Prune disease management

- Brown rot and rust -

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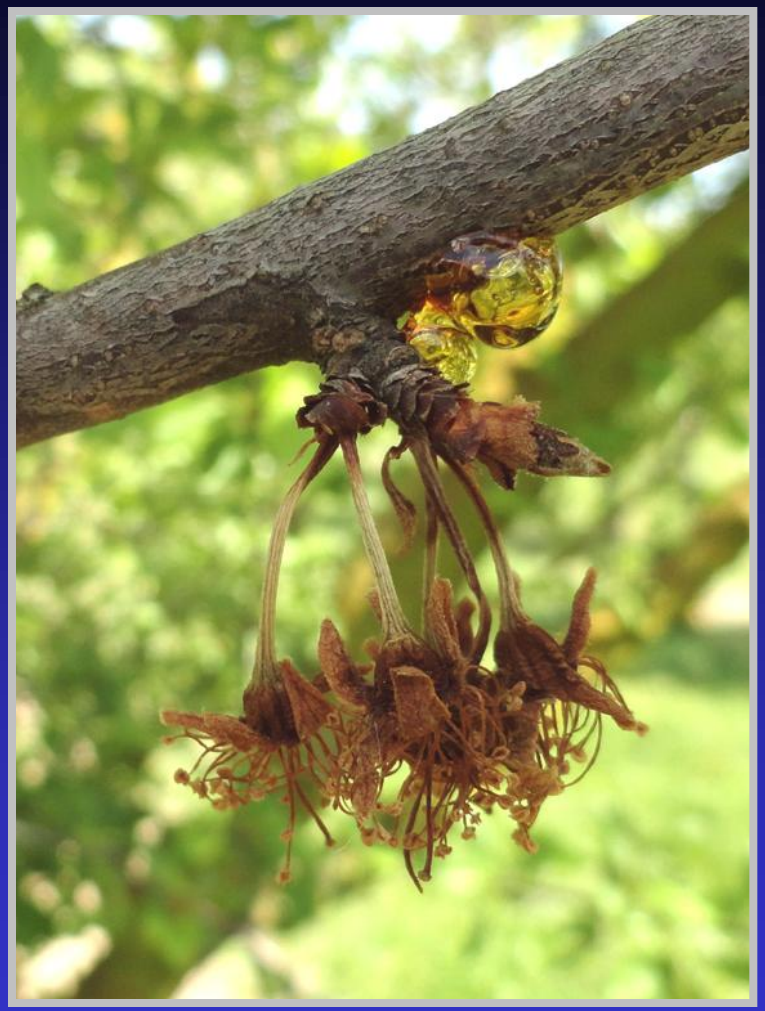
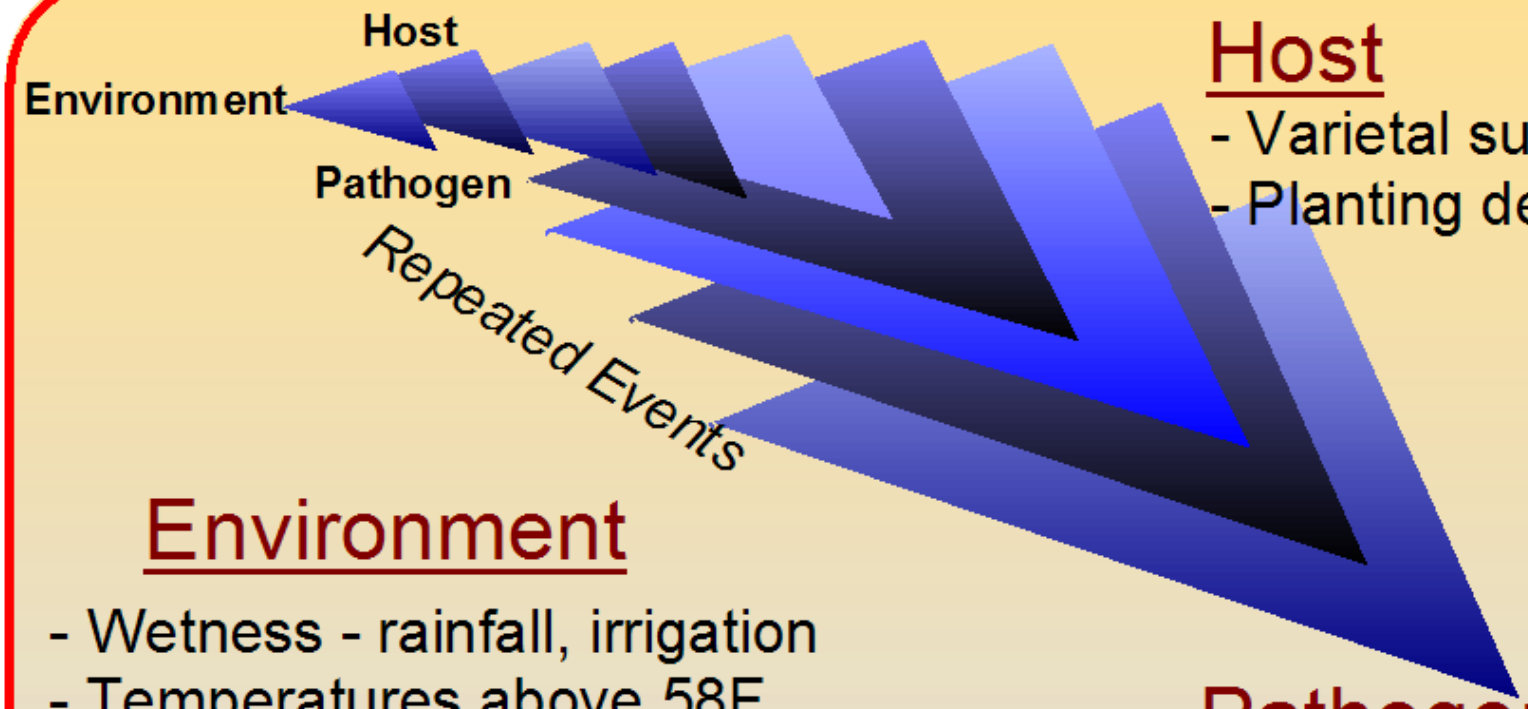


Management of Brown Rot of Prune caused by *Monilinia laxa* and *M. fructicola*

- The Disease Triangle of Plant Pathology -



Host

- Varietal susceptiblity,
- Planting design

Environment

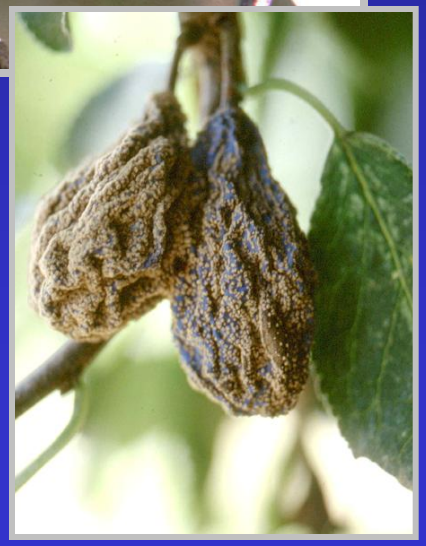
- Wetness - rainfall, irrigation
- Temperatures above 58F

