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**Agriculture and Natural Resources**

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# **Field Evaluation of Fungicides for Managing Powdery Mildew and Botrytis Fruit Rot in Santa Maria Strawberries**

**Surendra Dara**

**Strawberry and Vegetable Crops Advisor and Affiliated IPM Advisor**

**University of California Cooperative Extension**

**Santa Barbara and San Luis Obispo Counties**

**[skdara@ucdavis.edu](mailto:skdara@ucdavis.edu)**

strawberriesvegetables   @calstrawberries @calveggies

# Strawberry powdery mildew

Caused by *Podosphaera aphanis*

Previously known as *Sphaerotheca macularis*

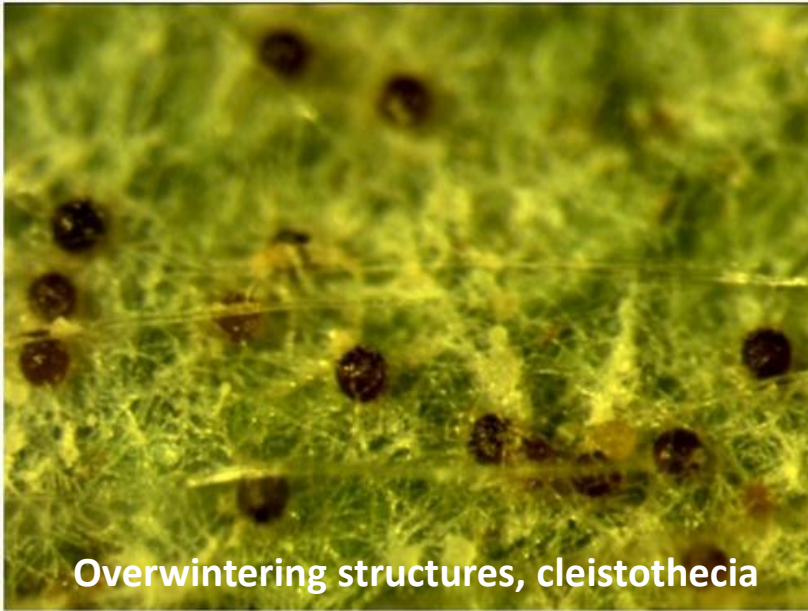


# Strawberry powdery mildew

Chains of conidial spores on conidiophores



Overwintering structures, cleistothecia



Ascus with ascospores in a cleistothecium



# Botrytis fruit rot or gray mold

Caused by *Botrytis cinerea*



UC Statewide IPM Project  
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# 2012 Strawberry fungicide trial

| BEDS>     | 1 | 2 | 3 | 4 | 5 | 6  | 7  | 8 | 9  | 10 | 11 |           |
|-----------|---|---|---|---|---|----|----|---|----|----|----|-----------|
| BLOCK IV  | 1 | 5 | 4 | 3 | 2 | 8  | 11 | 9 | 10 | 7  | 6  | ...20'... |
| BLOCK III | 2 | 3 | 5 | 4 | 1 | 6  | 7  | 9 | 11 | 10 | 8  | ...20'... |
| BLOCK II  | 3 | 5 | 1 | 2 | 4 | 10 | 11 | 6 | 8  | 9  | 7  | ...20'... |
| BLOCK I   | 4 | 2 | 3 | 1 | 5 | 9  | 8  | 7 | 10 | 6  | 11 | ...20'... |

