University of California Cooperative Extension

# Vegetable Crop Facts

Merced and Madera Counties

2145 Wardrobe Road Merced, CA 95341 (209) 385-7403
http://cemerced.ucdavis.edu

**IN THIS ISSUE:**



***Special Note:***

The processing tomato statewide variety trial report is posted on our website

2007 California tonnage: 12.1 million

December 2007
Happy New Year

## UPCOMING UCCE PRODUCTION MEETINGS:

### 61st California Tomato Growers Association Annual Meeting & UCCE Northern San Joaquin Valley Processing Tomato Production Meeting

**Doubletree Hotel, Modesto CA**
**January 31, 2008**
**8:00 am to 11:00 am**
*contact: Brenna Aegerter 209-468-2085*

| UCCE Northern San Joaquin Valley Processing Tomato Production Meeting | | |
|---|---|---|
| Thursday, January 31, 2008 8 am to 11 am | | |
| Location: Doubletree Hotel, 1150 9th Street, Modesto, CA 95354 | | |
| | | |
| 8:00 | sign in | refreshments in exhibit room |
| 8:15 | Welcome and Powdery Mildew Update | Brenna Aegerter, Farm Advisor, San Joaquin County |
| 8:30 | Evaluation of a Triticale Grass Cover Crop | Gene Miyao, Farm Advisor, Yolo, Sacramento and Solano Cou |
| 8:50 | Fusarium and Verticillium wilt control | Mike Davis, Plant Pathologist, UC Davis |
| 9:10 | short break - refreshments in exhibit room | |
| 9:30 | Tomato Resistance Against Root-knot Nematodes | Antoon Ploeg, Nematologist, UC Riverside |
| 9:50 | Spotted Wilt and Tomato Yellow Leaf Curl Viruses | Bob Gilbertson, Plant Pathologist, UC Davis |
| 10:10 | Irrigation and Salinity Management Considerations under Drip Irrigation | Blaine Hanson, Irrigation and Drainage Specialist, UC Davis |
| 10:30 | Fertility Management with Drip Irrigation | Tim Hartz, Vegetable Crop Specialist, UC Davis |
| 11:00 | adjourn - visit exhibits in Stanislaus Room | |
| | | |

### California Small Farm Conference

**Visalia Marriott, Downtown Visalia**
**February 24 -- 26, 2008**
**www.californiafarmconference.com**

## Powdery mildew in tomatoes

Remember 2004 when powdery mildew was hitting fields with a vengeance? 2007 was even worse for late season tomatoes. Some fields were so bad that the rarely seen grey mycelium covered entire plants. The combination of defoliation from this disease and delayed harvests resulted in high mold percentages in many processing fields, and sunburn problems in fresh market. To make matters even more aggravating, the common fungicide program of rotating Cabrio or Quadris with Rally seemed to do little to slow the progression of the disease, causing many to wonder if this was a new resistant strain of powdery mildew or just a different one altogether.

According to UC Extension Pathology Specialist Mike Davis, the powdery mildew fungus was the normal strain of ***Leveillula taurica*** that infects tomatoes in any year. There is also little evidence that the fungus has gained fungicide resistance. The reason for the severity of the disease more likely was the combination of weather and reduced sulfur use.

Powdery mildew occurs in most tomato-growing areas of California. The fungus infects weeds and crops in the solanaceous family; spores are carried by wind to tomato plants. The disease usually occurs late in the season. High relative humidity favors disease development. Mild temperatures favor infection while higher temperatures hasten the death of infected leaves. In Merced County this year, we experienced relatively mild late summer and fall temperatures, which provided an ideal environment for rapid growth of this disease (Fig 1).

Rumors of fungicide resistance were more likely the result of poor coverage with fungicides in fields where sulfur had not been used. I performed a powdery mildew trial this year in late season fresh market tomatoes and had good control with Cabrio and Rally in rotation (Fig 2); I was also using the equivalent of 45 gallons per acre. Simply put, aerial applications of fungicides will not effectively control powdery mildew in tomato fields past full bloom. The canopy is too dense for effective coverage.

History tells us that it is unlikely that we will have another season with high bacterial speck or powdery mildew pressure in 2008—it will be something else instead. UCCE Farm Advisors are conducting trials to determine if the predictive capability of the powdery mildew model on the UC IPM website can be improved.