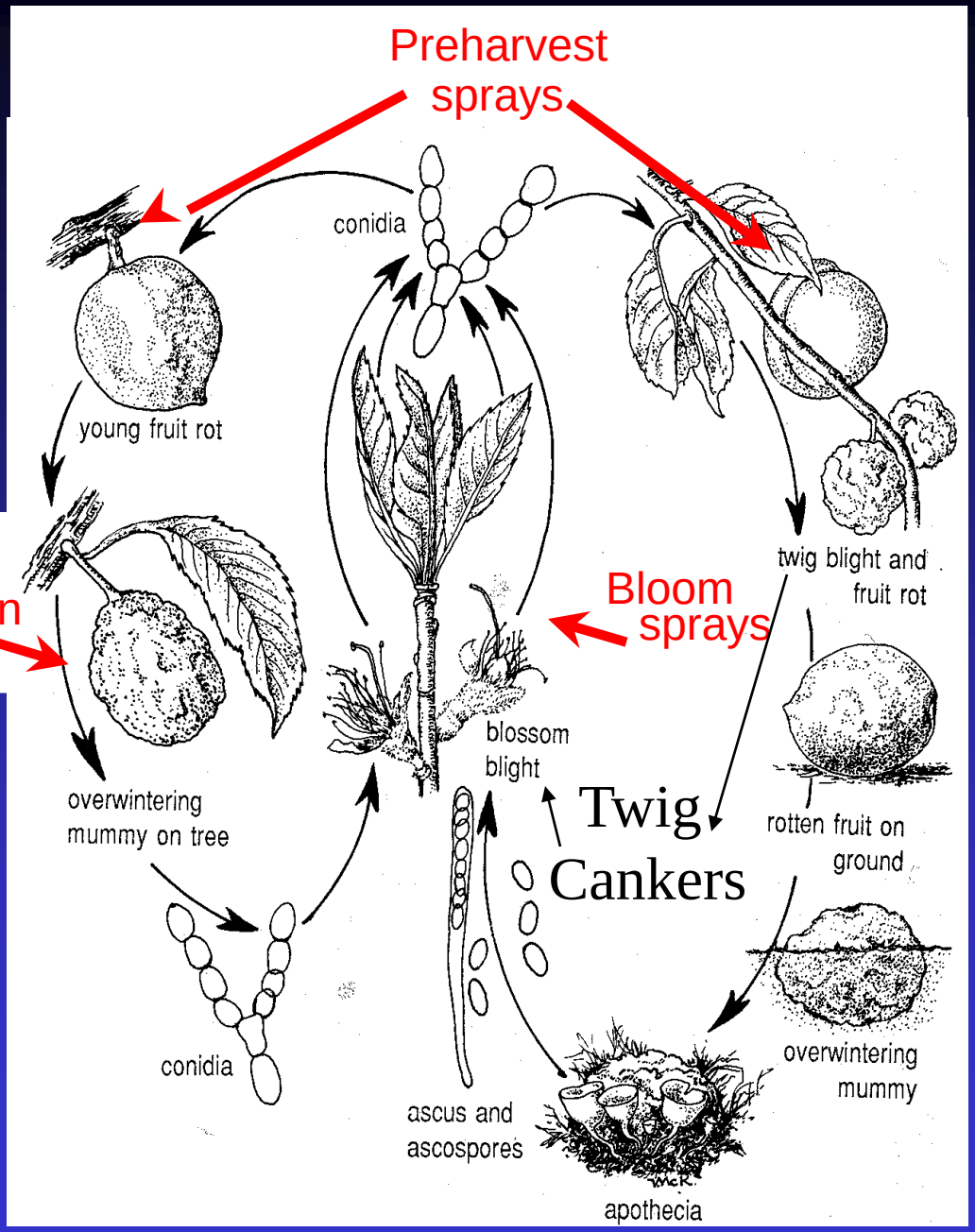
Pathogen

- *M. fructicola, M. laxa*
- Inoculum potential (overwintering mummies, twig cankers)

The interactions between the components effect the amount of disease.

Disease cycle of *Monilinia fructicola* on prune and preharvest control measures





Components of an integrated disease management program for brown rot of stone fruit

- Early disease detection
- Planting
  - Variety selection (host resistance)
  - Plant spacing (greater air movement, shorter drying times)
- Cultural practices
  - Avoid high-angle sprinkler irrigation
  - Provide a balanced nutrition
  - Pruning practices (improved microclimate, removal of diseased tissue)
- Sanitation
  - At harvest remove all fruit from trees
  - Remove overwintering mummies from trees and cultivate mummies into soil
- ***Chemical control***

Management of Brown Rot Blossom Blight

- Fungicide Maintenance Programs -

Dried Plum (prune) blossoms are susceptible at white tip through full bloom because all blossom tissues (green scales, petals, stamens, pistils) are susceptible, and infection may lead to blossom blight, but stamen and pistil tissues are the most susceptible.

EFFICACY AND TIMING OF FUNGICIDES, BACTERICIDES, AND BIOLOGICALS FOR DECIDUOUS TREE FRUIT, NUT, STRAWBERRY, AND VINE CROPS 2012

ALMOND
APPLE AND PEAR
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CHERRY
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PLUM
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Statewide IPM Program
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Efficacy tables will be updated again for 2013

Fungicide treatment timing in prune (dried plum)

http://www.ipm.ucdavis.edu

Disease	Green bud	White bud	Full bloom	May	June	July
Brown rot [a]	+++	+++	+++	—	+	++
Russet scab [b]	—	—	+++	—	—	—
Rust [c]	—	—	—	+	++	+++

Rating: +++ = most effective, ++ = moderately effective, + = least effective, and — = ineffective.

Timings depend upon orchard history of disease, length of bloom, and weather conditions each year.