| Trt | 1st spray 5/23/12          | 2nd spray 6/6/12           | 3rd spray 6/13/12          | 4th spray 6/20/12          | 5th spray 6/27/12          |
|-----|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1   | Untreated                  | Untreated                  | Untreated                  | Untreated                  | Untreated                  |
| 2   | Pristine 23                | Pristine 23                | Pristine 23                | Pristine 23                | Pristine 23                |
| 3   | Switch 14                  | Switch 14                  | Switch 14                  | Switch 14                  | Switch 14                  |
| 4   | OxiDate 1% + Yucca extract | OxiDate 1% + Yucca extract | OxiDate 1% + Yucca extract | OxiDate 1% + Yucca extract | OxiDate 1% + Yucca extract |
| 5   | OxiDate 0.5% + Procure 6   | Oxidate 0.5%+Pristine 18.5 | OxiDate 0.5% + Procure 6   | Oxidate 0.5%+Pristine 18.5 | OxiDate 0.5% + Procure 6   |
| 7   | Merivon 9                  | Merivon 9                  | Merivon 9                  | Merivon 9                  | Merivon 9                  |
| 8   | Merivon 11                 | Merivon 11                 | Merivon 11                 | Merivon 11                 | Merivon 11                 |
| 9   | F9110 24.4                 | Pristine 20                | F9110 24.4                 | Pristine 20                | F9110 24.4                 |
| 10  | F9110 24.4                 | Rally 4                    | F9110 24.4                 | Rally 4                    | F9110 24.4                 |
| 11  | F9110 20.5 + Abound 10     | Rally 4                    | F9110 20.5 + Abound 10     | Rally 4                    | F9110 20.5 + Abound 10     |



# 2012 Strawberry fungicide trial

1. Untreated
2. Pristine (23 oz) in 30 gpa
3. Switch 62.5 WG (14 oz) in 30 gpa - grower standard
4. OxiDate 2.0 (1% v/v) + 0.125% Yucca extract surfactant in 100 gpa
5. OxiDate 2.0 (0.5% v/v) + Procure (6 fl oz) alternated with OxiDate (.5%) + Pristine (18.5 oz) in 100 gpa
6. Merivon SC (7 fl oz) in 30 gpa
7. Merivon SC (9 fl oz) in 30 gpa
8. Merivon SC (11 fl oz) in 30 gpa
9. F9110 (24.4 fl oz) in 40 gpa alternated with Pristine (20 oz) after 7-10 d
10. F9110 (24.4 fl oz) in 40 gpa alternated with Rally 40WS (4 oz) after 7-10 d
11. F9110 (20.5 fl oz) + Abound (10 fl oz) in 40 gpa alternated with Rally 40WS (4 oz) after 7-10 d

Except for OxiDate with yucca extract, all treatments had 0.125% v/v DyneAmic.



# 2012 Strawberry fungicide trial

## Pristine (BASF)

Pyraclostrobin 12.8% (**Strobilurin**-inhibits mitochondrial respiration) +  
Boscalid 25.2% (**Carboxamide**-inhibits succinate dehydrogenase)

## Switch (Syngenta)

Cyprodinil 37.5% (Anilino-pyrimidine-interferes with the biosynthesis of methionine) +  
Fludioxonil 25% (Phenylpyrrole-disrupts fungal cell membranes)

## OxiDate (BioSafe Systems)

Hydrogen dioxide 27% (Peroxygen-increased cell permeability and collapse)

## Merivon (BASF)

Xemium 21.26% (**Carboxamide**-inhibits succinate dehydrogenase) +  
Pyraclostrobin 21.26% (**Strobilurin**-inhibits mitochondrial respiration)

## Problad Plus (FMC)

Beta-conglutin 20% (Protein inhibitor)

## Rally (Dow AgroSciences)

Myclobutanil 40% (**Triazole**-sterol biosynthesis inhibitor)

## Abound (Syngenta)

Azoxystrobin 22.9% (**Strobilurin**-inhibits mitochondrial respiration)

## Procure (Chemtura)

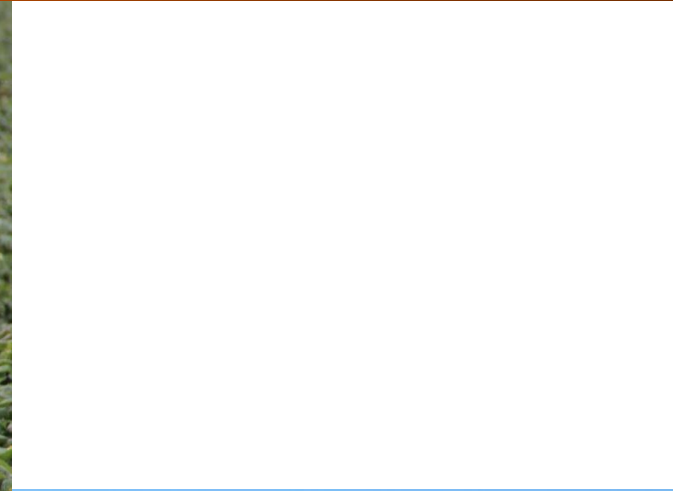
Triflumizole 42.14% (**Imidazole**-sterol biosynthesis inhibitor)



