

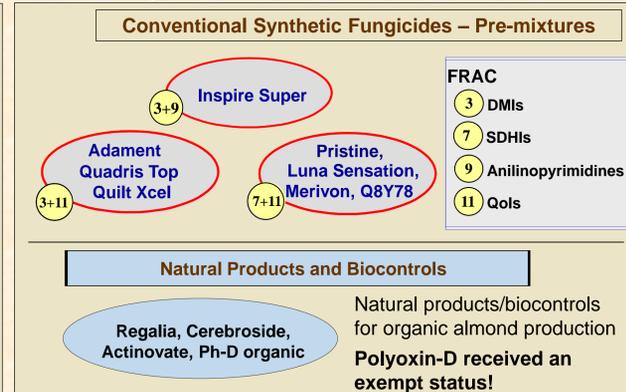
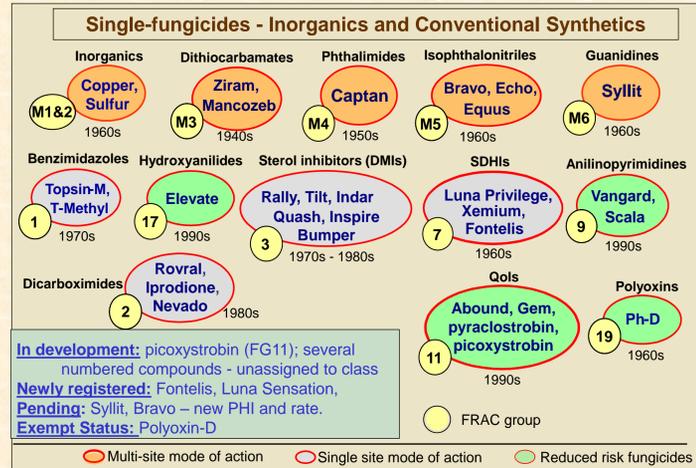


Epidemiology and Management of Brown Rot, Gray Mold, Shot Hole, Rust, and Hull Rot of Almond

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Classes of fungicides and natural products registered and in development for use on almond in California



Brown Rot Blossom Blight, Jacket Rot, and Shot Hole

Efficacy of new fungicides

Trial 1

Fungicide	Rate (A)	2-17	2-24	3-6	3-19	Brown rot	Shot hole	Gray mold
Control	---	---	---	---	---	a	a	a
Topguard	14 fl oz	@	@	@	@	bc	b	bc
Fontelis + Surf.	20 oz	@	@	@	@	c	bc	b
YT669	12 fl oz	@	@	@	@	c	d	a
Q8Y78 240SC	18 fl oz	@	@	@	@	c	d	a
LBG-61	32 fl oz	@	@	-	-	c	c	c
Catamaran	64 fl oz	-	-	@	@	-	-	-
Meteor 4L	16 fl oz	@	@	-	-	b	c	bc
Ziram 76 DF	8 lb	-	-	@	@	-	-	-
Rovral 4L	16 fl oz	@	@	-	-	b	d	c
Ziram	8 lb	-	-	@	@	-	-	-
Quash	3.5 oz	@	-	-	-	bc	d	bc
Vanguard	5 oz	-	@	-	-	-	-	-
Syllit	1.5 lb	-	-	@	@	-	-	-

cv. Drake, UC Davis

Trial 2

Fungicide	Rate (A)	2-23	2-28	3-8	3-23	Brown rot	Shot hole	Gray mold
Control	---	---	---	---	---	a	a	a
Indar 2F+NIS	6 fl oz	@	@	@	@	b	ab	a
Quash 50WG	3.5 oz	@	@	@	@	b	bc	c
Luna Sensation	5 fl oz	@	@	@	@	b	bc	bc
Inspire Super*	20 fl oz	@	@	@	@	b	bc	a
Quadris Top	14 fl oz	@	@	@	@	b	bc	a
Pristine 38WG	14 oz	@	@	@	@	b	c	bc
Merivon	4 fl oz	@	@	@	@	b	c	bc
Indar 2F*	6 fl oz	@	---	---	---	b	bc	Not done
Indar 2F + Dithane*	6 fl oz + 6 lb	---	@	@	@	-	-	-

* Breakthru was added.
cv. Sonora, UC Davis



Timing of brown rot treatments

Treatment	Rate/A	23-Feb PB	28-Feb FB	Brown rot
Control	---	---	---	a
Quadris Top	14 fl oz	@	---	ab
Quadris Top	14 fl oz	---	@	bc
Quadris Top	14 fl oz	@	@	c
Control	---	---	---	a
Luna Sensation	5 fl oz	@	---	b
Luna Sensation	5 fl oz	---	@	b
Luna Sensation	5 fl oz	@	@	c

cv. Butte, UC Davis

- Pink bud applications alone were effective for Luna Sensation, but not for Quadris Top.
- Luna Sensation (and others) have some locally systemic activity and can penetrate into closed blossoms.
- Fungicides with less systemic activity (e.g., Quadris Top) perform best if applied at pink bud and full bloom.