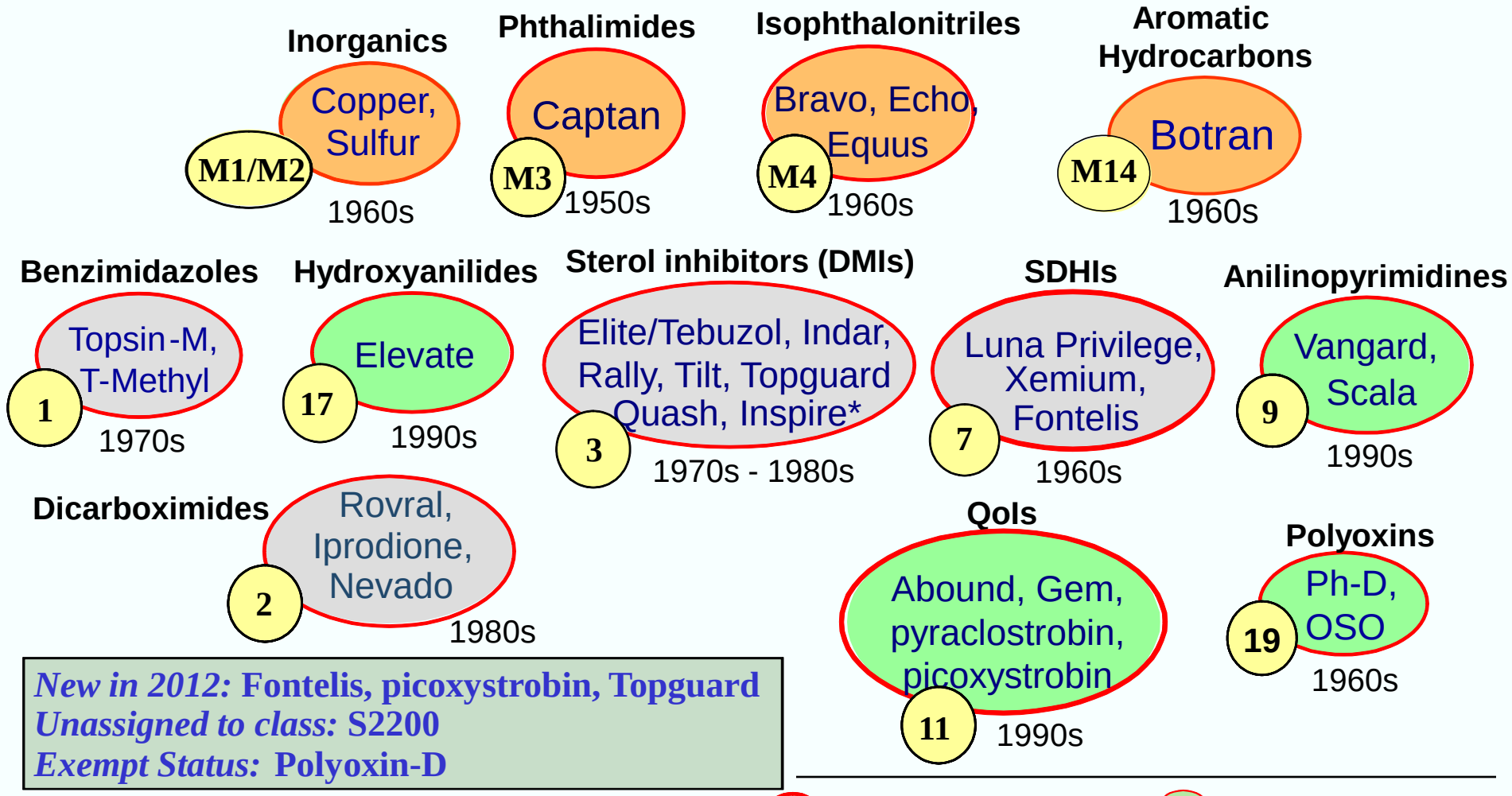
a. Flowers susceptible from the emergence of sepals (green bud) until petal fall, but are most susceptible when open.

b. A physiological disorder, no pathogens involved.

c. More severe when late spring rains occur.

Fungicides Registered and in Development for Managing Prune Diseases

Single-fungicides - Inorganics and Conventional Synthetics



New in 2012: **Fontelis, picoxystrobin, Topguard**
Unassigned to class: **S2200**
Exempt Status: **Polyoxin-D**

FRAC (Fungicide Resistance Action Committee) Group

Single-site mode of action

Multi-site mode of action

Reduced risk fungicides

Fungicides Registered and in Development for Managing Prune Diseases

Conventional Synthetic Fungicides – Pre-mixtures

- Inspire XT — 3+3
- Inspire Super — 3+9
- Adament, Quadris Top, Quilt Xcel — 3+11
- Pristine, Luna Sensation, Merivon, Q8Y78 — 7+11

3	DMIs
7	SDHIs
9	Anilinopyrimidines
11	QoIs

Pending: Luna Sensation, Merivon, Q8Y78 (picoxystrobin + penthiopyrad)

Natural Products and Biocontrols

Regalia, Cerebrocide, Polyoxin-D organic, OSO, Actinovate — 19

- **Natural products/biocontrols for organic prune production**
- **Polyoxin-D received an exempt status!**

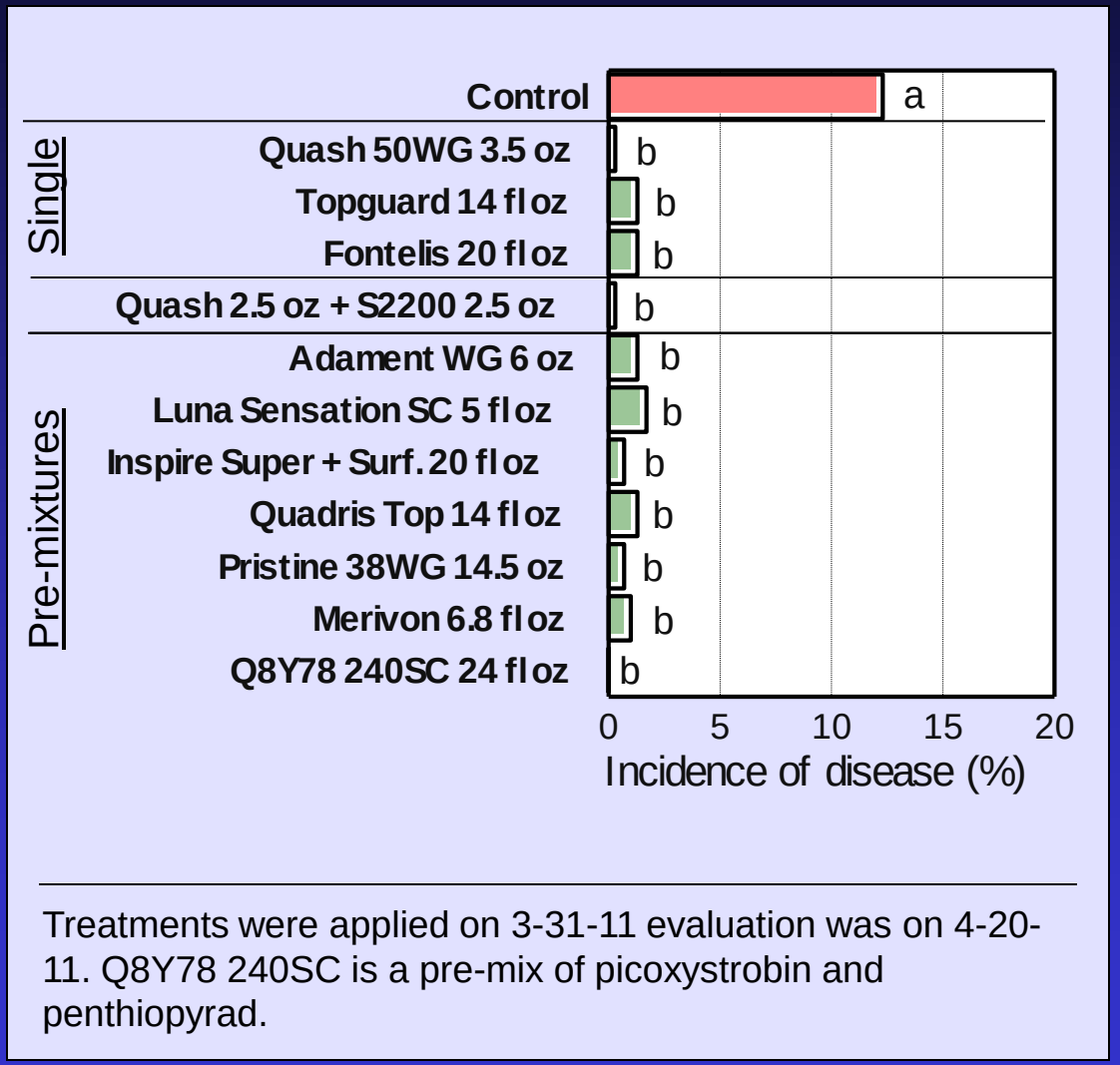
Field evaluations of fungicides for management of blossom blight of French prune -