# 2012 Strawberry fungicide trial



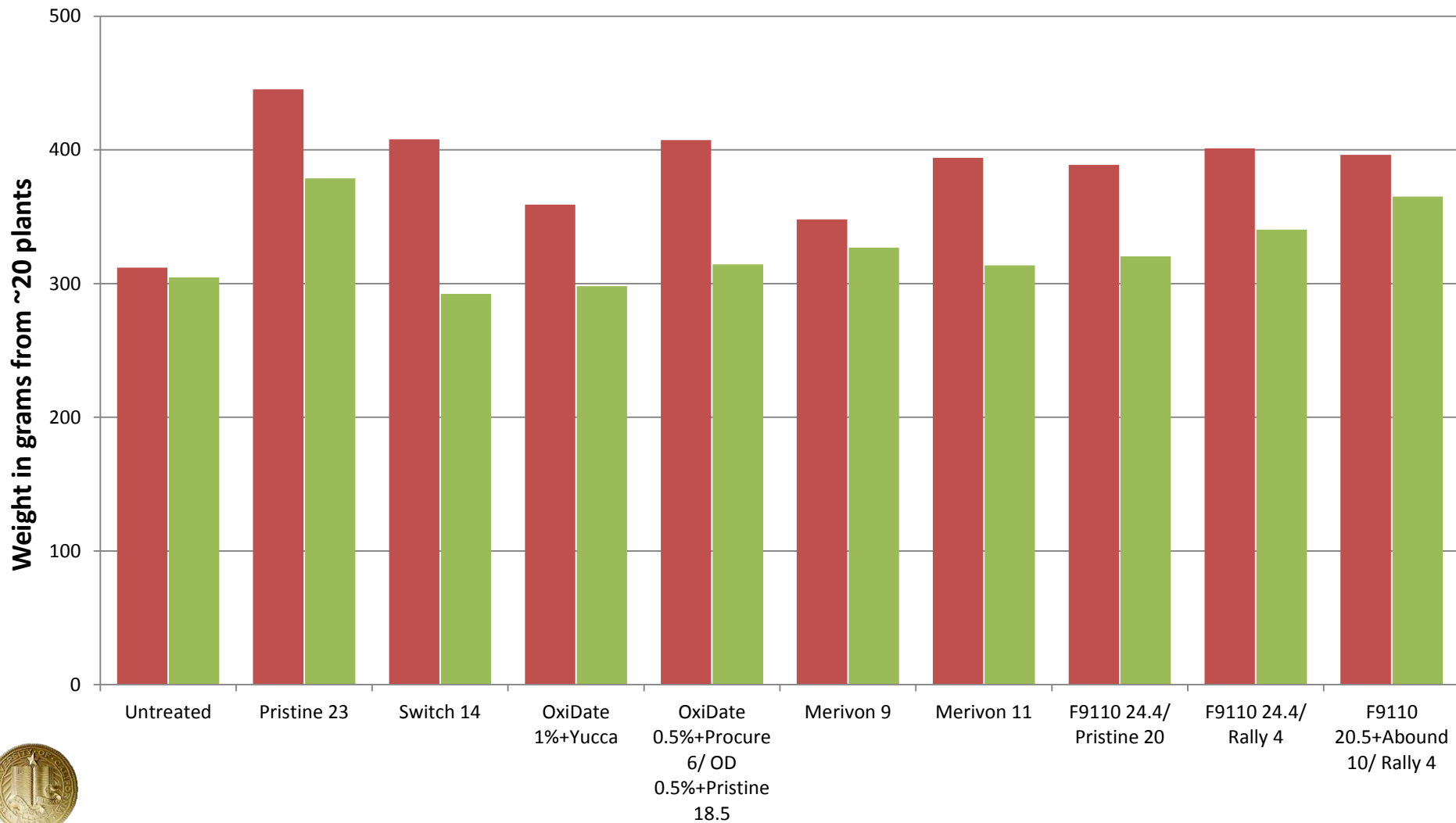
# 2012 Strawberry fungicide trial



# 2012 Strawberry fungicide trial

Average yield from 5/29/12 to 7/2/12

■ Fresh ■ Other (Unmarketable excluding infected + juice/freezer market)

