

Tomato Powdery Mildew

Brenna Aegerter
UCCE San Joaquin County



Tomato Powdery Mildew
Leveillula taurica (*Oidiopsis sicula*)



Symptoms



Symptoms

Yellow spots (or not)



Symptoms

Yellow spots (or not)

Powdery white sporulation (or not)



Symptoms

Yellow spots (or not)

Powdery white sporulation (or not)

Turning necrotic in age



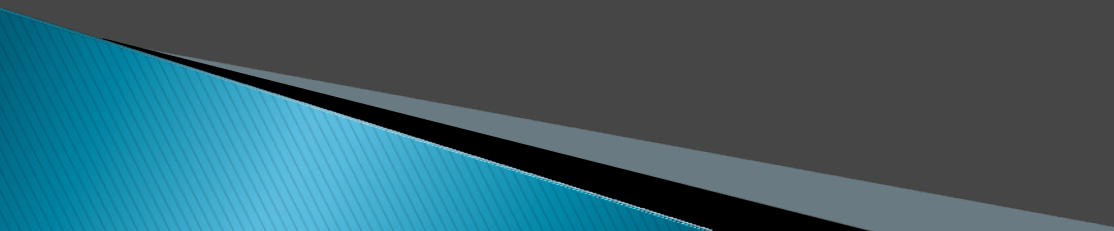
Leaf underside



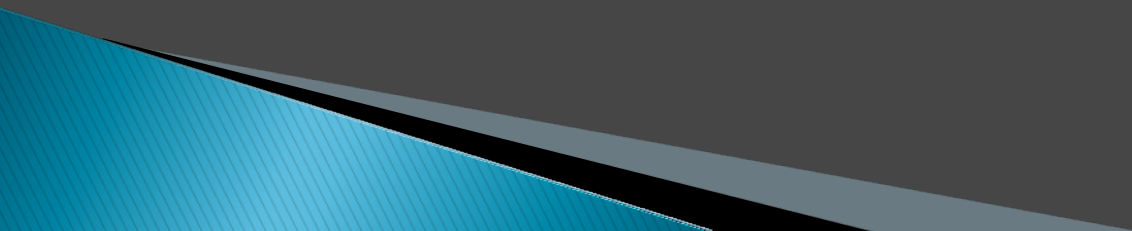
Photo by Scott Stoddard



Tomato Powdery Mildew Epidemic in 2007 and 2008

- ▶ Higher incidence than previous years
 - ▶ Abundant sporulation
 - ▶ Variability in processing varieties
 - ▶ Difficult to control at some locations
- 

What has changed?

- ▶ Fungicide resistance?
 - ▶ The weather?
 - ▶ “New strain”?
- 

Dept. of Plant Pathology
University of Arizona



Oidium neolycopersici

Occurs in greenhouses
and can be a minor
problem in coastal-
grown tomatoes





How to Manage Pests

- Home & garden
- Agriculture
- Weather data & products
- Degree-days
- Interactive tools & models