New effective treatments:

- TopGuard (DMI – FG3)
- Fontelis (SDHI - FG 7)

Pre-mixtures:

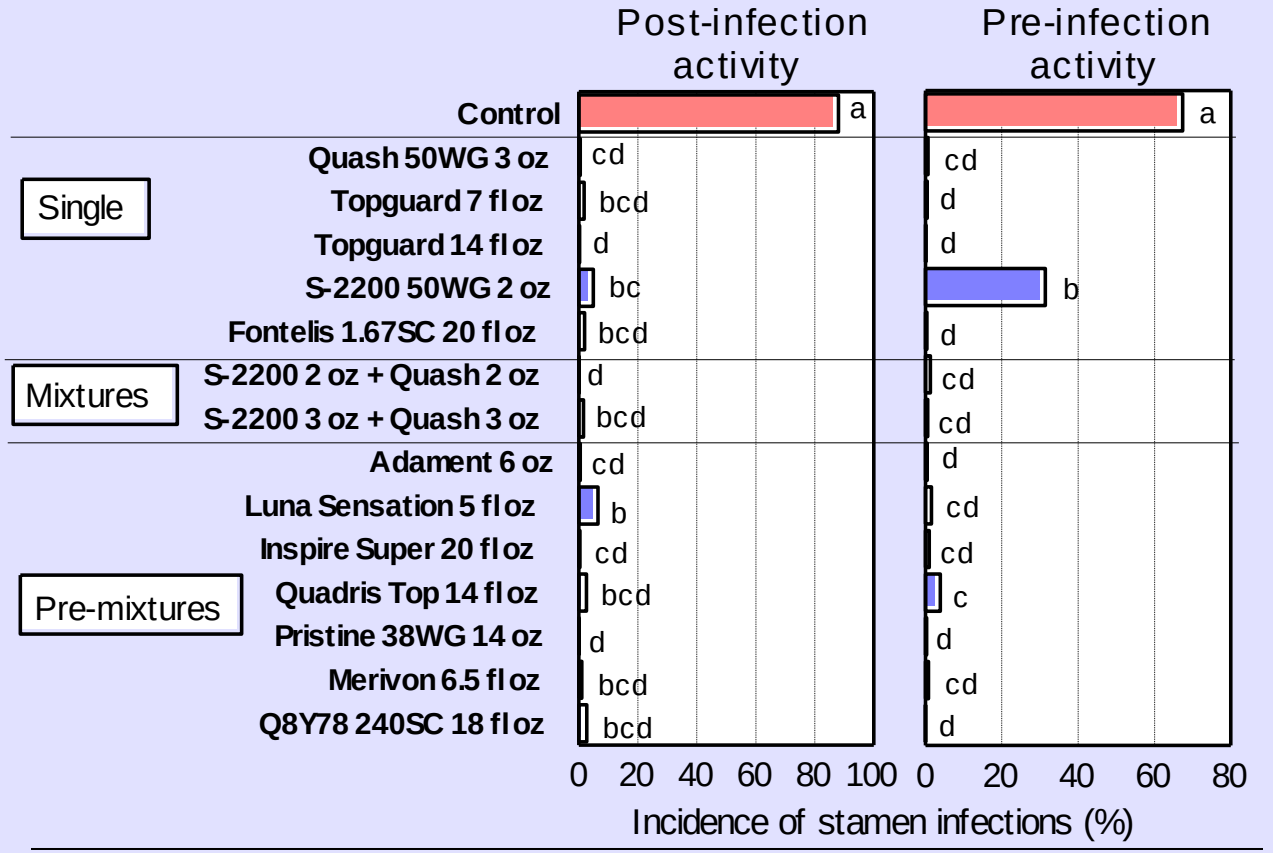
- Luna Sensation (FG 7+11)
- Merivon (FG 7+11)
- Q8Y78 (FG 7+11)



Treatments were applied on 3-31-11 evaluation was on 4-20-11. Q8Y78 240SC is a pre-mix of picoxystrobin and penthiopyrad.

Pre- and post-infection activity of selected fungicides - Blossom blight of French prune lab studies -

Control | Inspire Super | Merivon



For pre-infection activity, blossoms were treated in the laboratory and inoculated after 4 h with *M. laxa* (15K/ml). For post-infection activity, blossoms were inoculated and treated after 24 h. Blossoms were evaluated for stamen infections after 4-5 days of incubation at 20 C.

Summary:
Fungicides for blossom blight control

- ***Highly effective (+++ or ++++) for blossom blight, pre- and post-infection activity:***

- **Registered:**
  - FG 3 - DMIs: Tilt/Bumper, Indar, Elite, Quash, Topguard
  - FG 9 - Anilinopyrimidines (AP): Vangard, Scala
  - FG 2 - Dicarboximides: Rovral (-oil)/Nevado/Iprodione
  - FG 17 - Hydroxyanilide: Elevate
  - Pre-mixtures:
    - FG 7/11 - Pristine,
    - FG 3/11 - Quilt Xcel, Adament, Quadris Top
    - FG 3/9 - Inspire Super
- **Planned Registrations:**
  - Pre-mixtures: Luna Sensation, Merivon, Q8Y78, …
- **Exempt** – FG 19: Ph-D/OSO – higher rates need to be evaluated