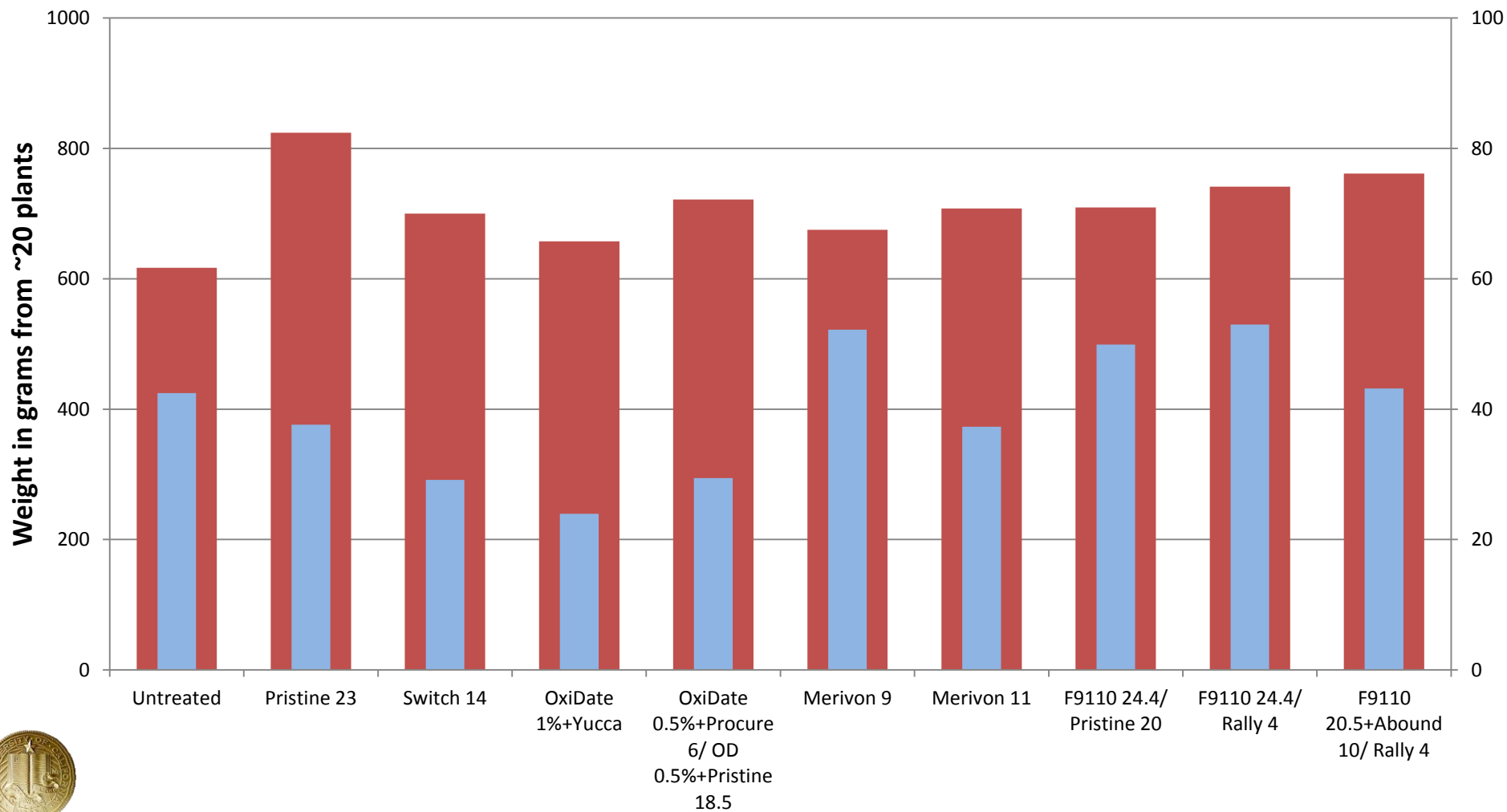


# 2012 Strawberry fungicide trial

Average yield from 5/29/12 to 7/2/12

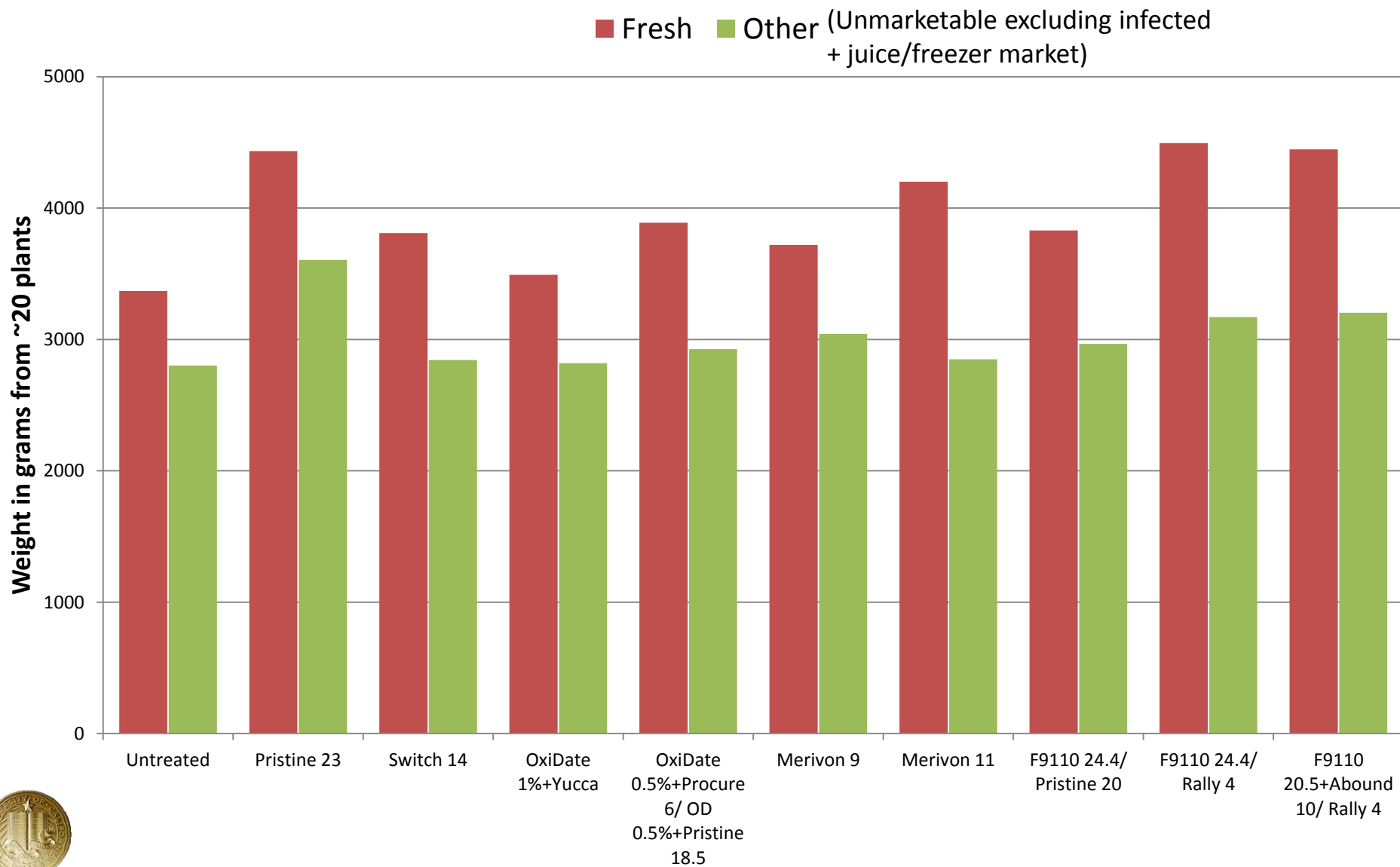
Infected berry data from 6/5 to 7/2