Educational Resources

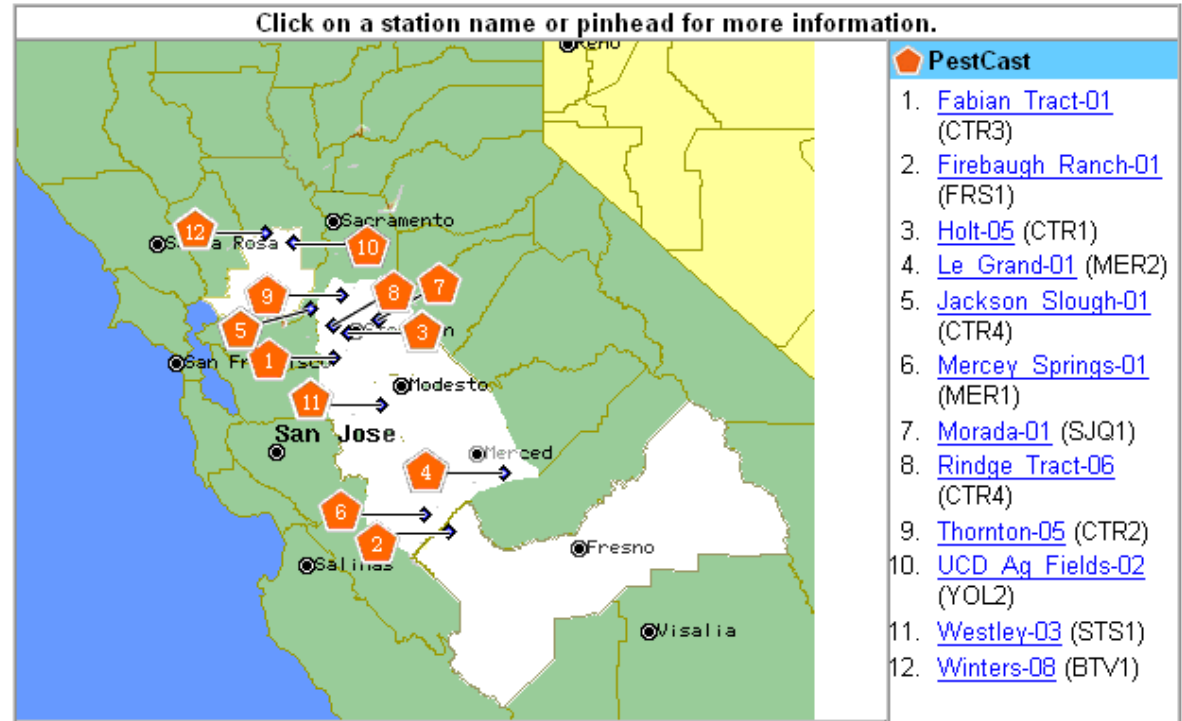
- Publications & more
- Workshops and events
- PCA exam helper
- Pesticide use and safety

Research and IPM

- Grants programs
- Funded-project results

- What's new
- In the news
- Announcements
- Site index
- Help
- Acknowledgments
- UC ANR: more topics