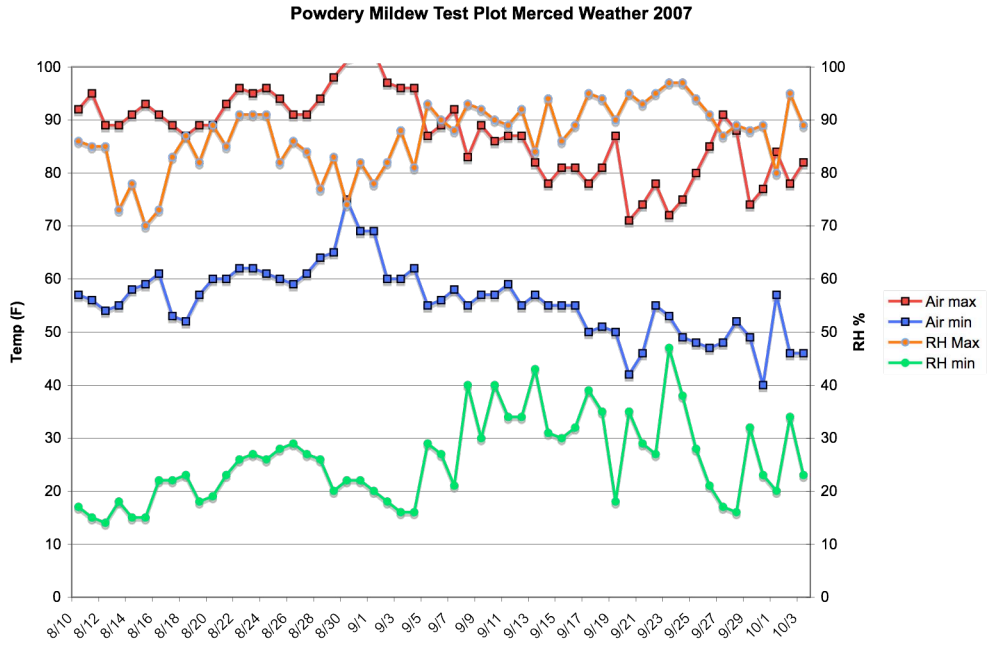



**Figure 1. In Merced County, relative humidity (RH) was above 80% when daily highs were below 90° F in late summer.**

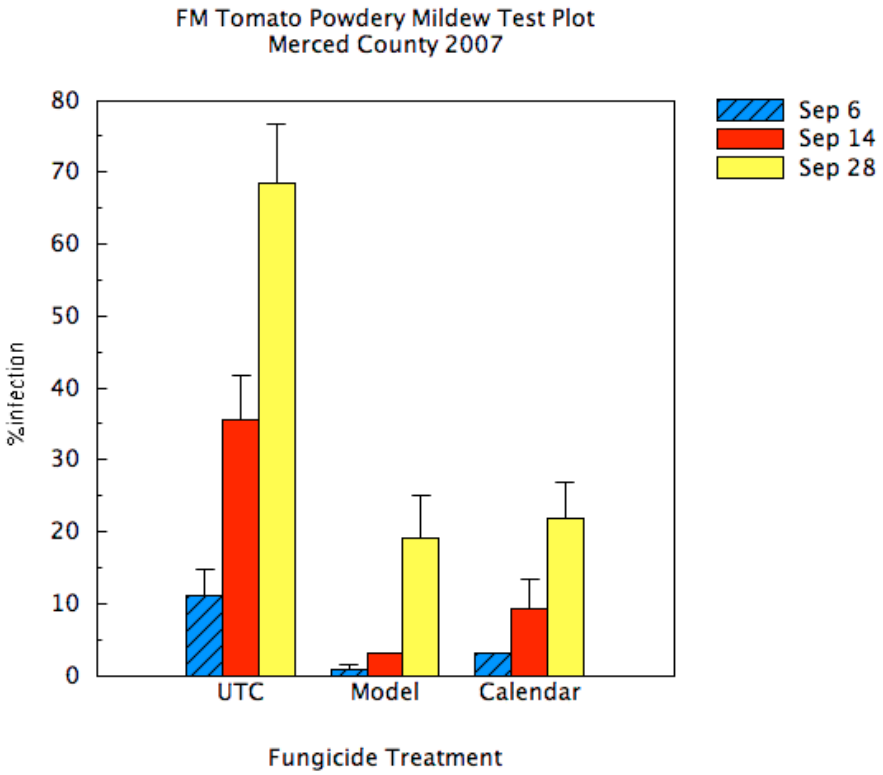



**Figure 2. Results from a powdery mildew trial conducted in northern Merced County in 2007. Fungicides used were Cabrio rotated with Rally, applied at 30 psi in 45 gpa water. Using the UC IPM model program or a calendar based system significantly reduced powdery mildew as compared to the untreated plots. Applications began August 13.**

# Statewide Fresh Market Tomato Variety Trials
# Field Evaluations for 2006

*Scott Stoddard, Michelle LeStrange, and Brenna Aegerter*
*Farm Advisors, Merced & Madera, Tulare & Kings, and San Joaquin Counties*
**University of California Cooperative Extension**

**Summary**
As part of a long-term project with the California Tomato Commission, fresh market tomato variety trials were conducted in commercial tomato production fields in Fresno, Merced, and San Joaquin Counties in 2006 to evaluate field and postharvest performance. At each location, "round" lines were grown in both replicated and observation plots, while "roma" lines were limited to a replicated trial. New varieties were compared to the standards Shady Lady, Quali T-21, and Monica, and evaluated on marketable yield, size breakdown, color, and cull percentage. Varieties performed differently depending on location/time of planting. The early trial in Fresno had excellent yields, while the late trial in San Joaquin County suffered through the July heat wave, which significantly reduced yield and quality of the harvested fruit. Averaged across locations, significant differences were found for marketable yield, fruit size, and red fruit in the replicated round and roma trial; no significant differences were found between varieties in the round observation trial. Round lines with overall best marketable yield were PS2935 and PS2942, Quali T-21, and Wolverine. Roma varieties Monica, PX739, Mi Roma, and Mi Rey all yielded well.

