NS = not significant.
CV = coefficient of variation.

Figure 1. T-port installed in buried drip line with injection access tube.

Figure 2. Injecting Ditera at 2nd application.

Figure 3. Injecting Ditera at 4th application.

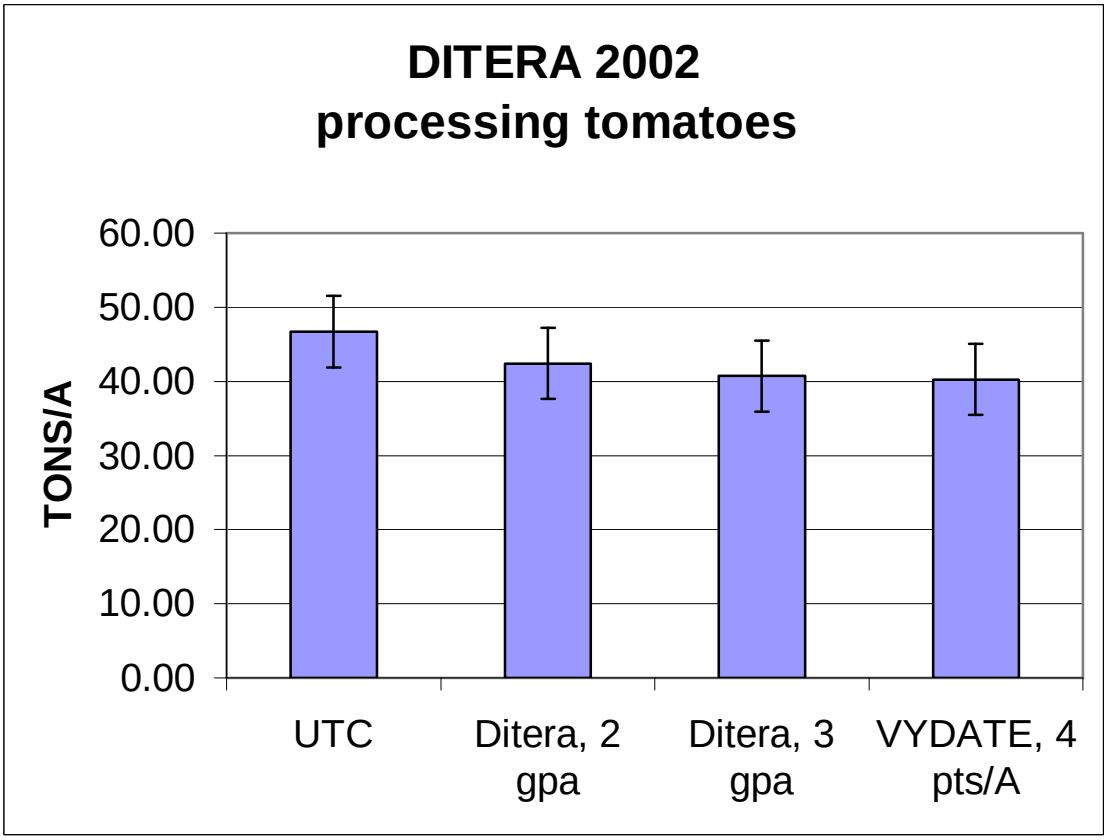

Figure 4. Average yield of processing tomatoes as affected by nematacide treatment.

SIDEDRESS N ON PROCESSING TOMATOES

2002 Research Progress Report

Scott Stoddard, Farm Advisor
Bill Weir, Farm Advisor Emeritus
Merced/Madera Counties

INTRODUCTION

Fertilizer rates vary widely in California for processing tomatoes—typical seasonal rates are 120 to 250 lbs per acre of nitrogen. Current University of California Cooperative Extension guidelines suggest 100 – 200 total pounds of nitrogen per season, usually with little response to rates above 150 lbs/A. University research has shown that under normal conditions, maximum yield can be obtained with 140 to 180 pounds of N per acre. Sidedress applications of 120 – 150 lbs are very adequate. In multiple trials conducted in Merced County in the last few years, best overall yields occurred at 125 lbs N/A, split 25 lbs/100 lbs pre-plant/sidedress applied.