2006 California Tomato Network Weather Stations



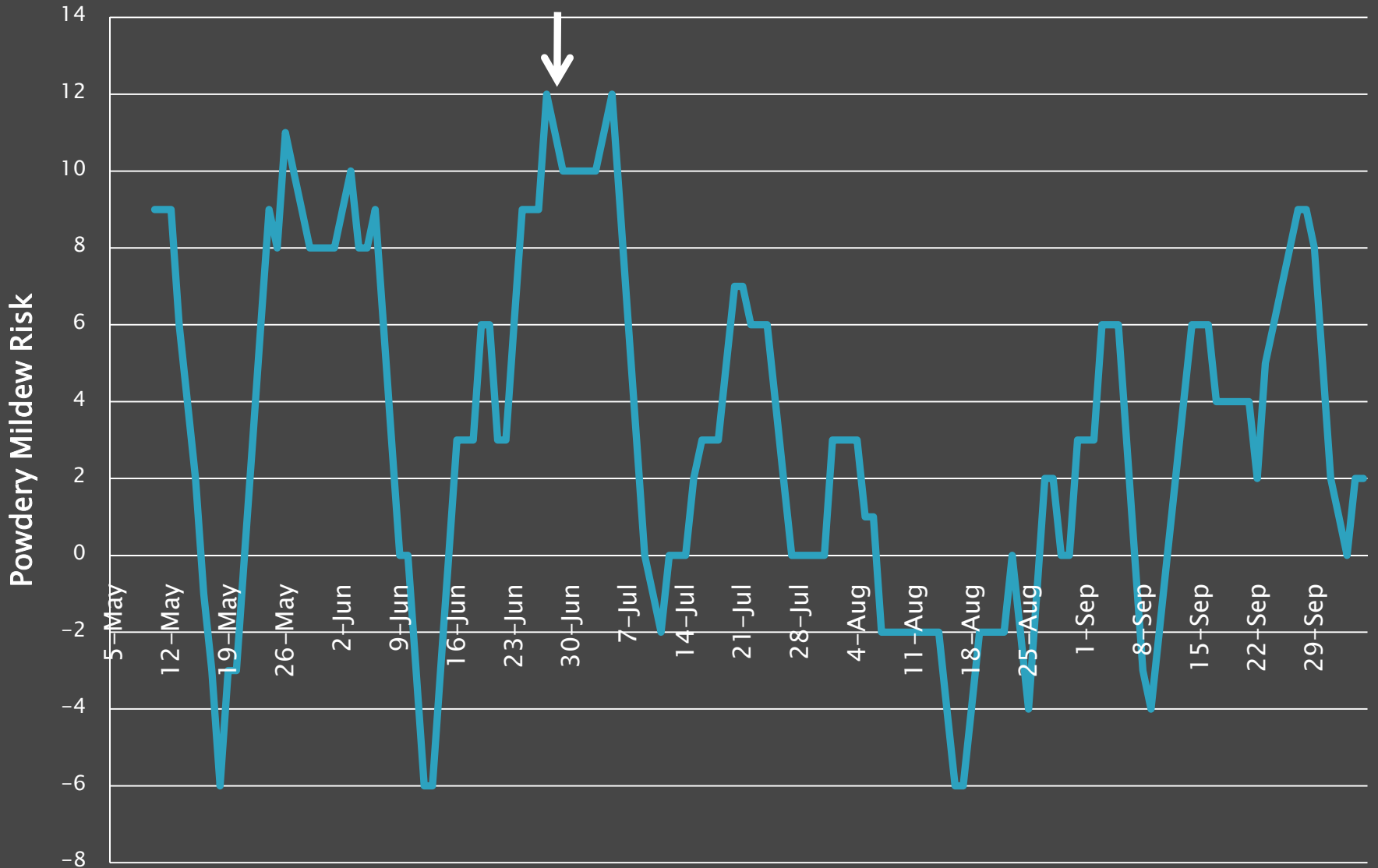
- PestCast**
1. [Fabian Tract-01](#) (CTR3)
 2. [Firebaugh Ranch-01](#) (FRS1)
 3. [Holt-05](#) (CTR1)
 4. [Le Grand-01](#) (MER2)
 5. [Jackson Slough-01](#) (CTR4)
 6. [Merced Springs-01](#) (MER1)
 7. [Morada-01](#) (SJQ1)
 8. [Rindge Tract-06](#) (CTR4)
 9. [Thornton-05](#) (CTR2)
 10. [UCD Ag Fields-02](#) (YOL2)
 11. [Westley-03](#) (STS1)
 12. [Winters-08](#) (BTV1)

Legend

| Networks and Stations | Map |
|--|------------|
| * Inactive | County |
| ● Automatic (daily, current data) | Water |
| ▲ TouchTone (daily, current data) | Expressway |
| ⬠ PestCast (daily & hourly, current data) | Highway |
| ▲ Climate (daily, at least 3.6 months old) | Connector |

- 2008 Powdery Mildew Risk -

Model prediction based on data from weather station near Winters



Powdery Mildew Reports, 2008

- ▶ First week in July: Yolo County
- ▶ Second week in July: San Joaquin Co., Merced Co.
- ▶ Third week in July: widespread problems and severe in some spots
- ▶ Sporadic but occasionally severe outbreaks throughout the Central Valley

Summary of 16 field trials 2006 - 2008

| Disease pressure | Model performance | Sprays saved |
|---|--|--------------|
| None (2 locations 2006) | --- | 1 - 2 |
| Low (3 locations in 2006, 2 locations in 2008) | Model and calendar similarly good control | 0 - 3 |
| Moderate to high (2 locations in 2006, 3 locations in 2007, 4 locations in 2008) | Similarly good control at 4 locations | 0 - 2 |
| | Calendar better at 3 locations | 1 - 2 |
| | Similarly poor control at 2 locations | 0 - 1 |

Model Evaluation – summary

- ▶ Over three years and sixteen trials, the calendar treatment averaged 3.5 sprays per season, while the model treatment averaged 2.3 sprays
- ▶ At 11 of the 14 locations where powdery mildew appeared, the calendar and model treatments provided a similar level of control
- ▶ At three locations the calendar treatment provided better control

Some of the challenges...