**Introduction**
UCCE conducts fresh market tomato variety trials in three areas in the San Joaquin Valley to evaluate the performance of new varieties and breeding lies from commercial plant breeders for the mature green market. These variety trials hopefully provide the opportunity to evaluate and compare fruit quality characteristics and

yield in commercial production fields with different types of soil, management, and growing conditions.

The objective of this trial is to identify dependable, higher yielding and higher quality lines that can be grown in a wide geographic area and varying environmental conditions characteristic of central California. The main commercial market is for mature green tomatoes. Varieties are typically semi-determinant, bush-type grown without support and hand harvested. This market includes both round and "roma" type tomatoes.

**Procedure**

In 2006, round and roma variety trials were conducted at three locations in Fresno, Merced, and San Joaquin Counties in commercial production fields and managed using standard production practices. The Fresno trial was drip irrigated, the others, furrow. The Fresno, Merced, and San Joaquin trials were planted one month apart, to reflect early, mid, and late season production fields, respectively.

Postharvest samples from all the replicated varieties were collected by Marita Cantwell from all trials at the time of harvest and taken to the Mann Laboratory at UC Davis for color, firmness, and fruit composition analysis at the mature-green and table-ripe stage. A complete summary of the both the field evaluation and postharvest results can be found at http://cemerced.ucdavis.edu.

**Results**

Results for marketable yield for Fresno, Merced, and San Joaquin Counties are shown in Tables 1, 2, and 3. Significant yield differences were found at each location, with Quali T-21 yielding the most in Fresno and San Joaquin, and PS 2942 in Merced County. When the data for all three locations were combined, significant differences occurred for yield, size, and amount of red fruit.

Extra large (XL) fruit were significant higher percentage of the market yield in Fresno as compared to the other locations (Fig. 1). In general, Shady Lady had consistently smaller fruit at each location. Shady Lady also had the highest percentage of red fruit.

The significant variety by location LSD found for yield, M%, XL%, small, cull %, and red% indicates that varieties are performing differently at different locations. This makes sense, because some lines are better adapted for early or late season growing conditions. The implications are that it is better to use the individual location results for determining variety fit rather than the combined analysis.

**Observed Lines**

Because there is no replication in the observed lines, statistical analysis could be performed only on the combined data set (Table 2). SXT 6783 and SXT6784 did particularly well in Fresno, while HMX 5790 yielded well in Merced. None of the Seeds of Change varieties performed well relative to the others at either the Merced or San Joaquin location. Combining locations, no significant differences among varieties were found for yield, size, or color, mainly because of the large amount of variability in the data.

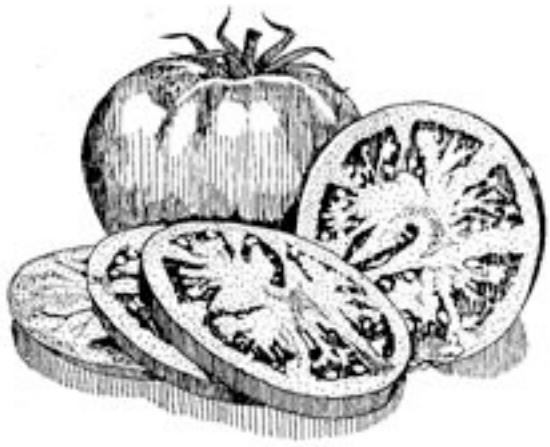
As with the replicated trial, the Fresno location had more XL fruit than the other locations.

**Roma Trials**

Roma trials were conducted in all three locations for the first time in 2006. There were not enough entries for both an observation and replicated trial, so only a replicated trial was conducted (Table 3). In general, yields were very good for all lines except BSS 526, which over produced small fruit. Neither the Merced nor San Joaquin location had any XL fruit.

**Acknowledgements**

Many thanks to the following seed company representative for their participation: Yair Askira, LSL Seed; Rod Jorgenson, Syngenta/Rogers Seed; Carl Hill and Susan Peters, Nunhems; Doug Heath, Seminis, Greg Styers, Bejo Seeds; Mark Beoshanz, Harris Moran; Erica Renaud, Seeds of Change; and Jeff Zischke, Sakata Seeds. Additional thanks to the cooperators who helped with these trials, and to the California Tomato Commission for financial support.