Recent research by Vegetable Specialists Jeff Mitchell and Tim Hartz have also shown that pre-sidedress nitrate soil tests (PSNT) could be used to predict whether additional sidedress nitrogen was necessary. Trials were conducted on 10 tomato fields throughout the state during 1998-99. They found that if the soil tested higher than 16 ppm NO_3-N in the upper 12" just prior to sidedress application when the plants were six inches tall, no yield response to additional N was observed. Essentially, there was enough residual nitrogen in the soil to carry the crop through harvest. Other states have found critical PSNT thresholds between 20 – 25 ppm NO_3-N.

In light of this information, a study was conducted where different sidedress N rates were applied to processing tomatoes in Merced County to determine the effect on yield. At the time of application, soil and plant samples were taken for nitrate analysis.

METHODS

Trial was set up in a commercial processing tomato field located near Dos Palos, CA. Field had been pre-plant fertilized with 600 lbs of 4-10-10 and 10 yards of manure per acre. Field variety was H9491, direct seeded in late February. Crop was furrow irrigated.

At the same time that the grower was sidedressing the field when the crop was about 6 – 8" tall, the plots were sidedressed using UAN32 mixed with water in a Solo back pack sprayer with the tip removed on (May 13, 2002). Treatments were 0, 65, 130, 185, and 35 lbs N/A (the last treatment was supposed to receive a second application, but this was deemed unnecessary at the time). A furrow was opened along side the plant row and the fertilizer was dribbled in a band in the furrow, then covered. Plots were one bed wide by 50 feet long. Soil samples to a depth of 12 inches were taken just prior to sidedress application and again 3 weeks later. Petiole samples were taken in early June at full bloom for N, P, and K analysis.

At harvest, fruit yields were determined by hand picking the fruit from 13 feet of one row within each plot.

RESULTS

Soil samples taken just prior to sidedress application in May 13 had an average value of over 40 ppm NO_3-N—well above the 16 ppm threshold developed by Hartz and Mitchell. A second set of samples taken June 4 showed no effect of the treatments, but again were all greater than 16 ppm (Table 1). Significant differences were observed in petiole NO_3-N and K values, with greatest levels in treatment 3 and lowest in treatments 1 and 5 (Table 1). While K and PO_4-P in the plants were above sufficiency levels for the crop growth stage, NO_3-N levels were low, averaging only 1726 ppm.

Yields were not significantly different among the treatments, nor were any differences found for the percentage of green fruit or rot at harvest (Table 2). Highest yields occurred at 23.5 tons per acre at a sidedress N rate of 65 lbs per acre (Figure 1). The low yields in this trial are primarily a result of heavy weed pressure.

This trial showed again that total N requirements for maximum yield in processing tomatoes are moderate. In this trial, the manure contributed sufficient N to the crop during the growing season such that no additional nitrogen was required. However, the conflicting information from the soil data, which indicated sufficient nitrogen in the soil, as compared to the petiole results, which showed a plant deficiency of nitrogen, does create a management dilemma. In this year, the PSNT results were correct, but this test is relatively new in California. Tissue tests are based on large data sets and have been used for many years.

ACKNOWLEDGEMENTS

Many thanks to Dan Burns of San Juan Ranch for his help and cooperation with this trial.

Table 1. Soil and petiole sample results.

Sidedress N lbs/A	*Soil NO_3-N[1] May 8*	*Soil NO_3-N June 4*	*NO_3-N, ppm*	*Petiole[3] K %*	*PO_4-P, ppm*
1. 0 (UTC)	40.5	28.6	1560	4.21	3815
2. 65 (½ x rate)		26.2	1977	5.02	3703
3. 130 (1x rate)		47.3	1943	5.19	3530
4. 185 (1.5 x rate)		18.7	1673	4.82	3287
5. 35 + 30[2]		19.3	1657	4.46	3707
Average		28.0	1762	4.74	3608
LSD 0.10[4]	----	----	290	0.41	NS

1. Soil NO_3-N ppm in the upper 12". Soil samples were composite samples taken from all treatments.
2. Treatment 5 did not receive the second sidedress application.
3. Petiole samples taken June 4, 2002.
4. Least significant difference at the 90% confidence level. Means separated by less than this amount are not significantly different

Table 2. Yield results for the process tomato sidedress N trial, 2002.

