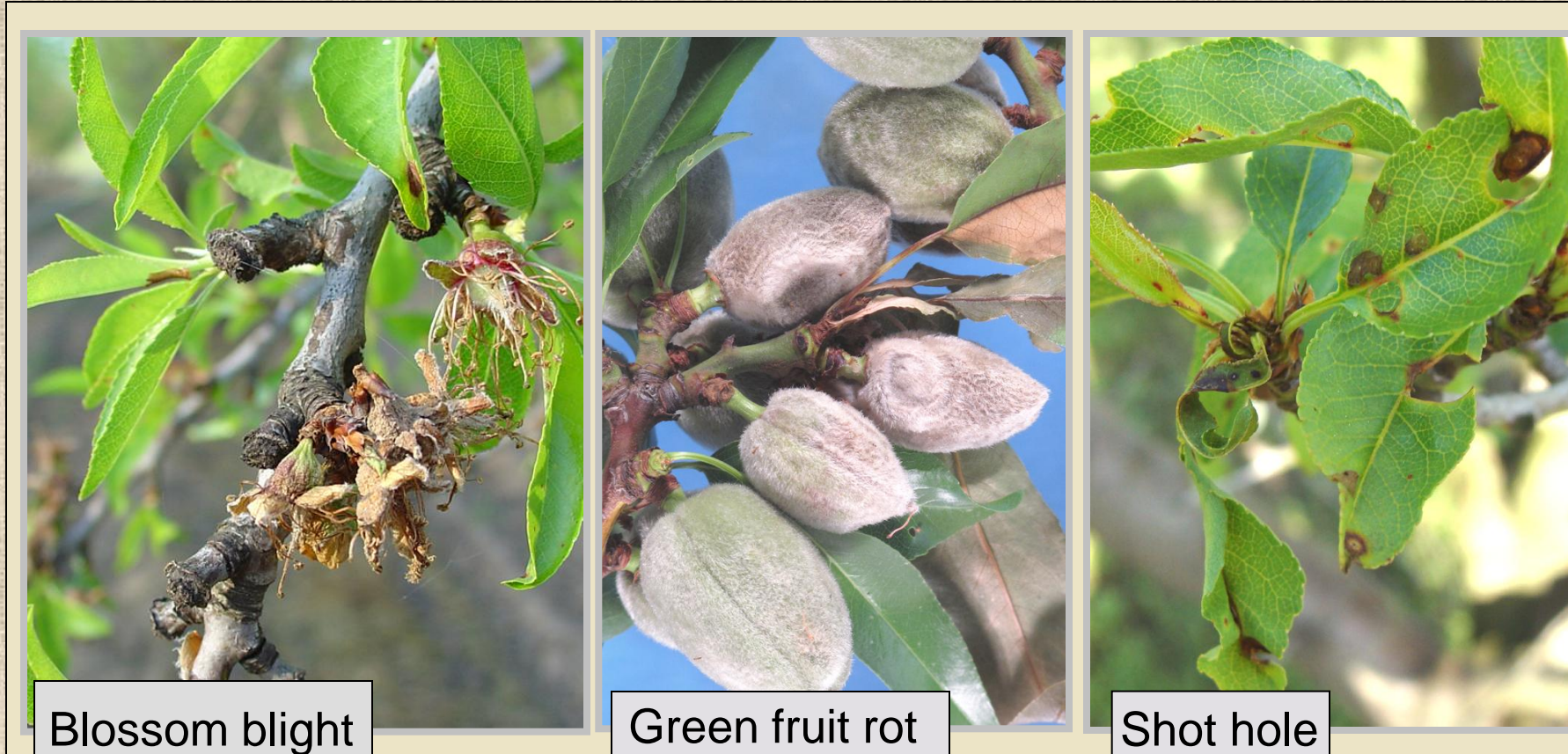


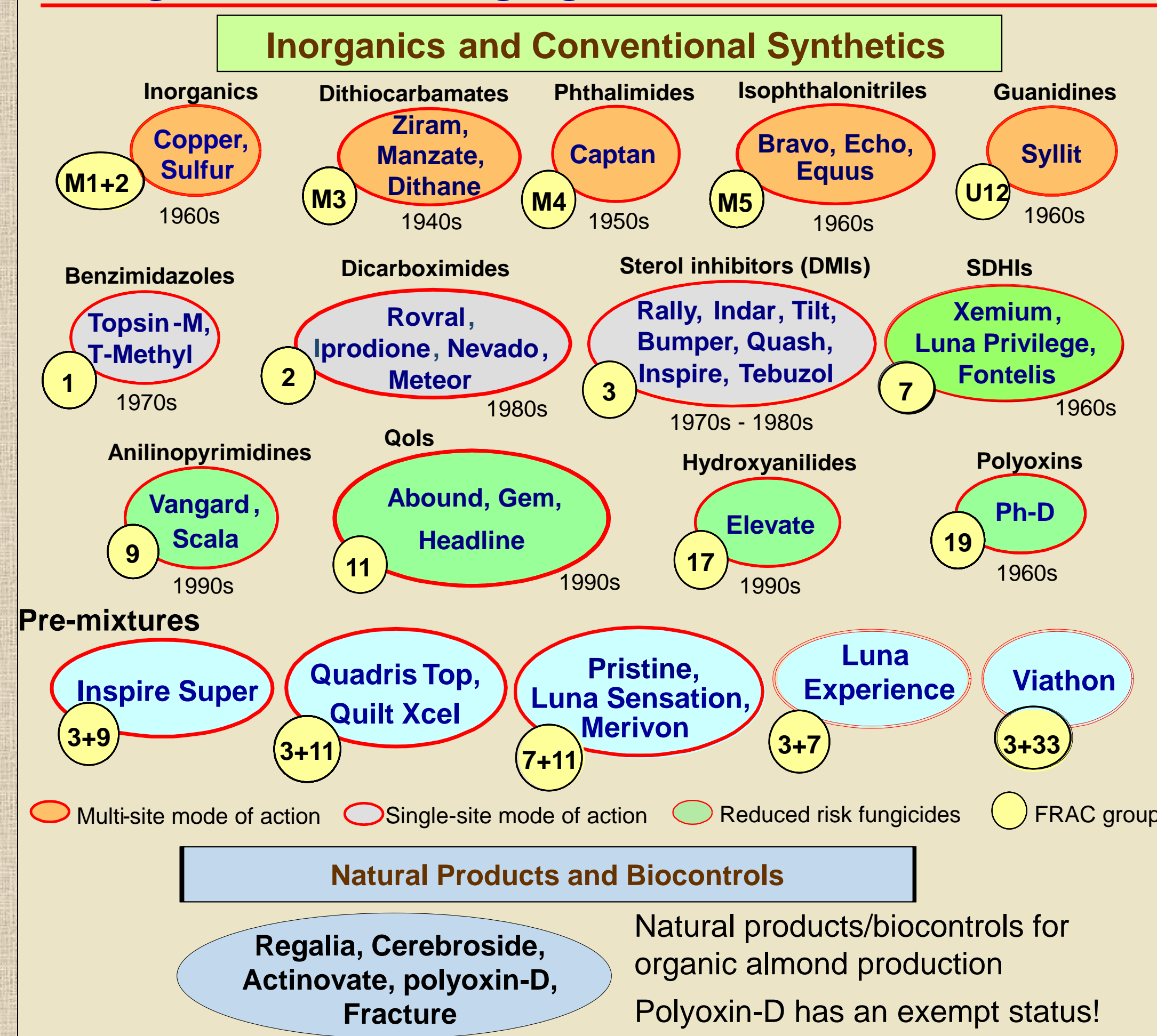
Epidemiology and Management of Brown Rot, Gray Mold, Shot Hole, Rust, and Hull Rot of Almond

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Fungicides for Managing Almond Diseases



New fungicide developments and management strategies for almond

Newly registered: Syllit, Manzate, Dithane
Pending: Viathon, Bravo – new PHI and rate, Merivon (FG 7/11).
Exempt Status: Polyoxin-D

Integrated annual 6- to 7-spray management programs for the main flower, foliar, and fruit fungal diseases (brown rot, shot hole, jacket rot, scab, Alternaria leaf spot, hull rot, rust) and pests are being developed (see Almond Scab and Alternaria Leaf Spot poster)

No new fungicide resistance outbreaks!