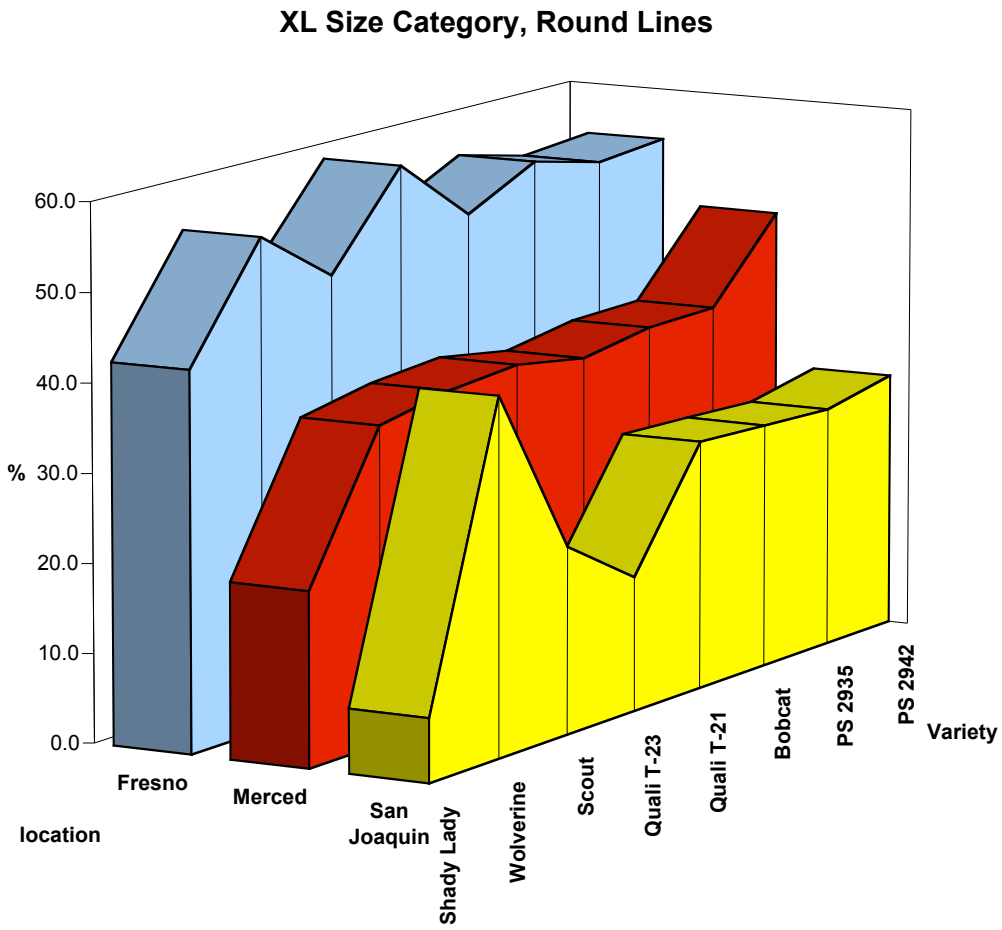



**Figure 1. Extra large (XL) sizes for the fresh market round replicated varieties at the different test locations.**

## Lycopene update:

On July 10, 2007, the FDA put out a press release stating that there is "no credible evidence" that lycopene cuts disease risk, namely cancers.

**Lycopene** is a bright red carotenoid pigment, a phytochemical found in tomatoes and other red fruits. It is an antioxidant, which helps neutralize free radicals in the body. Lycopene is what makes a tomato's flesh red, and is so named because of the scientific name for tomatoes, *Solanum lycopersicum*. It is also found in other red fruits such as pink grapefruit and watermelon.

While disease-related claims about lycopene cannot be made, it is still good for you because of its antioxidant properties.

**Table 1. Fresh market tomato (round) variety trial yield results by location and combined, 2006. REPLICATED varieties.**