Sidedress N lbs/A	*Tons per Acre*	*% green*	*% rot*
1. 0 (UTC)	22.84	15.5	1.77
2. 65 (½ x rate)	23.43	14.1	1.76
3. 130 (1x rate)	23.02	13.1	1.81
4. 185 (1.5 x rate)	22.14	17.7	2.81
5. 35 + 30[2]	22.68	17.5	1.63
Average	22.82	15.6	1.96
LSD 0.10	NS	NS	NS

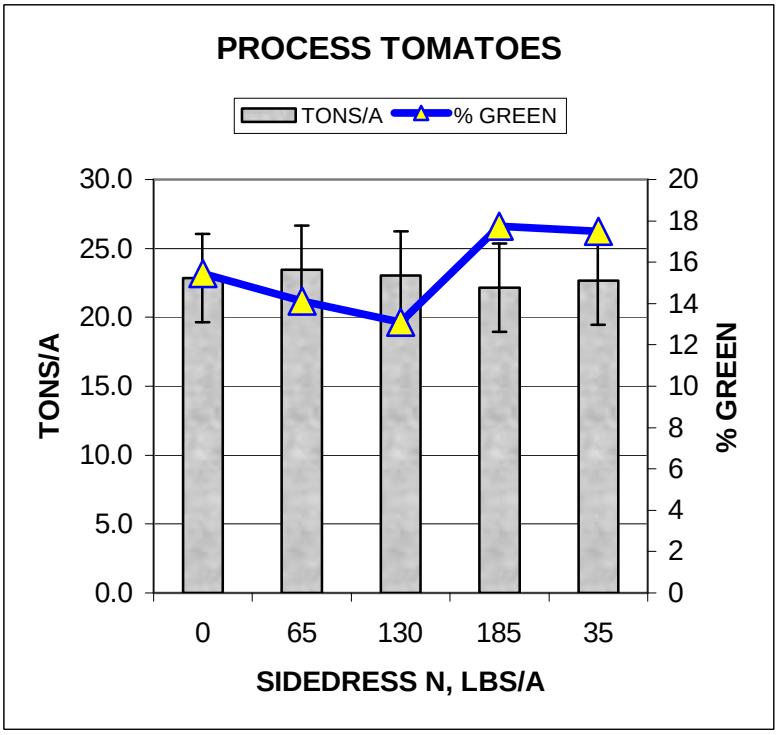

Figure 1. Process tomato yields as affected by sidedress nitrogen rate (bars) and percentage of green fruit (blue line).

WORM MONITORING RESULTS

2002 Research Progress Report

Scott Stoddard, Farm Advisor
Bill Weir, Farm Advisor Emeritus
Merced/Madera Counties

OBJECTIVE
Use pheromone traps to monitor adult moths of various tomato Lepidoptera pests to better detect potential pest problems; determine if there is a relationship between flights and pest detection in the field; and validate degree day models.

START DATE: Traps set out February 15, 2002.
END DATE: November 15, 2002.

PHEROMONES: Beet Armyworm (BAW), Western Yellowstripe Armyworm (WYSA), Black Cutworm (BCW), Variegated Cutworm (VGC), Cabbage Looper (CL), Tomato Fruitworm (corn earworm, CEW).

LOCATION: East Merced Co. (LeGrand)
Near the corner of Buchanon Hollw and Minturn Rds, in LeGrand, CA
T8S, R15E section 36
Traps set out before any transplants set
Surrounding fields almonds, corn, alfalfa, wheat, tomatoes
Nearest CIMIS station: Merced, about 10 miles away
Cooperators: Bob Giampaoli, Live Oak. Mark Hoatson, PCA.

West Merced County (Dos Palos)
Near the corner of Indiana and Washington Roads, south of Levy District
T9S, R13E section 31
Traps initially set February 15, moved to present location April 4, 2002
Surrounding field cotton, tomatoes, alfalfa
Nearest CIMIS station: Los Banos, about 12 miles away
Cooperators: Dan Burns, San Juan Ranch. Bob Vandenberg, PCA.

NOTE: only CEW, BAW, and WYSA monitored at this location.