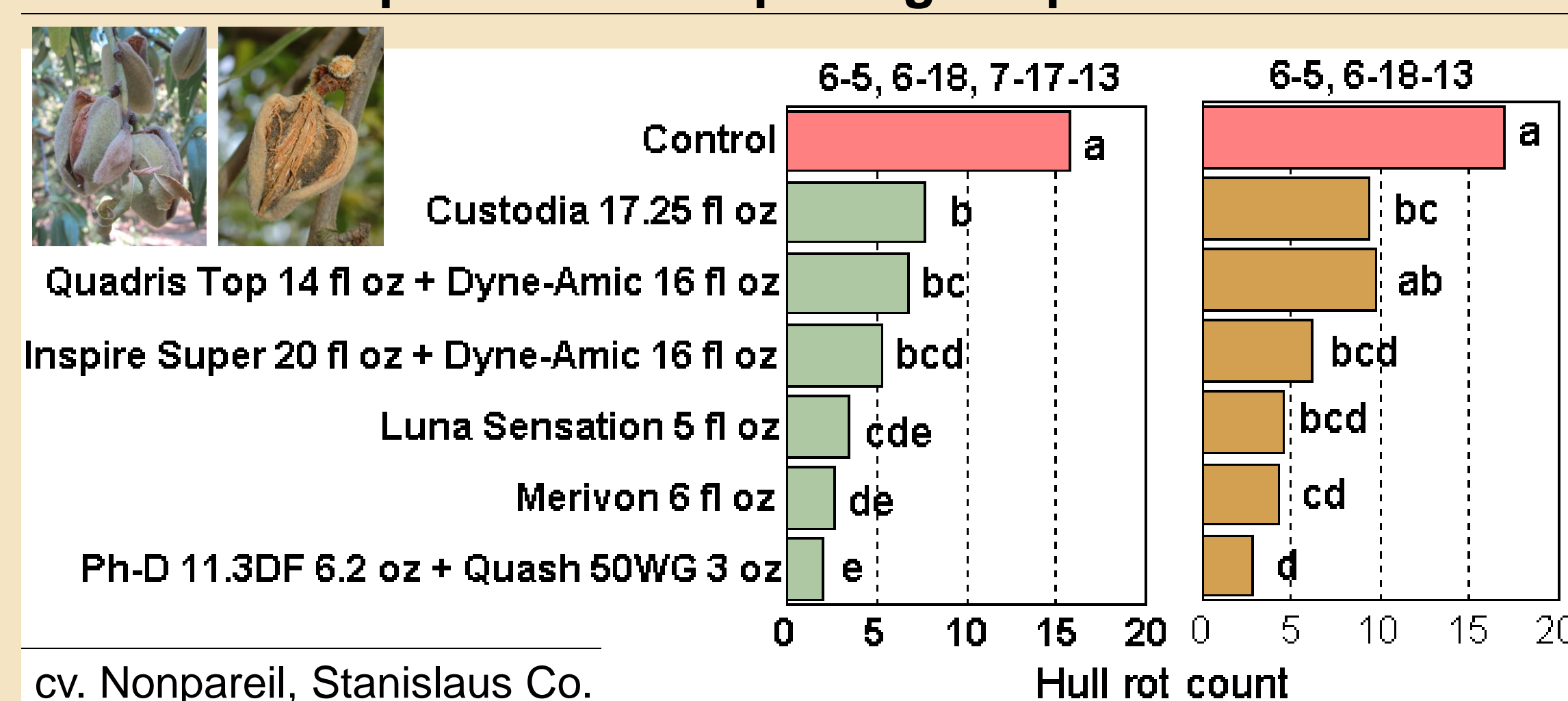
Hull Rot - Causal agents: *Rhizopus stolonifer* and *Monilinia fructicola*



1) and 2): Hull rot caused by *Rhizopus stolonifer* with infected fruit. Sporulation may cover the fruit under high humidity conditions. 2) Hull rot caused by *Monilinia fructicola* and dieback.

Inoculum of *Rhizopus stolonifer* is omnipresent (soil)
 Inoculum of *Monilinia fructicola* originates from almond and possibly other stone fruits (i.e., peaches, cherries). (Blossom blight can be caused by *M. laxa* and *M. fructicola*). The two hull rot pathogens require different management strategies.

Test plot with both pathogens present



cv. Nonpareil, Stanislaus Co.

Hull rot caused by *M. fructicola* or by both pathogens is best managed by late-spring applications.

Management of hull rot - Summary -

Fungicide treatments can be effective in reducing hull.

- For *Rhizopus* hull rot, early hull split applications when susceptibility is high should be done. (*R. stolonifer* generally infects injured - hull split or senescent tissues). Fungicides are applied most effectively with NOW applications.

- For *Monilinia* hull rot, applications should be done earlier in late spring (*M. fructicola* infects immature and mature hull tissues).