Considerations for timing of bloom applications

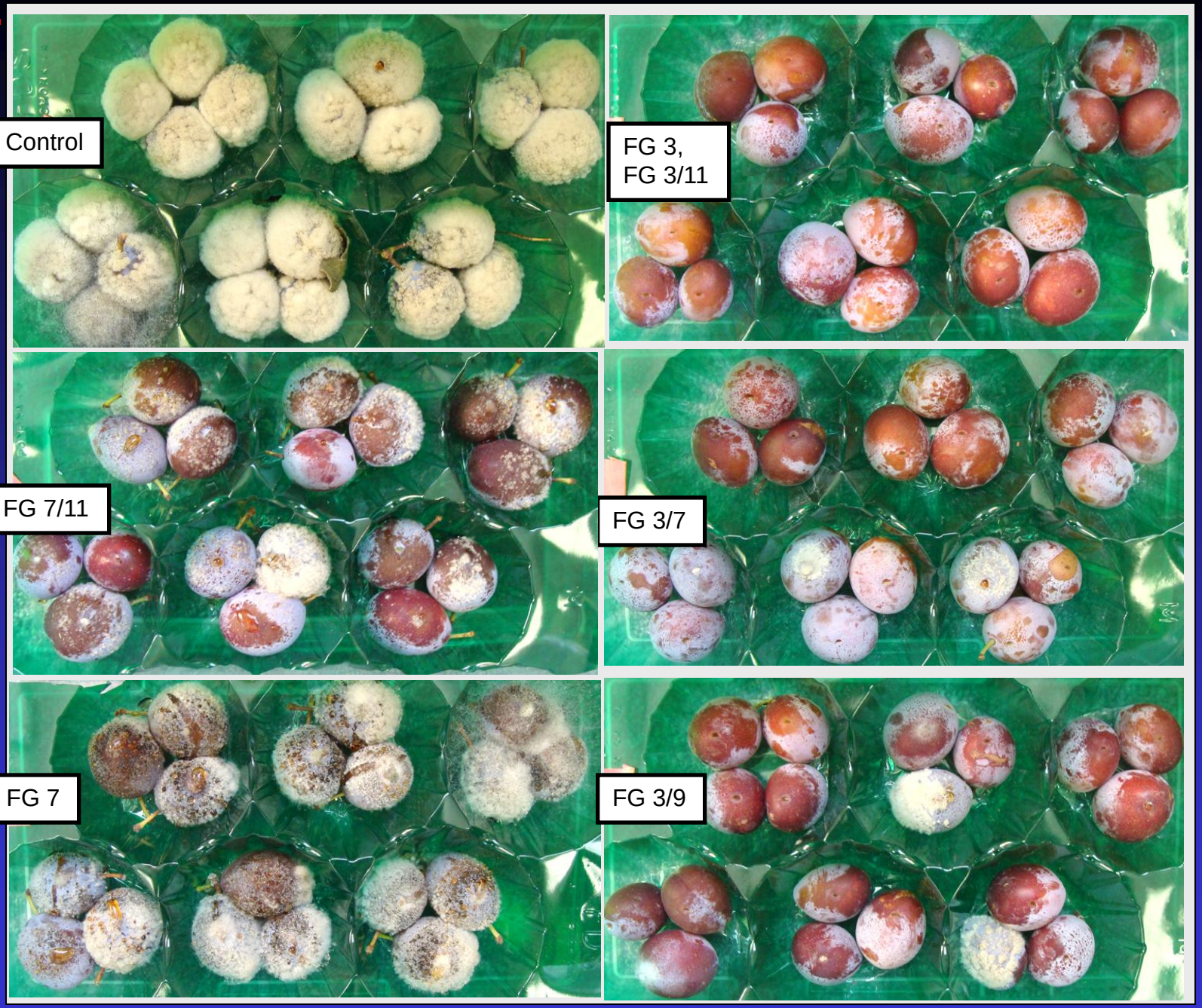
Environmental conditions and properties of fungicide used

Determining factors	WT or FB or **delayed bloom**	WT and FB application
Environmental conditions (rain)	Less favorable	Highly favorable
Fungicide properties	Locally systemic action	With or without locally systemic action

WT = White tip (5% bloom)
FB = Full bloom (80% bloom)
Delayed bloom = 20-40% bloom

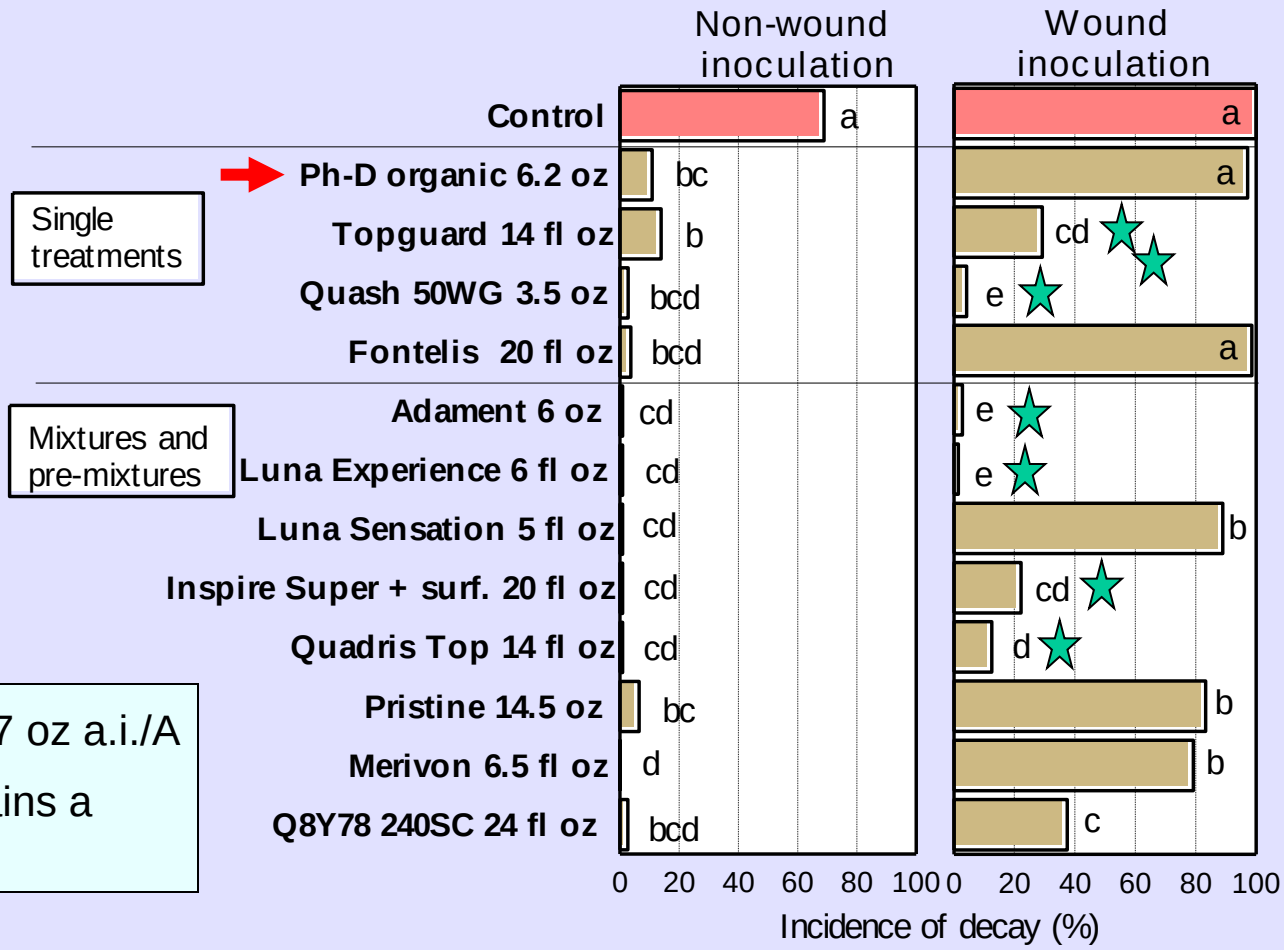
Management of brown rot fruit decay with preharvest fungicide treatments

Fungicide efficacy for managing brown rot of French prune in wound-inoculated fruit



Treatments applied 12 days before harvest.