SET UP: Two sets of bucket traps at each site, for a total of 12 traps at Live Oak Farms and 6 traps at San Juan Ranch. One trap for each worm species placed along two sides of the field. Traps separated from each other by at least 100 feet.

PROTOCOL: Check traps weekly and record number of each moth species. Note the number of incorrect moths in each traps if there are any. Change pheromones every 4 weeks, pest strips every 3 months. Notify PCA's of high counts, and input data to website.

RESULTS:

Trap counts, in number of moths per trap per day for each species, for Dos Palos are shown in Figures 1 – 3. Results for LeGrand are shown in Figures 4 – 9. Vertical lines on each graph indicate the approximate time the field or nearby fields were sprayed for worm pests. The curved line indicates cumulative degree days for each species.

Based on this years data and subsequent years of monitoring, one of the conclusions that can be made is that the eastside and Westside trap counts were independent of each other in both numbers and timing of peak moth flights. This means that there is a geographic limit to the effectiveness of the traps. This limit has not been determined, but it is probably around one mile radius from the trap. Additionally, years were also independent of each other. For example, in 2000 there were high traps counts early in the season, whereas in 2002 peak counts occurred rather late in the season.

The type of crop had an impact on the relationship between trap counts and worm sprays. On fresh market tomatoes in LeGrand, sprays often occurred when trap counts met or exceeded 10 moths per trap per day. However, sprays at this threshold did not always occur, as crop growth stage plays a role as to whether a spray is warranted. This threshold applied when the crop was past full bloom and fruit were present. On the Westside with processing tomatoes, worm sprays occurred much less often, and there was no association between trap counts and an insecticide application.

We found that there were about 750 – 1000 degree days between strong peaks in the trap data. This corresponded to about 4 – 6 weeks (typically in Merced receives 20 – 30 degree days per day in the summer months, depending on the model used). This could possibly be used as a guide to estimate another possible spray date, but only if the subsequent peak falls during the fruiting stage of the crop.

In general, the use of bucket traps to predict potential pest problems in tomatoes appears to be too limited for widespread use. Adjacent crops, target crop, and crop growth stage all impact the quality of the trap data and make analysis very difficult.

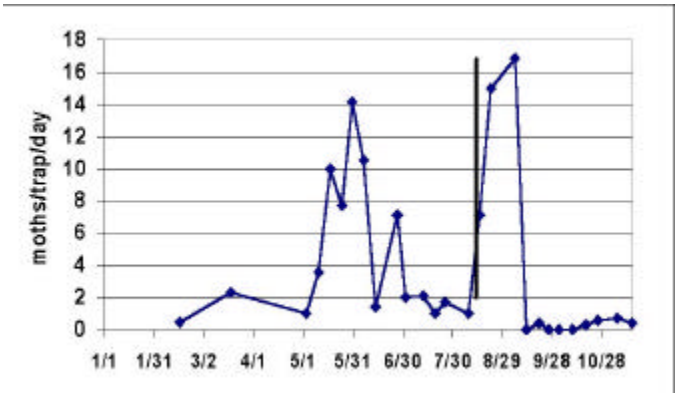

Figure 1. Average trap counts for WYSA in Dos Palos, 2002. Vertical line indicates a worm spray.

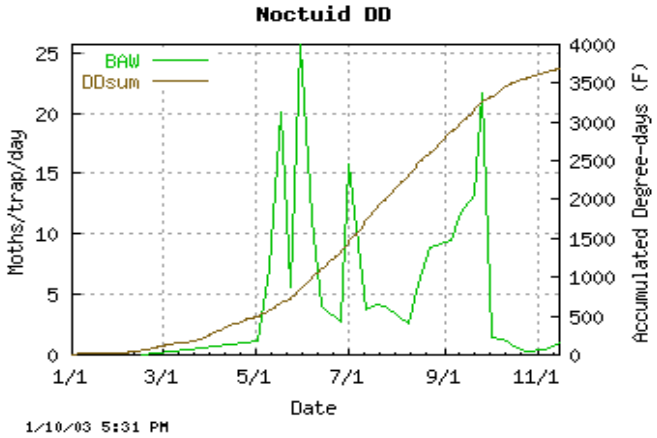

Figure 2. Average trap counts for BAW in Dos Palos, 2002.