| Code | Variety | TMY Fresno Tons/A | TMY Fresno Boxes/A | TMY Merced Tons/A | TMY Merced Boxes/A | TMY San Joaquin Tons/A | TMY San Joaquin Boxes/A | TMY combined Tons/A | TMY combined Boxes/A | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | PS 2935 | 45.1 | 3608 | 27.9 | 2232 | 10.2 | 813 | 29.3 | 2344 | A |
| 1 | PS 2942 | 42.9 | 3430 | 28.0 | 2242 | 11.5 | 921 | 28.9 | 2312 | A |
| 4 | Quali T-21 | 46.8 | 3746 | 22.6 | 1809 | 12.9 | 1034 | 28.8 | 2304 | A |
| 7 | Wolverine | 47.8 | 3823 | 22.1 | 1767 | 7.4 | 596 | 27.4 | 2192 | A B |
| 3 | Bobcat | 42.9 | 3432 | 22.8 | 1827 | 8.0 | 639 | 26.1 | 2088 | B |
| 6 | Scout | 44.4 | 3552 | 19.3 | 1543 | 6.8 | 547 | 25.0 | 2000 | B C |
| 5 | Quali T-23 | 32.2 | 2576 | 23.7 | 1899 | 8.4 | 670 | 22.6 | 1808 | C D |
| 8 | Shady Lady | 38.5 | 3077 | 15.1 | 1206 | 6.2 | 493 | 21.1 | 1688 | D |
| | **Average** | 42.6 | 3405.8 | 22.7 | 1815.6 | 8.9 | 714 | 26.2 | 2093 | |
| | **LSD 0.05** | 4.6 | 364 | 5.0 | 401.0 | 4.0 | 322 | 2.6 | 208 | |
| | **CV %** | 7.3 | 7.3 | 15.0 | 15.0 | 25.8 | 26 | 11.6 | 11.6 | |
| | **VAR X LOCATION LSD @ 0.05 (Between Merced and Fresno)** | | | | | | | 4.3 | 345 | |
| | **VAR X LOCATION LSD @ 0.05 (Between SJC and Merced or Fresno)** | | | | | | | 4.7 | 373 | |

*See notes following Table 2.*

**Table 2. Fresh market tomato (round) variety trial yield results by location and combined, 2006. OBSERVATION varieties.**

| Code | Variety | TMY Fresno Tons/A | TMY Fresno Boxes/A | TMY Merced Tons/A | TMY Merced Boxes/A | TMY San Joaquin Tons/A | TMY San Joaquin Boxes/A | TMY combined Tons/A | TMY combined Boxes/A |
|---|---|---|---|---|---|---|---|---|---|
| 13 | SXT 6783 | 51.8 | 4140 | 18.9 | 1515 | 7.8 | 622.0 | 26.2 | 2096 |
| 14 | SXT 6784 | 47.5 | 3801 | 23.4 | 1868 | 5.2 | 414.7 | 25.4 | 2032 |
| 9 | HMX 5790 | 35.9 | 2873 | 30.9 | 2472 | 4.8 | 383.3 | 24.5 | 1960 |
| 16 | 11091 | --- | --- | 11.6 | 925 | 16.7 | 1339.9 | 23.2 | 1856 |
| 10 | HMX 6812 | 31.1 | 2489 | 27.8 | 2225 | 8.2 | 656.9 | 22.9 | 1832 |
| 12 | SXT 6782 | 40.7 | 3260 | 13.8 | 1107 | 7.4 | 592.4 | 20.6 | 1648 |
| 11 | SXT 6764 | 38.0 | 3043 | 12.5 | 1000 | 9.3 | 740.5 | 19.9 | 1592 |
| 17 | 5151 | --- | --- | 9.3 | 748 | 9.6 | 768.4 | 18.5 | 1480 |
| 15 | 10442 | --- | --- | 3.4 | 268 | 8.0 | 643.3 | 14.8 | 1184 |
| 18 | 6260-D | --- | --- | 5.1 | 407 | 4.9 | 393.8 | 14.1 | 1128 |
| | **Average** | 40.8 | 3267.7 | 15.7 | 1253 | 8.2 | 656 | 18.7 | 1496 |
| | **LSD 0.05** | | | | | | | NS | NS |
| | **CV %** | | | | | | | 40.0 | 40.0 |

Market yield = XL + L + M size fruit, average of four replications. One box = 25 lbs.
LSD 0.05 = least significant difference at the 95% probablility level.
Var x Location LSD = least significant difference between the same variety at different locations.
NS = not significant at the 95% probability level.
CV = coefficient of variation, a measure of the variability in the experiment.

**Table 3. Fresh market tomato ROMA variety trial yield results by location and combined, 2006. REPLICATED ROMA varieties.**

| Code | Variety | TMY Fresno Tons/A | TMY Fresno Boxes/A | TMY Merced Tons/A | TMY Merced Boxes/A | TMY San Joaquin Tons/A | TMY San Joaquin Boxes/A | TMY combined Tons/A | TMY combined Boxes/A | |
|---|---|---|---|---|---|---|---|---|---|---|
| R1 | Monica | 40.8 | 3264 | 25.9 | 2070 | 19.9 | 1590 | 29.7 | 2376 | A |
| R6 | PX 739 | 37.2 | 2979 | 25.8 | 2062 | 20.3 | 1628 | 28.5 | 2280 | A |
| R4 | Mi Rey | 38.9 | 3114 | 21.6 | 1731 | 17.4 | 1392 | 26.8 | 2144 | A B |
| R5 | Mi Roma | 35.1 | 2809 | 24.1 | 1927 | 19.3 | 1544 | 26.8 | 2144 | A B |
| R3 | SD257 | 32.6 | 2608 | 19.7 | 1578 | 19.7 | 1579 | 24.4 | 1952 | B |
| R2 | BSS 526 | 21.9 | 1750 | 13.7 | 1094 | 8.0 | 640 | 15.1 | 1208 | C |
| | **Average** | 34.4 | 2754 | 21.8 | 1744 | 17.4 | 1395 | 25.2 | 2016 | |
| | **LSD 0.05** | 6.6 | 525 | 4.2 | 336 | 6.0 | 477 | 3.1 | 246 | |
| | **CV %** | 12.7 | 12.7 | 12.8 | 12.8 | 18.8 | 18.8 | 14.2 | 14.2 | |
| | **VAR X LOCATION LSD @ 0.05 (Between Merced and Fresno)** | | | | | | | NS | NS | |
| | **VAR X LOCATION LSD @ 0.05 (Between SJC and Merced or Fresno)** | | | | | | | NS | NS | |