12-day PHI fungicide treatments for management of brown rot decay of French prune – Yuba Co. 2012

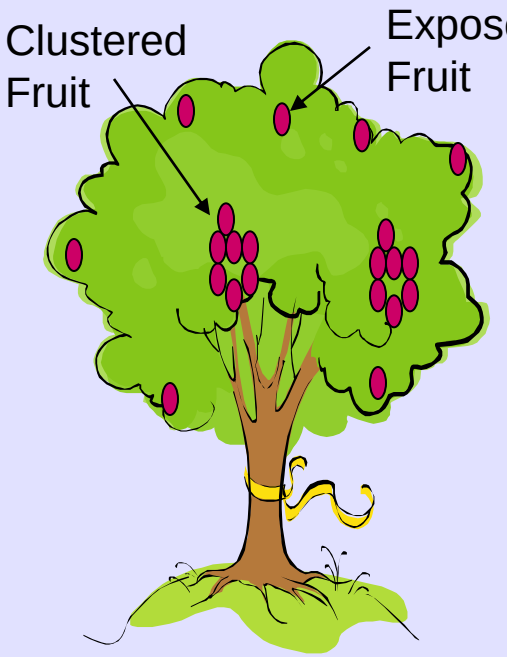


Ph-D used at 0.7 oz a.i./A

Treatment contains a FG 3 DMI

Treatments were applied in combination with Omni Supreme Spray Oil (1.5%) on 8-16-12 using an air-blast sprayer at 130 gal/A. After harvest, fruit were non-wound- or wound-inoculated with *M. fructicola* (30,000 conidia/ml) and then incubated for 7 days at 20 C.

Efficacy of high- and low-gallonage fungicide treatments to clustered and exposed fruit on incidence of brown rot



All fruit were inoculated on the inside surface opposite to the perimeter.