■ Uninfected ■ Infected



# 2012 Strawberry fungicide trial

Total yield from 5/29/12 to 7/2/12

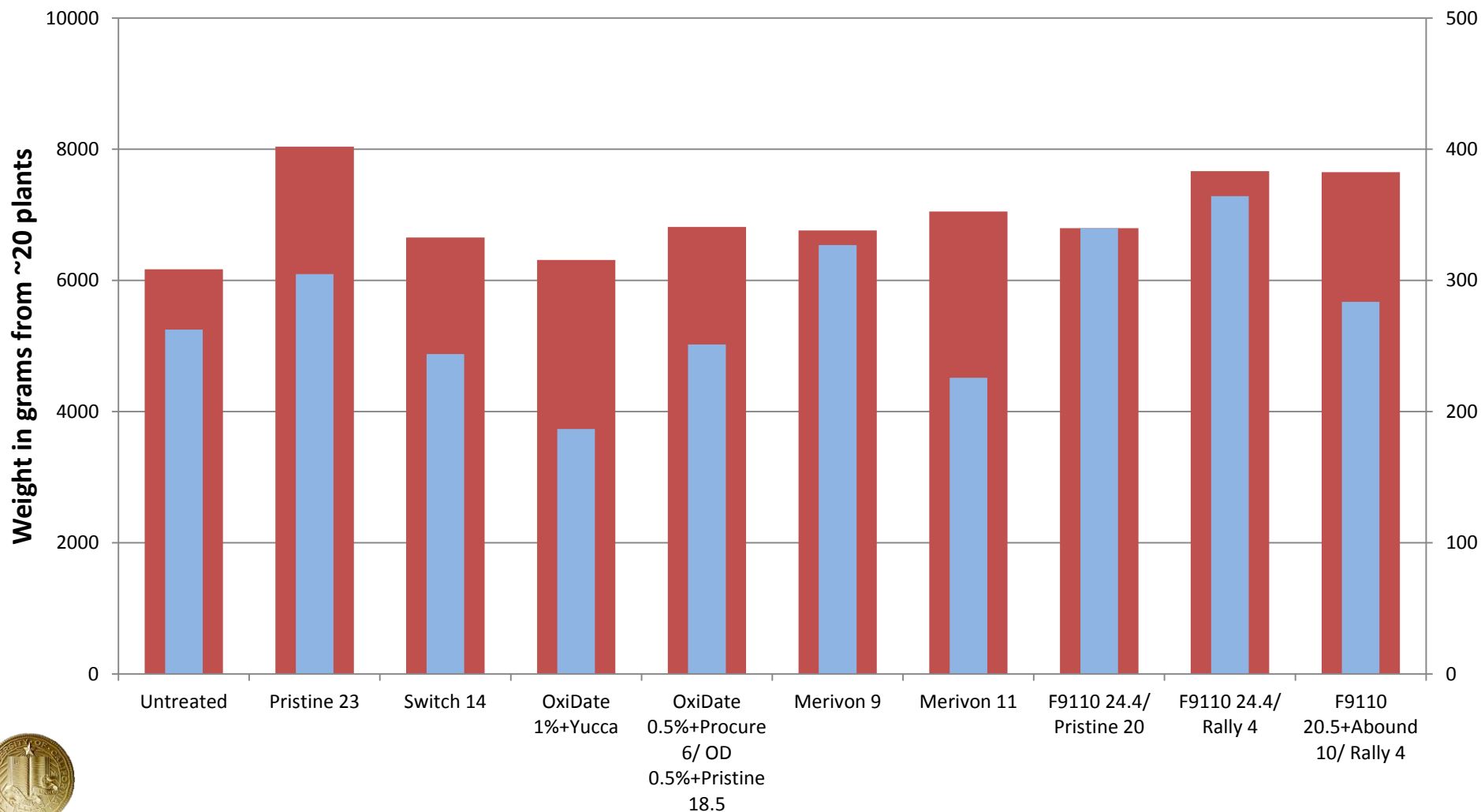


# 2012 Strawberry fungicide trial