Market yield = S + M + L + XL size fruit, average of four replications. One box = 25 lbs.
LSD 0.05 = least significant difference at the 95% probablility level.
Var x Location LSD = least significant difference between the same variety at different locations.
NS = not significant at the 95% probability level.
CV = coefficient of variation, a measure of the variability in the experiment.

## Merced County Fresh Market Tomato Variety Trials
## Field Evaluations for 2007

The mid-season trial for fresh market lines takes place near Le Grand, CA, in Merced County. PS2942 and Valley Cat yielded significantly more than the others (PS2942 yielded well in Fresno this year too, data to be shown in the upcoming fresh market tomato variety report). No regional trial is planned for 2008 because of the decommissioning of the CTC.

Seeded: 3/14/2007
Transplant: May 21, 2007
Plot: 60" x 50 ft rep 4 times
Drip irrigated
Field Day: Aug 7, 2007
Harvest: Aug 8 – 9
Notes: Live Oak Farms

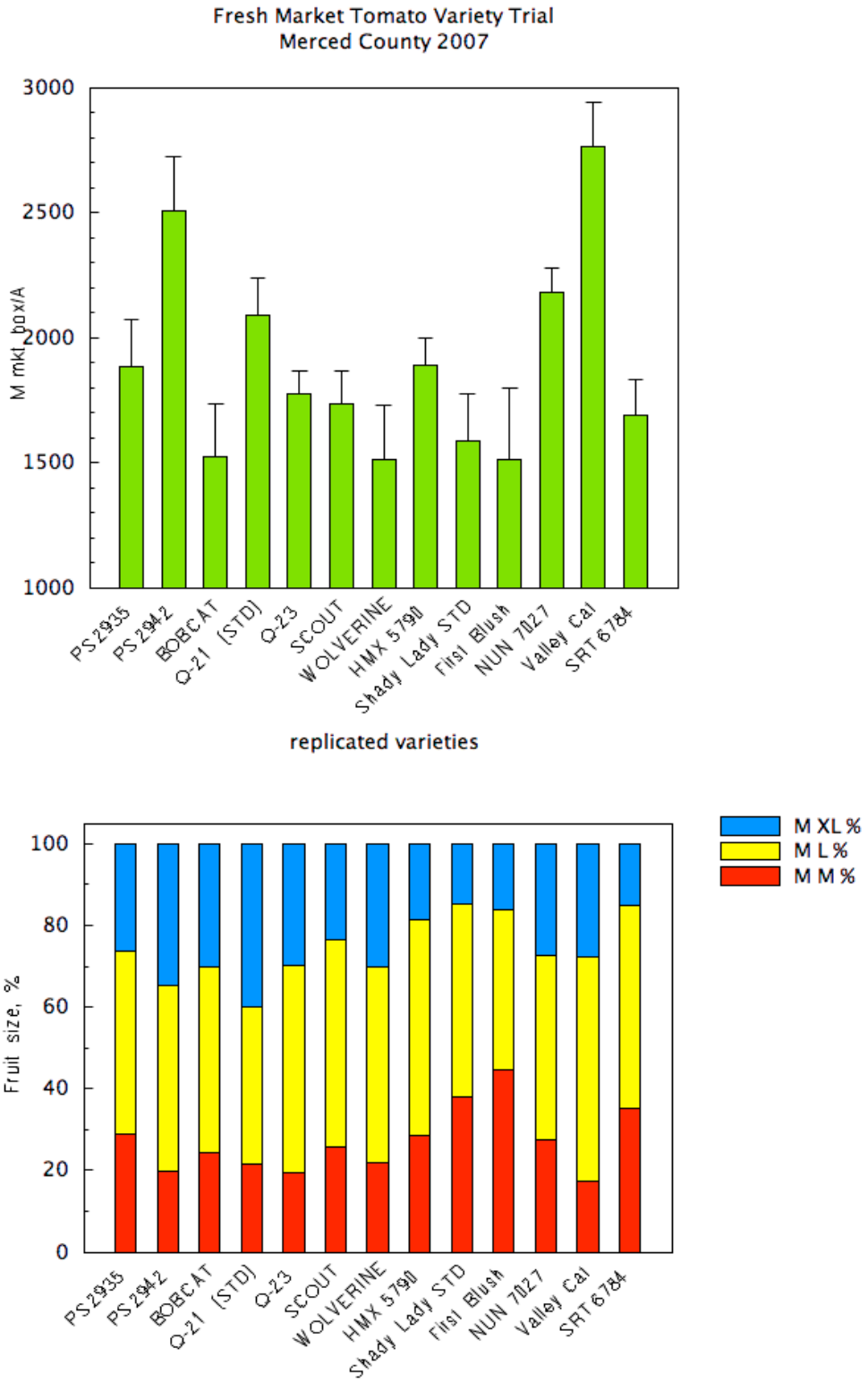



**Figure 1. Merced County yield and size results for the fresh market tomato variety trial 2007.**

# UCCE Statewide Processing Tomato Variety Evaluation Trials, 2007

Brenna Aegerter, Farm Advisor, San Joaquin County
Diane Barrett, Food Science & Technology CE Specialist, UCD
Janet Caprile, Farm Advisor, Contra Costa County
Tim Hartz, Vegetable Crops CE Specialist, UCD
Michelle LeStrange, Farm Advisor, Tulare & Kings Counties
Gene Miyao, Farm Advisor, Yolo, Solano, & Sacramento Counties
Jan Mickler, Farm Advisor, Stanislaus County
Joe Nunez, Farm Advisor, Kern County

Scott Stoddard, Merced & Madera Counties

**Summary:**
UCCE farm advisors conducted three early-maturity variety tests and seven mid-maturity tests in 2007. Spring weather was warm and dry across all locations, and most trials had excellent stand establishment. The one exception was the mid-maturity trial in San Joaquin County, where high winds shortly after transplanting resulted in almost complete stand loss. Insect pest pressure was generally low this season, but some of the mid-maturity locations were impacted by high powdery mildew pressure. The trials continue to increase in transplants relative to direct seed (only 2 of the 10 locations were direct seeded) and drip irrigation (3 of the 10 were drip irrigated), which mirrors changes taking place in the industry.

The early maturity trials escaped most insect or disease problems and yielded very well in all three locations, averaging more than 41 tons/acre. In the early trial, Sun 6366, H5003, BOS 66509, 1411, and 66508 had significantly better yields than the other entries in this test; SUN 6366 and BOS 1411 had the highest °Brix. Significant differences were observed for fruit pH between the varieties, though values were high for all, averaging 4.48. In the mid-season observation trial, 4 of 11 lines yielded significantly less when combining locations; large differences were also observed for Brix, but not color nor pH. In the replicated mid-maturity trial, best yields occurred with SUN 6368, H8004, and H2005, and H2005 also had significantly higher Brix than the other varieties. Significant differences were also seen for color and pH, and like the early maturity trial, pH was elevated, averaging 4.45.