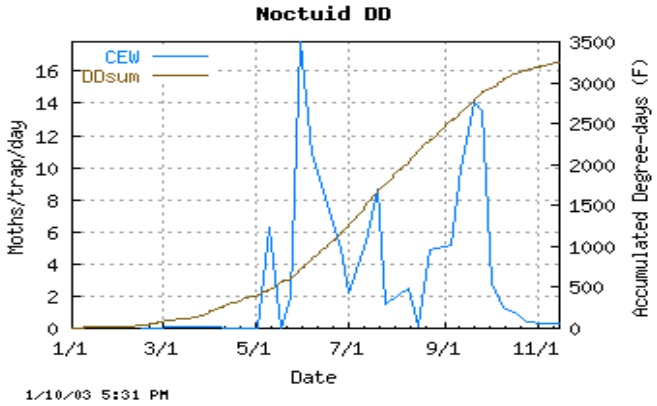

Figure 3. Average trap counts for CEW in Dos Palos, 2002.

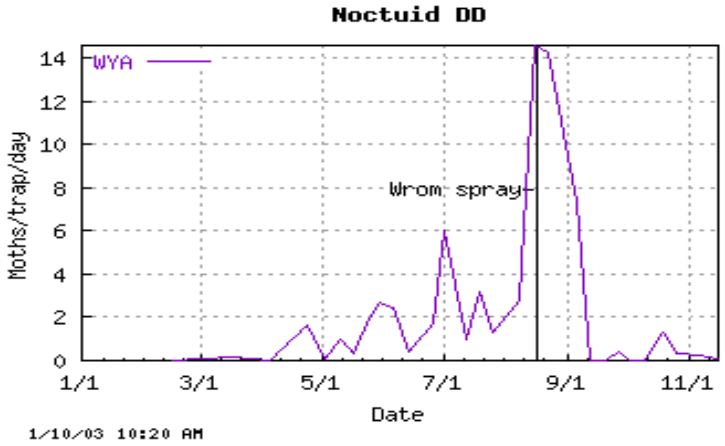

Figure 4. Average WYSA trap counts for LeGrand, 2002. Vertical lines = worm spray.

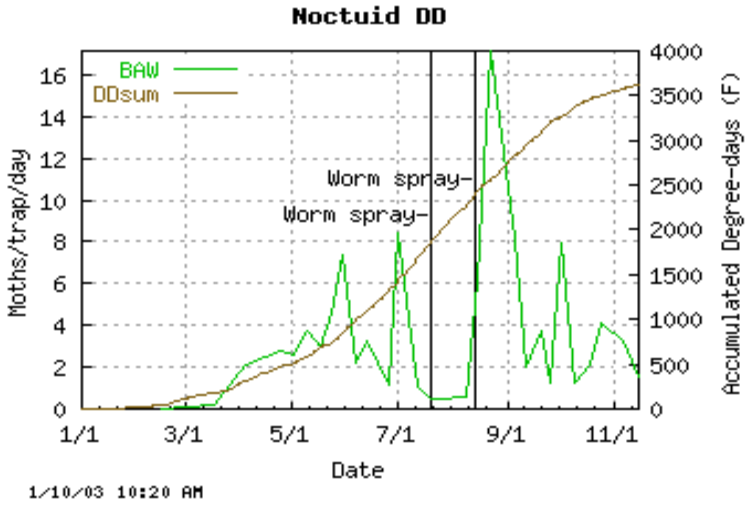

Figure 5. Average BAW trap counts for LeGrand, 2002.