- ▶ Model assumes presence of inoculum and uniformly susceptible varieties
- ▶ Cost of in-field weather stations, maintenance, data quality control
- ▶ User friendliness of interface
- ▶ Sensitivity of model to small differences in data (both real microclimate differences but also errors)

Fungicide Resistance Risk

| Group Code | Chemical group name | Common names | Product examples | Risk |
|------------|----------------------------------|---|--|---------------------------------|
| 11 | Quinone outside inhibitors (QoI) | azoxystrobin trifloxystrobin pyraclostrobin | Quadris Flint Cabrio | high |
| 3 | Demethylation inhibitors (DMI) | myclobutanil | Rally | medium |
| M | M2 – inorganic | sulfur | Microthiol Disperss, Thiolux, dust, etc. | low |
| | Not categorized | potassium bicarbonate | Kaligreen, Armicarb, Milstop, etc. | unknown, presume very low |

Fungicide Efficacy Trials

- ▶ Fungicides applied with a backpack sprayer
- ▶ High volumes of water (equivalent of 50 gallons per acre spray volume)
- ▶ Two replicated trials in commercial fresh market tomato fields
- ▶ 4 fungicide applications at each site – 10 to 12 day intervals starting preventatively

Powdery mildew fungicide trials, San Joaquin County 2008

| <u>Registered materials:</u> | | <u>FRAC</u> |
|------------------------------|-----------------------------------|-------------|
| □ Cabrio | pyraclostrobin | 11 |
| □ Quadris | azoxystrobin | 11 |
| □ Rally | myclobutanil | 3 |
| □ Revus Top | mandipropamid + difenoconazole | 40 + 3 |
| □ Thiolux | wettable sulfur | M2 |

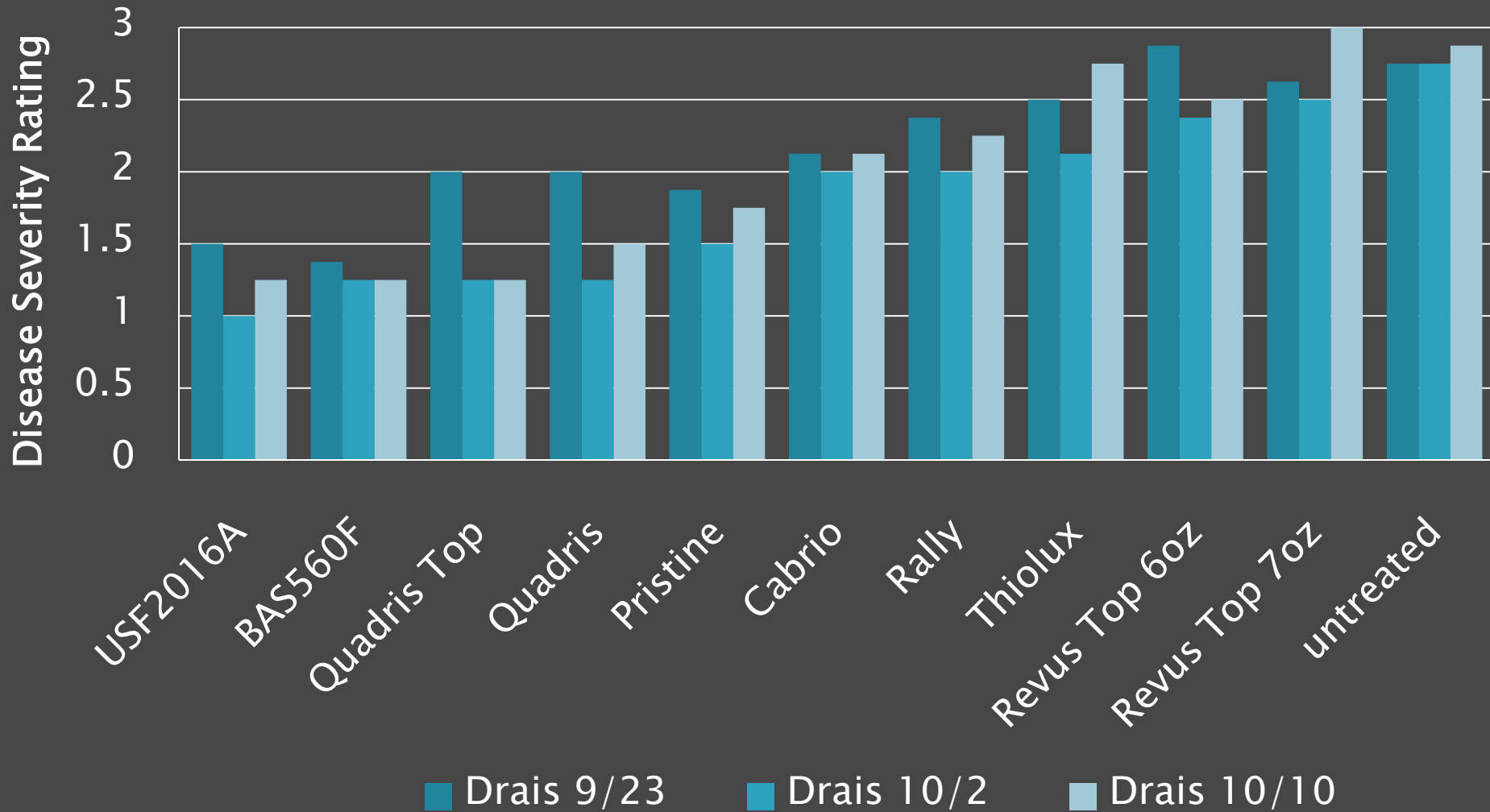
Powdery mildew fungicide trials, San Joaquin County 2008