Wound-inoculations

Clustered fruit

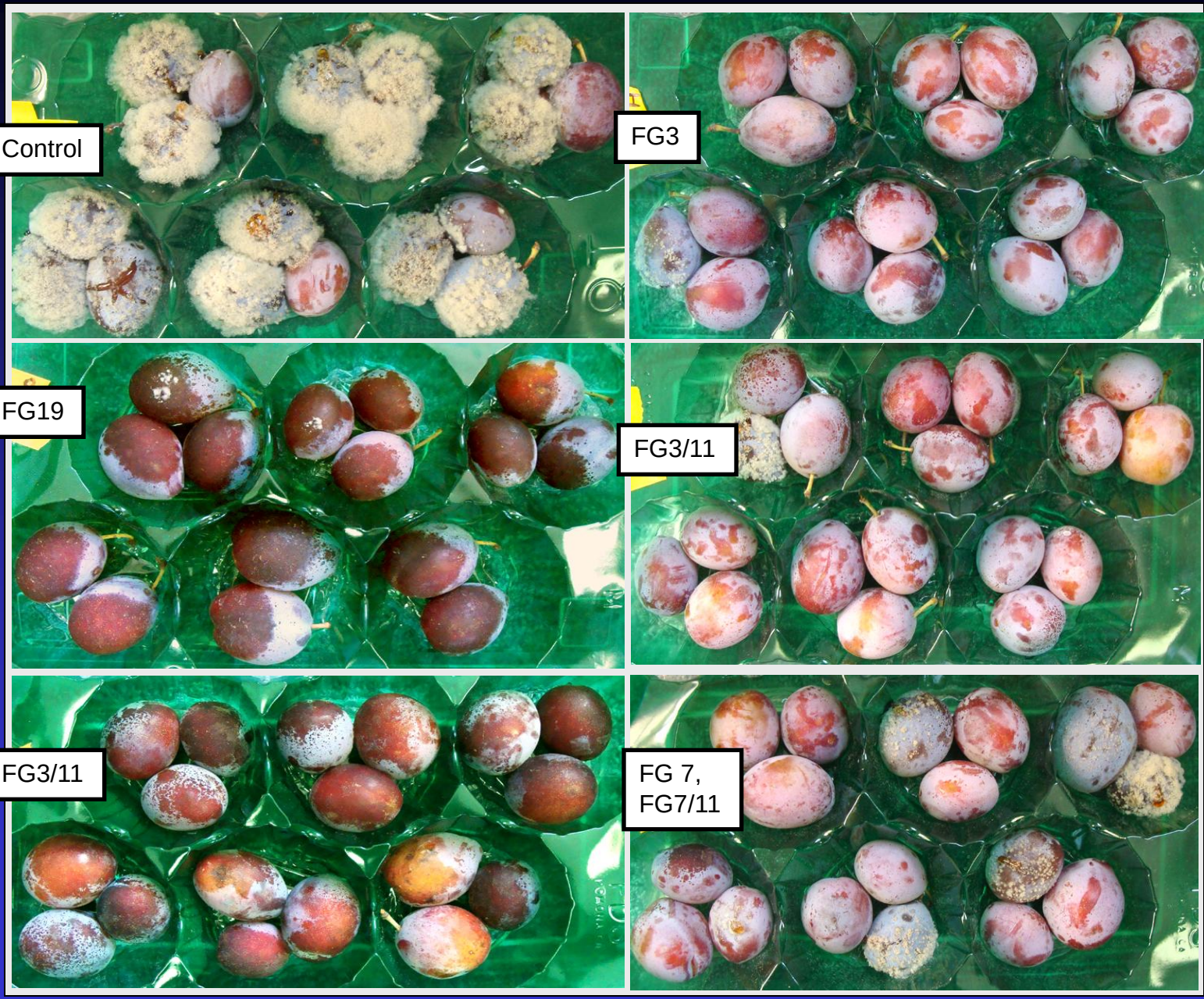
Exposed fruit

Control

Pristine 160 gal/A

Pristine 80 gal/A

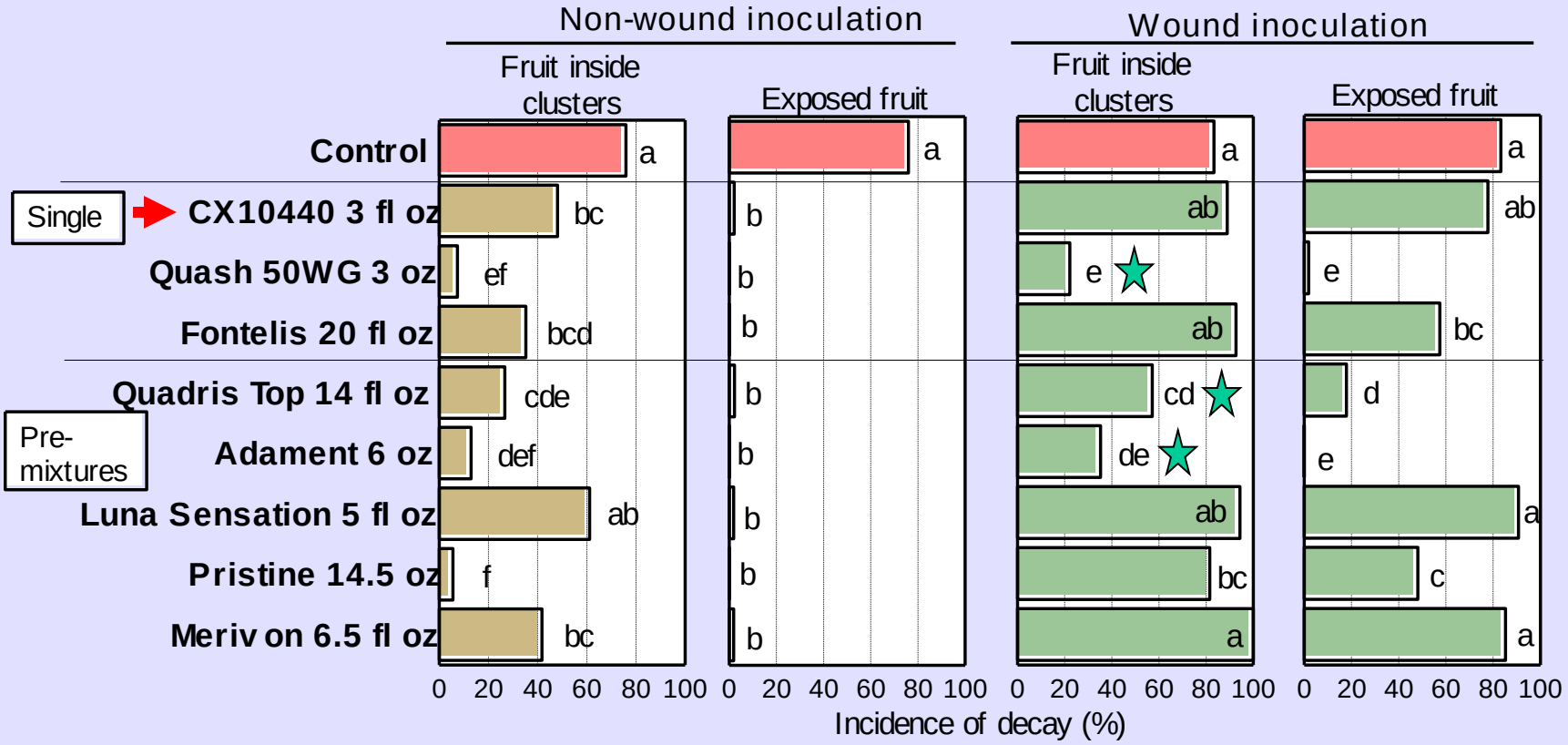
Fungicide efficacy for managing brown rot of French prune – Comparing exposed and clustered fruit in non-wound inoculation studies



Treatments applied 12 days before harvest.

12-day PHI treatments for management of brown rot decay of French prune - UC Davis 2012

- Efficacy on exposed fruit and fruit inside clusters -



Treatments were applied on 8-16-12 in combination with Omni Supreme Spray Oil (1.5%) using an air-blast sprayer at 130 gal/A. At harvest, fruit from the tree perimeter (exposed fruit) and from clusters were collected and wound- or non-wound-inoculated with *M. fructicola* (30,000 conidia/ml). Fruit were then incubated for 7 days at 20 C.

Organic formulation of polyoxin-D

Treatment contains a FG 3 DMI

Summary: Fungicides for fruit brown rot control

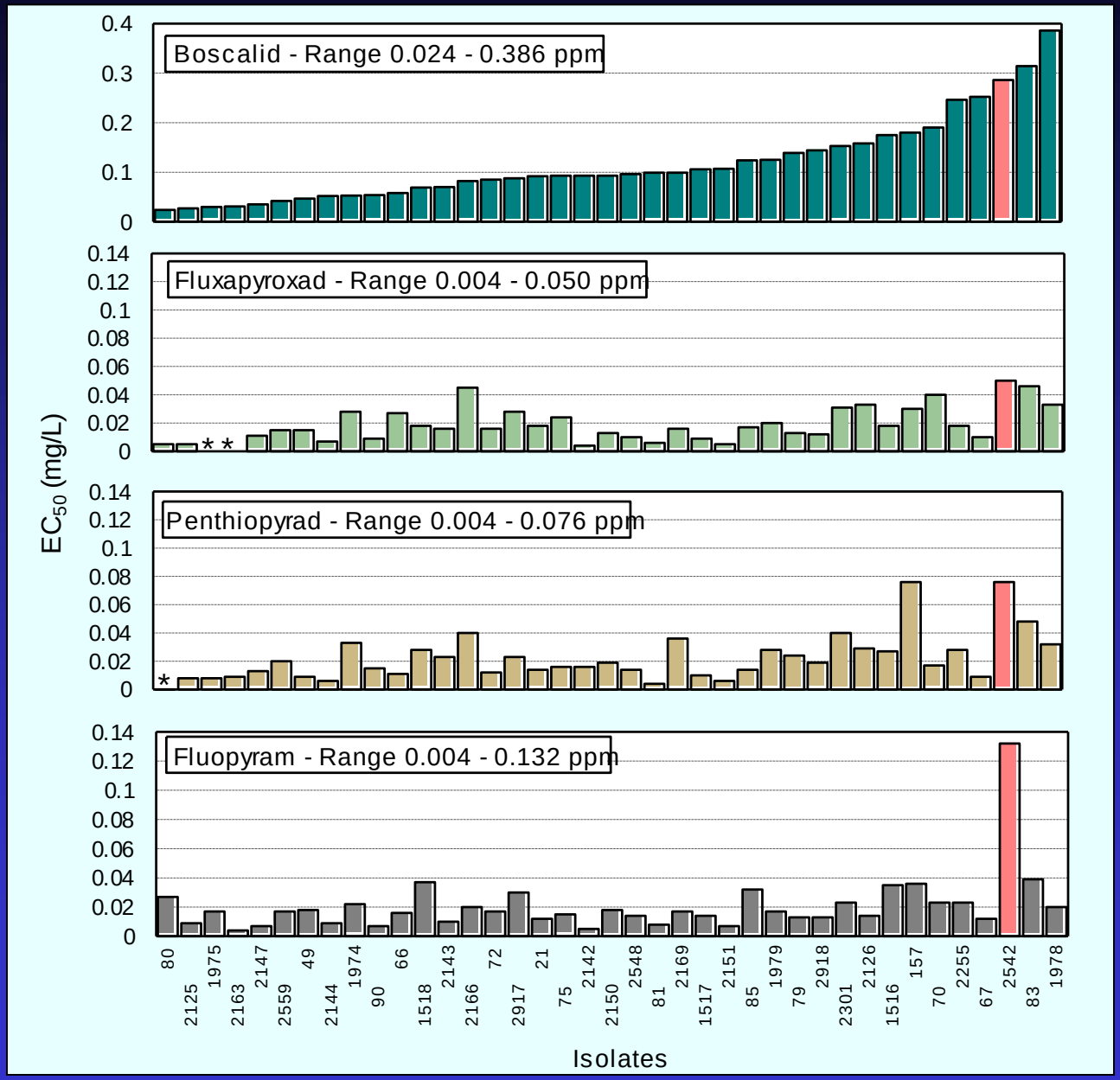
- Multiple effective fungicides are available
- Only **fungicides containing a DMI** were effective after wound-inoculation of harvested fruit (DMIS have local systemic activity, other fungicides are contact materials).
- The addition of a **spray oil** enhances the efficacy of fungicides (comparative research done previously).
- Application at **higher volumes** (130-160 gal) is beneficial for protecting fruit inside clusters from brown rot (comparative research done previously).
- **New pre-mixtures** are highly effective and can be used as a resistance management strategy.
- **Polyoxin-D** (Ph-D or CX10440=OSO) highly effective on exposed, non-wound-inoculated fruit – higher rates need to be evaluated.