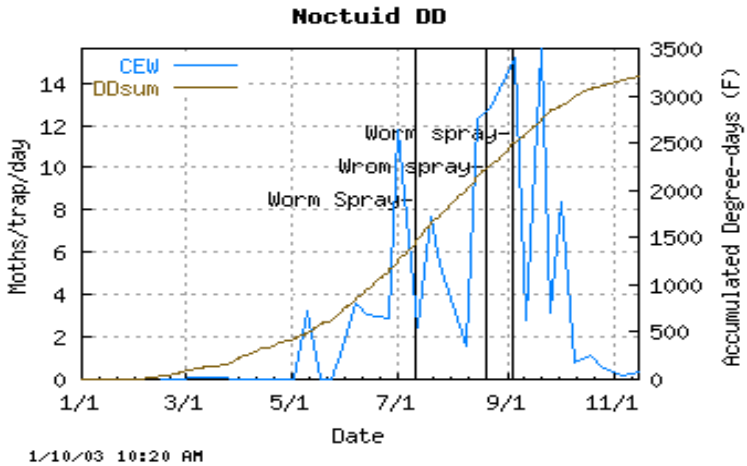

Figure 6. Average CEW trap counts for LeGrand, 2002.

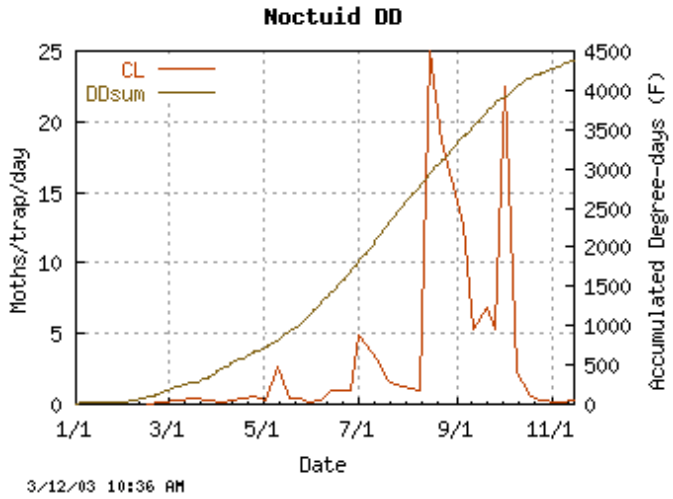

Figure 7. Average cabbage looper (CL) counts for LeGrand, 2002.

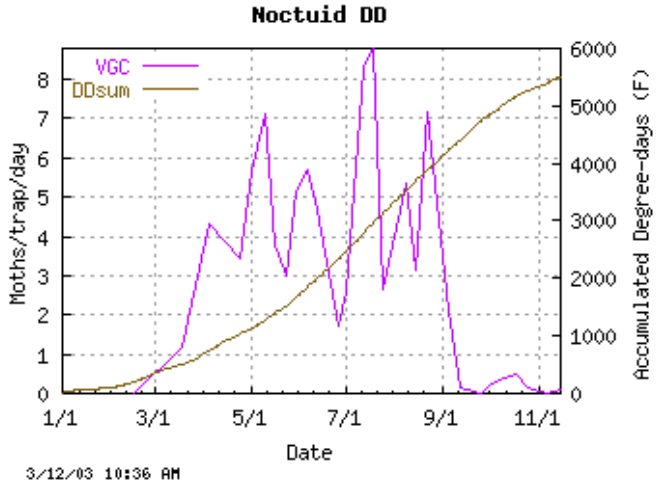

Figure 8. Average variegated cutworm (VGC) counts for LeGrand, 2002.

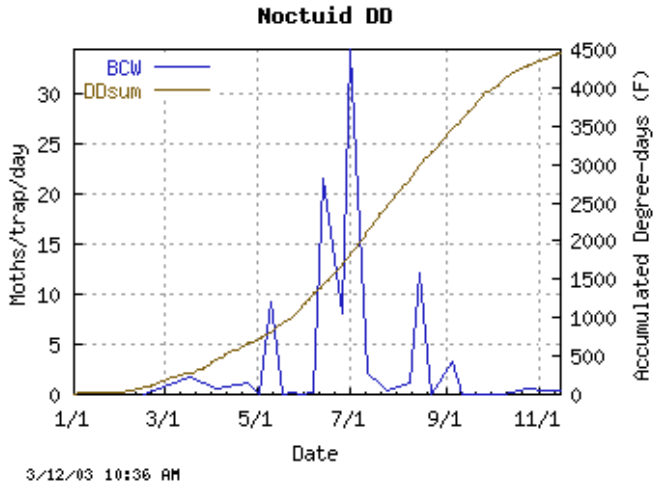

Figure 9. Average black cutworm (BCW) counts for LeGrand, 2002.