Experimental materials:

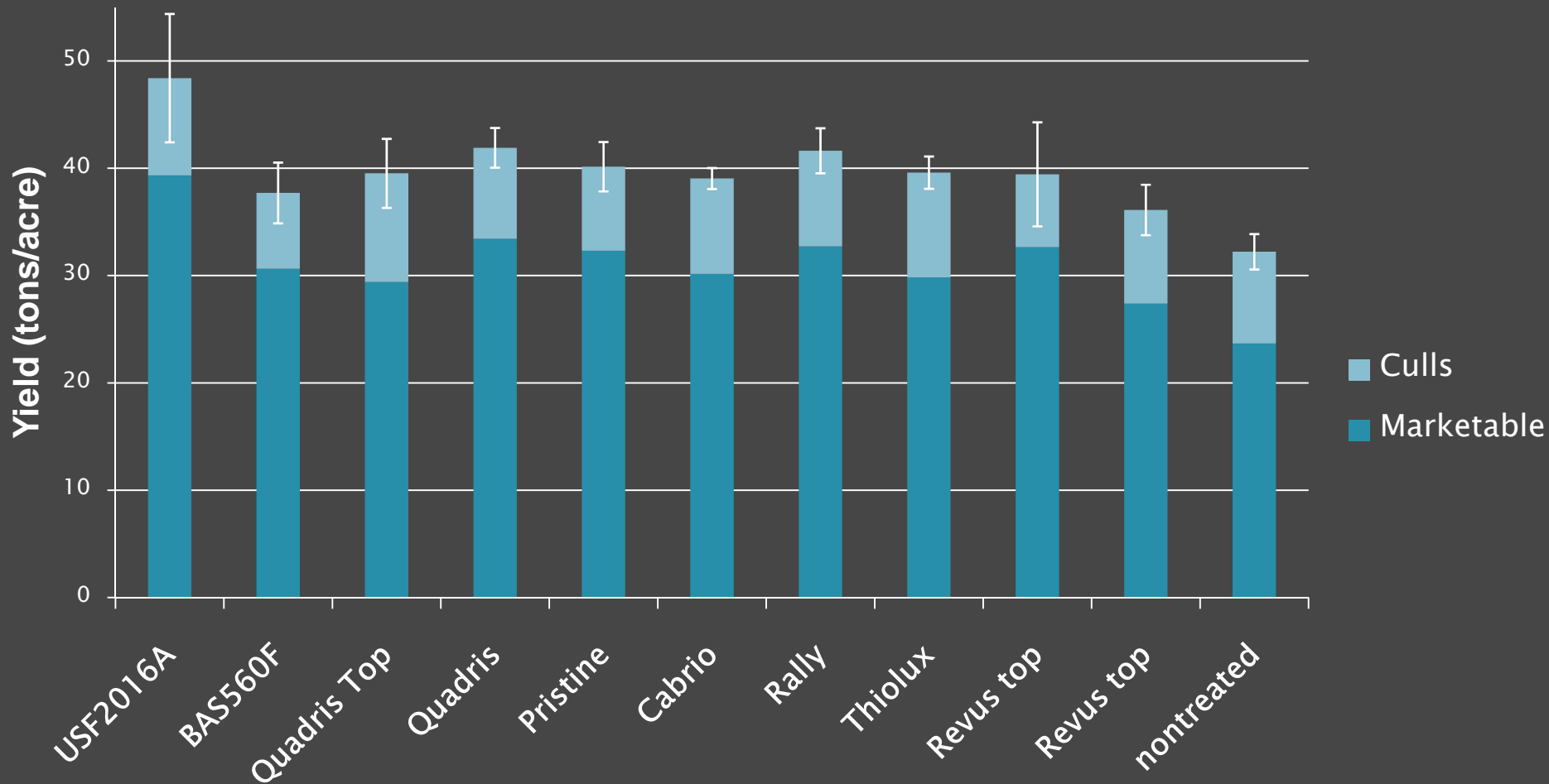
FRAC

| | | |
|---------------|----------------------------------|-----------|
| □ BAS560 F | metrafenone | unique |
| □ LEM17 | ? | ? |
| □ Pristine | pyraclostrobin + boscalid | 11 + 7 |
| □ Quadris Top | azoxystrobin + difenoconazole | 11 + 3 |
| □ USF2016A** | ? | ? |

Powdery Mildew Control



Fresh Market Tomato Yield



Powdery Mildew Trial, Woodland 2008

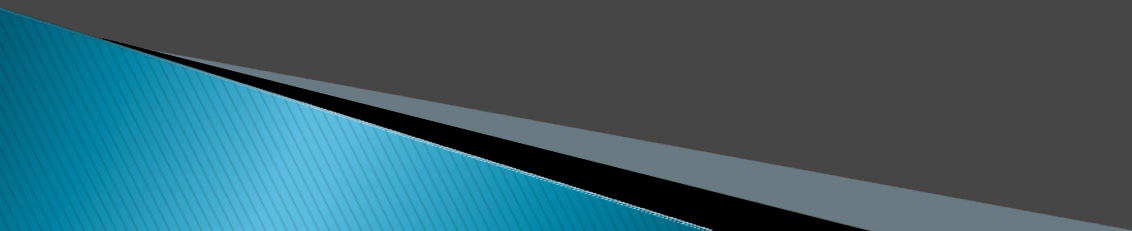
Late- season Processing Tomatoes

Gene Miyao

| Fungicide treatments ¹ | 15-Sep % mildew | 23-Sep % infection | 7-Oct % necrosis | 9-Oct Yield (tons/A) |
|--|--------------------|-----------------------|---------------------|-------------------------|
| Non treated control | 8 | 62 | 89 | 48.1 |
| Cabrio@16oz+Endura@5oz fb same | 4 | 46 | 68 | 49.4 |
| Quadris fb Quadris | 4 | 27 | 68 | 51.9 |
| Cabrio fb Endura | 4 | 34 | 68 | 49.3 |
| Rally fb Rally 4 oz + 4 lbs Kocide | 11 | 34 | 65 | 53.6 |
| LSD @ 5% | 5.2 | 11.3 | NS | NS |
| % CV | 63 | 21 | 19 | 7 |
| Average | 6.2 | 40.6 | 71.7 | 50.5 |

¹ Initial fungicide application followed by (fb) 2nd application within 14 days

Powdery mildew chemical control

- ▶ Early treatment
 - ▶ Rotations and tank mixes
 - ▶ Good coverage
- 

Acknowledgements

- ▶ California Tomato Research Institute
- ▶ Gene Miyao, UCCE Yolo, Sacramento and Solano counties
- ▶ Michelle Le Strange, UCCE Tulare & Kings counties
- ▶ Scott Stoddard, UCCE Merced & Madera counties
- ▶ Mike Davis, UC Davis Plant Pathology Dept.
- ▶ Joyce Strand and Marty Martino, UC IPM
- ▶ BASF, Bayer, DuPont and Syngenta
- ▶ Our cooperating growers and PCAs!