- Both pathogens are usually present at varying frequencies among locations and years.

Recommendations: 1-2 treatments should be applied in early/mid-June, and another one at early hull split.

- Effective treatments: FG 3+7, 3+9, 7+11, 3+11, 3+19.

- For the most effective **integrated management of hull rot**, fungicides should be integrated with proper water management (i.e., deficit irrigation) and nitrogen fertilization.

Brown Rot Blossom Blight, Jacket Rot, and Shot Hole

Efficacy of new and registered fungicides

Trial 1, cv. Drake, UC Davis – high disease pressure

Fungicide	Rate (A)	Application				No. of brown rot strikes/tree	Shot hole incid. (%)	Gray mold incid. (%)
		2-22	3-1	3-11	3-25			
Control	---	---	---	---	---	---	---	
Indar 2F	6 fl oz	@	@	@	@	b	ab	
Indar 2F + Breakthru	6 + 16 fl oz	@	@	@	@	b cde	a	
CHA-1323 Rhyme	7 fl oz	@	@	@	@	bc	bc	
Luna Experience	6 fl oz	@	@	@	@	cde	bc	
Luna Sensation	5 fl oz	@	@	@	@	e	bc	
Quadris Top + Dyne-Amic	14 + 16 fl oz	@	@	@	@	bcde	a	
Inspire Super + Dyne-Amic	20 + 16 fl oz	@	@	@	@	d	a	
Merivon	5 fl oz	@	@	@	@	cde	a	
Scala 6005C	18 fl oz	@	---	---	---	cde	bc	
Luna Sensation	5 fl oz	---	@	---	---	---	bcde	
Ziram 76DF	8 lb	---	---	@	@	---	cd	
Scala 6005C	18 fl oz	@	---	---	---	cde	cd	
Luna Sensation	5 fl oz	---	@	---	---	---	---	
Serenade Optimum	16 fl oz	---	@	---	---	---	---	
Indar 2F + Breakthru	6 + 16 fl oz	@	@	---	---	bcde	bc	
Dithane 75DF	6 lb	---	---	@	@	---	fg	
Dithane 75DF + Breakthru	6 lb + 16 fl oz	---	---	@	@	---	---	

Trial 2, cv. Sonora, UC Davis – New treatments - lower disease pressure

Fungicide*	Rate (A)	Application				No. of brown rot strikes/tree	Shot hole severity	Gray mold incid. (%)
		2-2	2-27	3-12	3-29			
Control	---	---	---	---	---	---	---	
Fracture + Breakthru	30 + 32 fl oz	@	@	@	@	a	a	
Rovral + Omni Oil	1 pt + 1.5% oil	@	@	@	@	bc	bc	
IKF-5411	17.1 fl oz	@	@	@	@	bc	bc	
Meteor + Omni Oil	1 pt + 1.5% oil	@	@	@	@	bc	bc	
Fontelis	20 fl oz	@	@	@	@	bc	bc	
IKF-5411	6 fl oz	@	@	@	@	c	de	
IB18220	8 fl oz	@	@	@	@	c	de	
Syllit 65WG	2 lb	@	@	@	@	c	de	
Tebucon 45DF	4 oz	@	@	@	@	c	de	
Rovral + Omni Oil	1 pt + 1.5% oil	@	@	@	@	c	de	
Fracture + NIS	30 + 32 fl oz	@	@	@	@	c	de	
Meteor	1 pt + 1.5% oil	@	@	@	@	bc	bc	
Topsin-M70WDG	1.5 lb	---	@	---	---	---	bc	
KFD 167-01	5 lb	---	@	---	---	---	bc	
Topsin-M	1.5 lb	@	@	---	---	bc	bc	
Meteor	1 pt + 1.5% oil	@	@	---	---	bc	bc	
Manzate Pro-Stick	6 lb	---	@	---	---	---	bc	

Best treatments

Brown rot

- Numerous excellent treatments available
- Classes: Dicarboximides (FG 2), DMIs (FG 3), SDHIs (FG 7), APs (FG 9).
- Pre-mixtures: FG 3+7, 3+9, 3+11, and 7+11.
- New FG 7/11 pre-mixture: Merivon (registration pending).

Gray mold

- Most effective treatments in the SDHIs (FG 7) and APs (FG 9). New: IKF-5411.
- Effective pre-mixtures: FG 3+7, 3+9, 3+11, and 7+11.

Shot hole

- Most effective: M3-M5; pre-mixtures of FG 3+9, 3+11, 7+11, mixture of U12 and FG 3.