In vitro sensitivities of isolates of *Monilinia fructicola* from California to four SDHI fungicides

The newer SDHIs fluxapyroxad, penthiopyrad (both FG 7F), and fluoropyram (FG 7B) are generally more active than boscalid (FG 7G).

One isolate with lower sensitivity to all subgroups was identified.

Isolates were collected from stone fruit crops between 1992 and 2005



Fungicide resistance in pathogens of prune

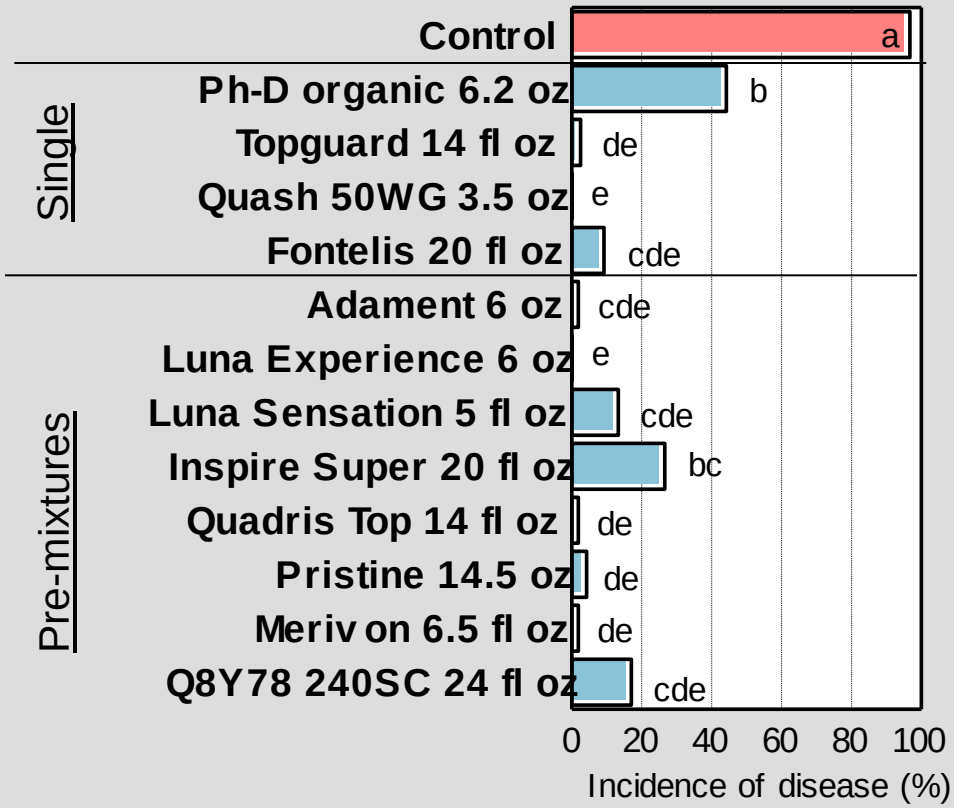
- **APs:**
  - Resistance in both *Monilinia* spp. from prune reported with control failures in CA in 2007 and 2009
  - Resistance in *M. laxa* from one almond orchard with control failure in CA in 2012

- **DMIs:**
  - Resistance developed in other stone fruit growing areas of the country.
  - Surveys indicate that DMI fungicides still highly effective in CA

- **SDHIs**:
  - One isolate with reduced sensitivity to the three subgroups was identified in baseline studies.
  - Resistance potential is high for this class.

Late-season fungicide treatments for management of prune rust caused by *Tranzschelia discolor* - Yuba Co. 2012

- Highly effective treatments are available.
- Polyoxin-D should be evaluated at higher rates.



Applications on 8-16 and 9-3-12. Evaluation on 11-15-12.

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Efficacy tables will be updated again for 2013

PRUNE (OR DRIED PLUM)—FUNGICIDE EFFICACY

http://www.ipm.ucdavis.edu

Fungicide	Resistance risk (FRAC#)[1]	Brown rot		Russet scab	Rust
		Blossom	Fruit[2]		
Adament[2,7]	medium (3/11)	++++	++++	----	+++
Bumper/Tilt[2]	high (3)	++++	++++	----	+++
Distinguish**	medium (9/11)	++++	++	----	++
Elite** /Tebuzol[2,7]	high (3)	++++	++++	----	+++
Indar[2]	high (3)	++++	++++	----	+++
Luna Experience*[2]	medium (3/11	++++	++++	----	++++
Inspire Super	high (3/9)	++++	++++	----	+++
Luna Sensation*[2]	medium (7/11)[4]	++++	++++	ND	ND
Pristine[2]	medium (7/11)[4]	++++	++++	ND	ND
Quash[2]	high (3)	++++	++++	----	+++
Quadris Top[2]	medium (3/11)[4]	++++	++++	ND	++++
Quilt Xcel[2]	medium (3/11)[4]	++++	++++	ND	++++
Rovral + oil[2,5]	low (2)	++++	NR	----	NR
Scala[6]	high (9)[3,4]	++++	+++[6]	----	ND
Topsin-M /T-Methyl/ Incognito + oil[2,4]	high (1)[4]	++++	++++	----	----
Vangard[6]	high (9)[3,4]	++++	+++[6]	----	ND
Fontelis*	high (3)	++++	+++	----	ND
Elevate[2,7]	high (17)[4]	+++	+++	ND	----
Rovral /Iprodione /Nevado[2]	low (2)	+++	NR	----	NR
Topsin-M/T-Methyl /Incognito[2,3]	high (1)[4]	+++	+/-	----	----
Abound	high (11)[4]	++	+	----	+++
Botran	medium (14)	++	++	ND	ND
Bravo/Chlorothalonil/Echo/Equus[8,9,10]	low (M5)	++	++	++	----[9]
Captan[7,8,10]	low (M4)	++	++	+++	----
Gem[7]	high (11)[4]	++	+	----	+++
Rally[2]	high (3)	++	++	----	----
Sulfur[10]	low (M2)	+/-	+/-	----	++

Questions?