See our website for the full report at http://cemerced.ucdavis.edu

---

*Note: this article originally appeared in the Fall 2006 Contra Cost "Crop Currents" newsletter.*

## Good Agricultral Practices Reduce Microbial Contamination

**Janet Caprile, Farm Advisor**

The recent incidents of foodborne illness from contaminated spinach have reminded us how important our production practices are — both for the health of our customers as well as the health of our agricultural industries. Salad crops are particularly vulnerable to microbial contamination as they are eaten raw and have an edible portion that comes in contact with the ground or irrigation water. However, ANY crop that can be eaten raw can cause foodborne illness, if contaminated. This includes MANY of the tree fruits (apples, apricots, cherries, peaches, nectarine, persimmons, plums, etc.) and vegetable crops (green beans, sweet corn, sweet onions, green garlic, tomatoes, fresh herbs, cucumbers, melons, summer squash, peppers, etc.).

Contamination can come from soil, water, manure, equipment, workers, or animals. It can occur either in the field or in the packing shed. This might be a good time to review your production practices for possible points of contamination and correct them

before next season. Keep in mind that once produce has been contaminated, removing or killing the pathogens is very difficult. The best approach is to prevent the contamination in the first place. Below, I have included a brief overview of points to consider:

**Manure and Animal management**

- Hot compost or age manure before field application
- Incorporate manures/composts prior to planting
- Maximize the time between application and harvest
- Don't top dress with fresh manure or manure "teas"
- Exclude domestic animals (dogs, livestock, poultry) from fields during the growing and harvesting season
- Minimize wild animals in fields
    - Have an active control program for rodents (squirrels, voles, etc.)
    - Bare buffers around fields can discourage rodents, reptiles and amphibians from entering fields
    - Eliminate cull piles, food residues and other attractants for wild animals

**Water used for crop production**

- Check irrigation water for fecal coliform contamination
- Be aware of water that passes close to livestock or sewage treatment areas.
- Foliar applications made within 2 weeks of harvest should be from potable water.

**Worker health and hygiene**: Hepatitis A outbreaks have been linked to infected workers. Any workers who touch fresh produce can contaminate it. This includes pickers, sorters, graders, packers.