Natural products

- Fracture (BLAD - extract of *Lupinus alba*) showed activity against blossom blight and gray mold.

Polyoxin-D – exempt status

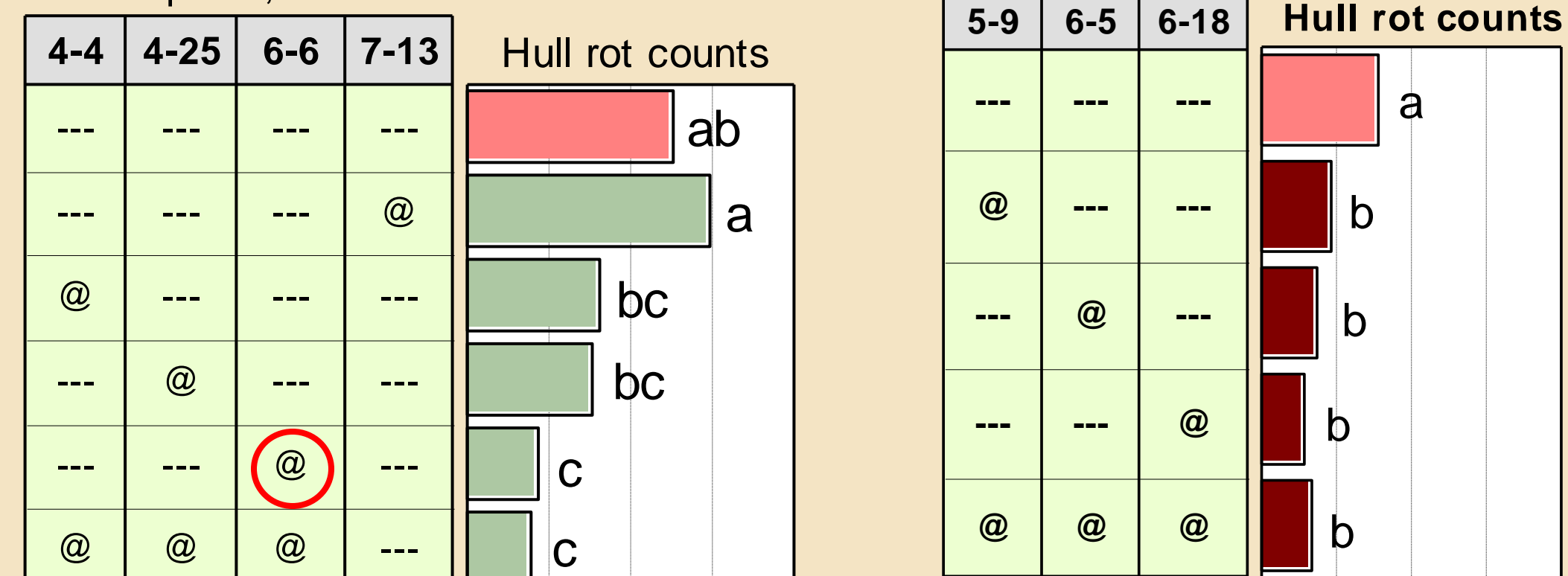
- Very good activity against gray mold, scab, Alternaria leaf spot

Considerations for timing of bloom applications:

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

Timing studies to control hull rot caused by both pathogens

cv. Nonpareil, Stanislaus Co.



2012 - 9.5 mm (0.37 in) precipitation (hull rot mostly caused by *M. fructicola*)

2013 - 3.6 mm (0.14 in) precipitation (hull rot mostly caused by *M. fructicola*, but more *R. stolonifer* than in 2012)

New disease outbreaks in 2013 – Bacterial spot of almond (*Xanthomonas arboricola* pv. *pruni*)

- Bacterial spot is common on peach in the eastern US (high moisture conditions)
- Found in spring 2013 on almond, cherry, and possibly other stone fruit crops - Colusa, San Joaquin, Stanislaus, Merced and Madera Co. – Identification with specific PCR primers
- Fritz is one of most susceptible varieties, but isolations have also been made from Nonpareil, Butte, Carmel, and Price.
- Little is known about the disease on almond.
- Management strategies are being explored: dormant and springtime applications with bactericides.



Symptoms of bacterial spot on almond fruit and leaves.

CIMIS Temperature and Precipitation Data for Colusa, Manteca, Modesto, and Merced March 1 to June 30, 2013.