Total yield from 5/29/12 to 7/2/12

Infected berry data from 6/5 to 7/2

■ Uninfected ■ Infected

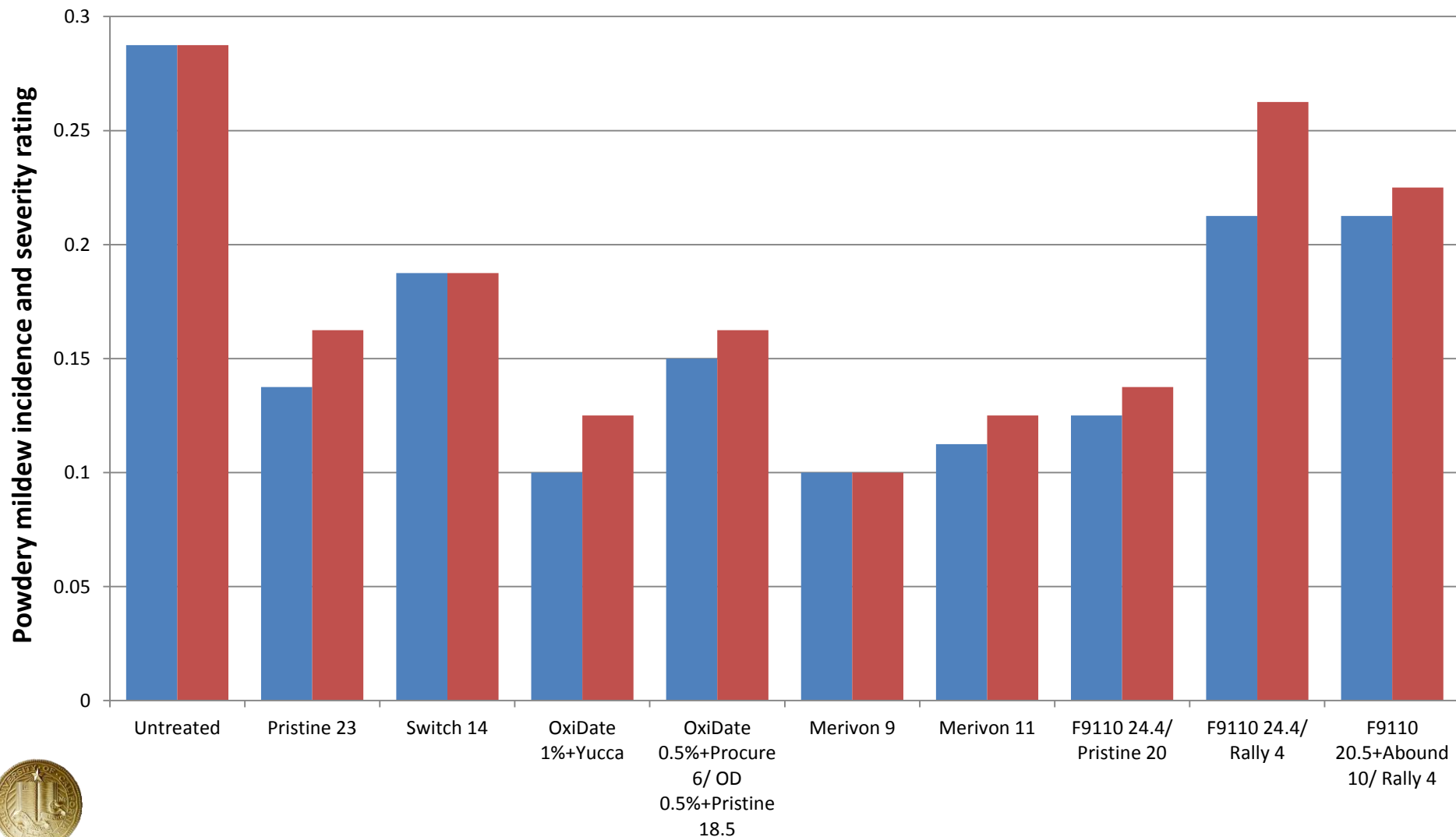


# 2012 Strawberry fungicide trial

## Powdery mildew

■ Avg. Incidence ■ Avg. Severity

**Incidence:** 0 if absent and 1 if present; **Severity:** 1 if 1-24%, 2 if 25-50%, 3 if 51-75%, and 4 if 76-100% of leaf area is infected