- Train workers about microbial risks and proper procedures
    - Wash hands before handling produce
    - Wash hands after using the restrooms
- Supply soap, clean water, single use towels *and enforce their use*.
- Provide clean restrooms and *enforce their use*.
- Be careful when moving or servicing toilets to prevent leakage
- Provide bandages to handlers with cuts or lesions.
- Gloves should be kept clean if they touch produce.
- Re-assign sick employees to non- food contact jobs.

**Field & Harvest Sanitation**

- Harvest bins, equipment, implements and surfaces that touch fresh produce should be cleaned and sanitized daily.
- Remove excess soil in the field
- Minimize crop bruising and damage

Packing and Post Harvest: *Water that contacts fresh produce after harvest is widely recognized as the most essential pathogen control point.*

- Use potable water for cooling, washing, dipping, grading, etc.
- Use potable water for making ice
- Chlorinate wash water and monitor levels and pH
- Pay special attention to water quality in dump tanks and re-circulated water
- Cool produce quickly to minimize potential pathogen growth
- Clean and sanitize staging, loading & food contact surfaces regularly
- Keep birds and rodents out of packing and storage areas

You can find more detailed information at:

**UC Good Agricultural Practices website**:
http://ucgaps.ucdavis.edu

- "Self Audit for Growers and Handlers"
- "Chlorination in Fresh Fruits and Vegetables"
- "Key Points of Control and Management of Microbial Food Safety: Information for Growers, Packers, and Handlers of Fresh-Consumed Horticultural Products"

**UC Small Farm Center:**
http://www.sfc.ucdavis.edu (Click Program Areas, then Food Safety)

- "Food Safety Begins on the Farm"

**US FDA's Overview of Good Agricultural Practices:**

- "Guide to Minimize Microbial Food Safety Hazards for fresh Fruits and Vegetables" http://www.foodsafety.gov/~dms/prodguid.htm

USDA Audit verification Program provides independent, 3rd party audits for a fee. Those passing annual audit receive a certificate and a website posting accessible to customers and participants.

- http://ams.usda.gov/fv/fpbgapghp.htm

## Stripe Rust Management Plan

Wheat growers have experienced yield losses from stripe rust disease over the last few years. Dr. Lee Jackson (UC Cooperative Extension Agronomy Specialist) along with several UC Cooperative Extension Agronomy Farm Advisors and the California Wheat Commission have put together the following management plan as part of an ongoing effort to minimize yield losses from this disease.

1. Plant varieties suitable for your growing region and intended market. Avoid using susceptible varieties or be prepared to apply a fungicide if you plant a susceptible variety. Refer to the small grains website for variety information. http://agric.ucdavis.edu/crops/cereals/cereal.htm

2. Diversify your plantings. Plant more than one variety in case new races of the stripe rust pathogen infects the crop in your region.

3. Monitor your crop carefully during the growing season in order to detect the first infections early enough to plan for effective fungicide application(s).
   - Initial infections in the Central Valley can occur as early as January or as late as April.
   - For effective disease control, fungicides should be applied when 10% of plants show symptoms of infection or when 'hot spots' of disease are detected in the field and weather conditions are conducive for the disease.

4. Pay attention to reports of stripe rust in other areas of California and surrounding areas. Spores of the stripe rust pathogen are wind-borne and can be disseminated over long distances (hundreds of miles). The California Wheat Commission's Weekly Bulletin is a good source of this type of information.

5. Monitor weather conditions. Cool, wet conditions (50-60° F with intermittent rain, fog, or dew) are most favorable for infection, spore production, and spore dispersal. However, races of the stripe rust pathogen now present in California can cause disease at higher temperatures and drier conditions than in the past.

6. Apply an effective fungicide (follow label directions) if necessary to minimize yield loss.
   - Application timing is critical since available effective fungicides have residual activity of no longer than about 3 weeks.
     - If the initial application is made too early, (before infection is detected) the protective activity of the fungicide will be gone before disease appears. Losses then will occur if disease subsequently develops.
     - If the initial application is made too late (after disease is well established and severe), the fungicide will not prevent loss (the damage has already been done).
   - Protection of the flag-leaf from infection and protection of the plant during the grain-fill period is the goal.
   - Under continuing severe disease pressure, more than one application may be necessary to adequately protect susceptible varieties.
   - Label restrictions for timing of application vary by fungicide class (triazoles and triazole/strobilurin combinations vs strobilurins). The following are examples of permissible fungicide application timings:

| Material | | Apply before | Crop limits |
|---|---|---|---|
| Tilt | (Syngenta) | Feekes 10.5 | (wheat only) |
| Stratego | (Bayer) | Feekes 8 | |
| Quilt | (Syngenta) | Feekes 10.5 | (wheat only) |
| Headline | (BASF) | Feekes 10.5 | |
| Quadris | (Syngenta) | Feekes 10.5 | |

**Scott Stoddard**
**Farm Advisor**