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



- Brown rot:** Numerous excellent treatments available
 • Classes: DMIs (FG 3), SDHIs (FG 7), APs (FG 9)
 • Pre-mixtures of FG 3+11, 7+11, and 3+9
 • New FG 7/11 pre-mixtures: Luna Sensation, Merivon
- Gray mold:** Most effective treatments in the SDHIs (FG 7) and APs (FG 9)
 • Effective pre-mixtures: FG 3+11, 7+11, and 3+9
- Shot hole:** Most effective: pre-mixtures of FG 7+11, 3+11, and 3+9, rotations of FG 2 and M5 also effective

Hull Rot

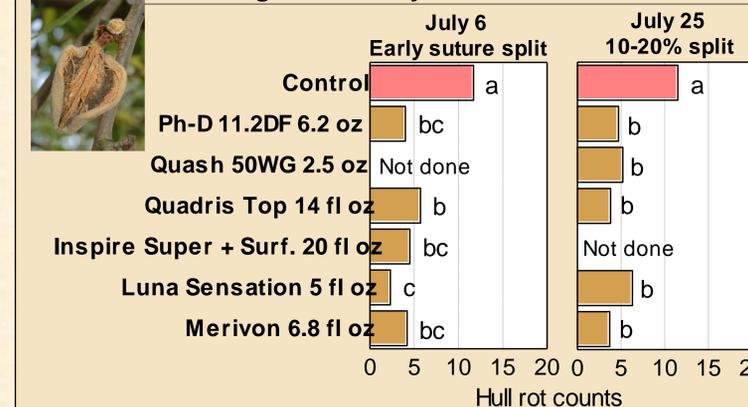
Causal agents: *Rhizopus stolonifer* and *Monilinia fructicola*. The two pathogens require different management strategies



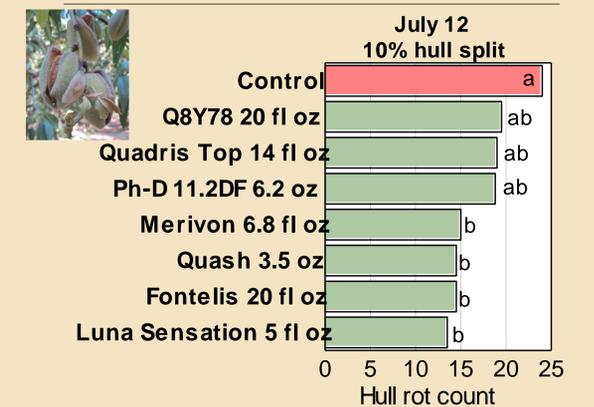
1) and 2): Hull rot caused by *Rhizopus stolonifer* with infected fruit. Sporulation may cover the fruit under high humidity conditions. 2) Hull rot caused by *Monilinia fructicola* and dieback.

Inoculum of *Rhizopus stolonifer* is omnipresent (soil)
 Inoculum of *Monilinia fructicola* originates from other stone fruits (peaches, cherries)? (Blossom blight is mainly caused by *M. laxa*).

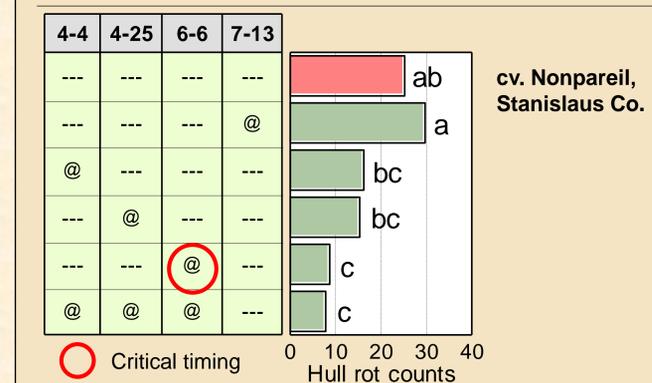
Test plot on cv. Nonpareil, Colusa Co. - Pathogen is mainly *R. stolonifer*



Test plot on cv. Nonpareil, Fresno Co. - Pathogen is mainly *M. fructicola*



Timing study using Luna Sensation to control hull rot caused by *M. fructicola* and *R. stolonifer*



- 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 senescent tissues). Fungicides are applied most effectively with NOW applications.
 - For *Monilinia* hull rot, applications should be done earlier (late spring). This needs further evaluation. (*M. fructicola* infects younger tissues)
 - For the most effective integrated management of hull rot, hull split should be induced simultaneously with proper water management (i.e., deficit irrigation).

Update on fungicide resistance

- **QoIs (FRAC 11):** Resistance continues to be widespread in populations of the scab and Alternaria pathogen populations (see Alternaria poster)
- **SDHIs (FRAC 7):** Resistance to one sub-group in *Alternaria* spp. at some locations. Resistance potential high for other sub-groups.
- **APs (FRAC 9):** Resistance found in *Monilinia laxa* at one location in 2012 – first report on almond (reported in the last few years on prune for both species of *Monilinia*).

New disease outbreaks in 2012