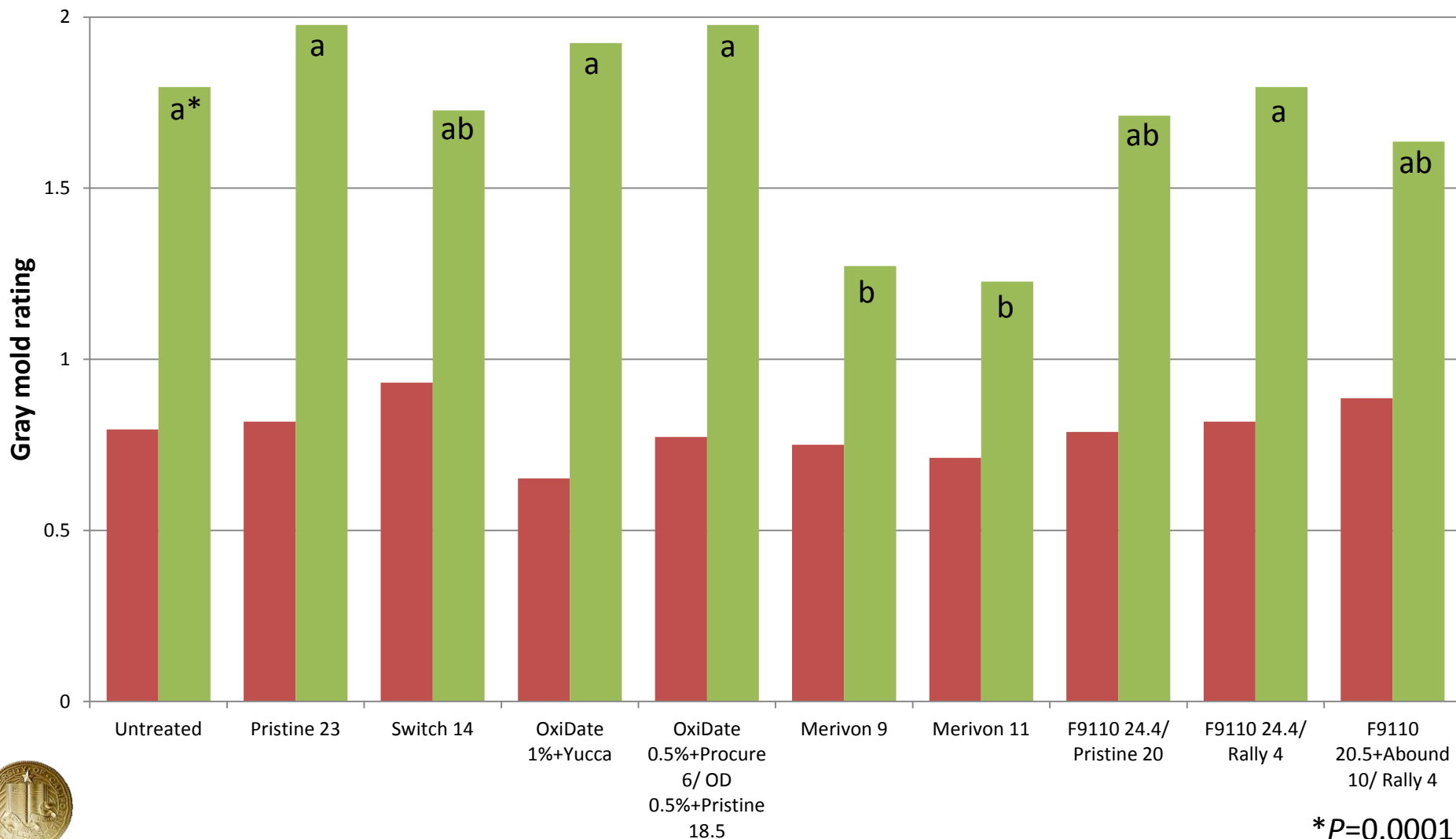


# 2012 Strawberry fungicide trial

## Average postharvest mold growth

■ 3 DAH ■ 5 DAH

0=Absent; 1=1-24% severity; 2=25-50% severity; 3=51-75% severity; 4=76=100% severity



\* $P=0.0001$



# Conclusions

- Both existing and new fungicides performed well for higher yields and lower infection levels
- Rotate different fungicides for good results
- Regularly monitor and apply fungicides at the first sign of disease
- Monitor weather conditions especially for gray mold
- Remove infected plant material

# Acknowledgments

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