

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

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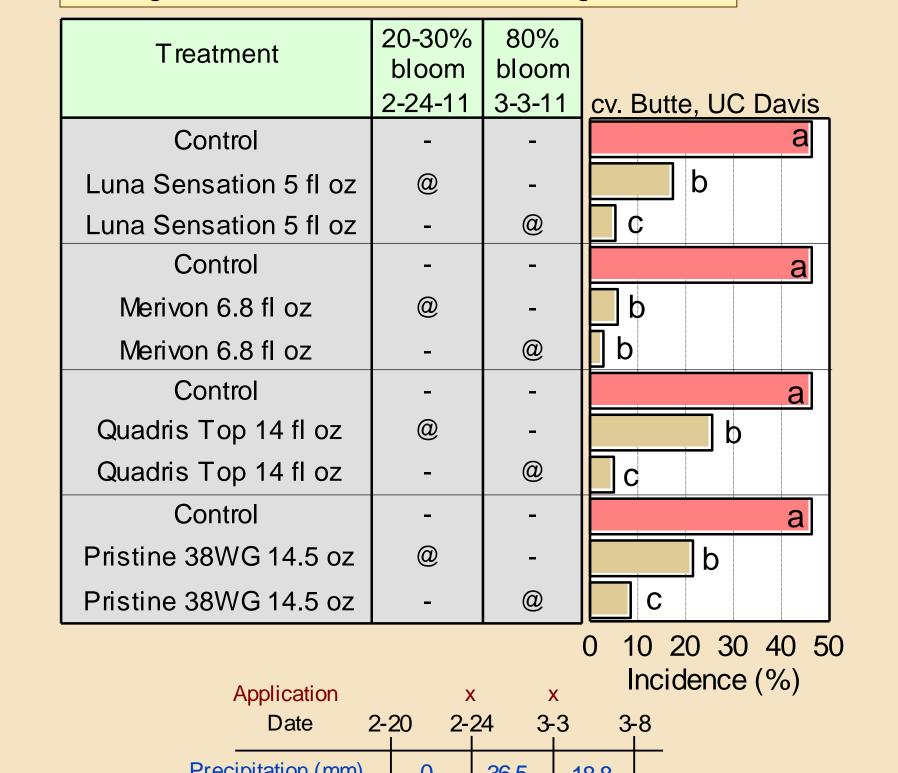
Classes of fungicides and natural products registered and in development for use on almond in California Single-fungicides - Inorganics and Conventional Synthetics Conventional Synthetic Fungicides – Pre-mixtures Ziram, Bravo, Echo, (7) SDHIs Sterol inhibitors (DMIs) Anilinopyrimidines 9 Anilinopyrimidines Quadris Top **Luna Sensation** Topsin -M Luna Privilege, Rally, Laredo, Orbit Quilt Xcel Merivon, Q8Y7 Indar, Quash, Inspire Dicarboximides **Natural Products and Biocontrols** Iprodione, Polyoxins Natural products and a biocontrol that pyraclostrobin, Cerebrocide New in 2011: Fontelis, picoxystrobin already are or potentially will be OMRI Ph-D organic, Unassigned to class: S2200, fenpyrazamine (V-10135), approved were evaluated for organic **IKF-5411** farming of almonds.

Brown Rot Blossom Blight, Jacket Rot, and Shot Hole

Multi-site mode of action Single-site mode of action

		2-15	2-23	3-2	3-9	cv. Drake,
	Fungicide	PB	FB	PF	PF	UC Davis
	Control					а
Single treatments	Syllit 65WP 20 oz	@	@	@	@	b
	Fontelis 1.67SC 20 fl oz + Breakthru	@	@	@	@	defgh
	YT669 2.08SC (picoxystrobin) 8 fl oz	@	@	@	@	gh
Pre- mixtures	Adament 50WG 6 oz	@	@	@	@	efgh
	Luna Sensation 5 fl oz	@	@	@	@	defg
	Luna Experience 6 fl oz	@	@	@	@	defgh
	Merivon (BAS703) 6.8 fl oz	@	@	@	@	h
	Pristine 38WG 14 oz	@	@	@	@	fgh
	Inspire Super 20 fl oz	@	@	@	@	defg
	Quadris Top 14 fl oz	@	@	@	@	defg
	Q8Y78 240SC 24 fl oz	@	@	@	@	h
Rotations	Scala 600SC 9 fl oz	@	-	-	-	cd
	Rovral 4F 16 fl oz	-	@	-	-	
	Luna Experience 6 fl oz	-	-	@	@	
	Scala 600SC 9 fl oz	@	-	-	-	def
	Luna Sensation 5 fl oz	-	@	-	-	
	Quash 50WDG oz	-	-	@	@	

Timing of treatments for blossom blight control





Brown rot blossom blight

- Numerous excellent treatments available
- Classes: DMIs (3), SDHIs (7), APs (9)
- Pre-mixtures of groups 3+11, 7+11, and 3+9 New pre-mixtures: Luna Sensation, Merivon, Inspire Super

0 30 60 90 120 150

No. strikes/tree

- Gray mold: Most effective treatments in the SDHIs (7) and APs (9)
- - Effective pre-mixtures: 3+11, 7+11, and 3+9 • Most effective: pre-mixtures of 7+11 and 3+11, rotations of 2
 - and M5 also effective
 - Luna Sensation, Merivon, Inspire Super, Quadris Top

and June23 (as

Alternaria leaf

Severity rating

program).

from 0 to 4.

spot management

- Timing for blossom blight control: A single application at full bloom was generally more effective than a single application at early bloom even when high rainfall occurred before full bloom.
- In another trial on cv. Drake (very high disease pressure), applications at pink bud plus full bloom were more effective than a single treatment at full bloom.

Almond Rust Control CX10440 3.75 fl oz cv. Fritz, Kern Pathogen: IKF-5411 400SC 17 fl oz bcd Co. Tranzschelia discolor Ph-D 11.2DF org. 6.2 oz Quash 50WG 3 oz Applications on

May13, June 21, Inspire Super SC 20 fl oz Luna Experience 6 oz part of an EBDC 96 oz gh BAS700 (Xemium) 4.5 fl oz Luna Sensation 5 fl oz Quadris Top 14 fl oz Pristine 38WG 14 oz BAS703 (Merivon) 6.8 oz

- Materials that included a Qol and/or a SDHI compound (e.g., Luna Experience, Luna Sensation, Quadris Top, Pristine, Merivon) were among the most effective fungicides.
 - The DMIs (Quash, Inspire Super), Ph-D, as well as numbered compounds also significantly reduced the incidence of disease.
 - The EBDC material was also highly effective, but this fungicide class is currently not registered for late-season applications.
 - The first fungicide application should be done at the very first occurrence of disease symptoms (1% of leaf sample) in a spring (April-June) monitoring program if the disease occurred in the previous season.

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

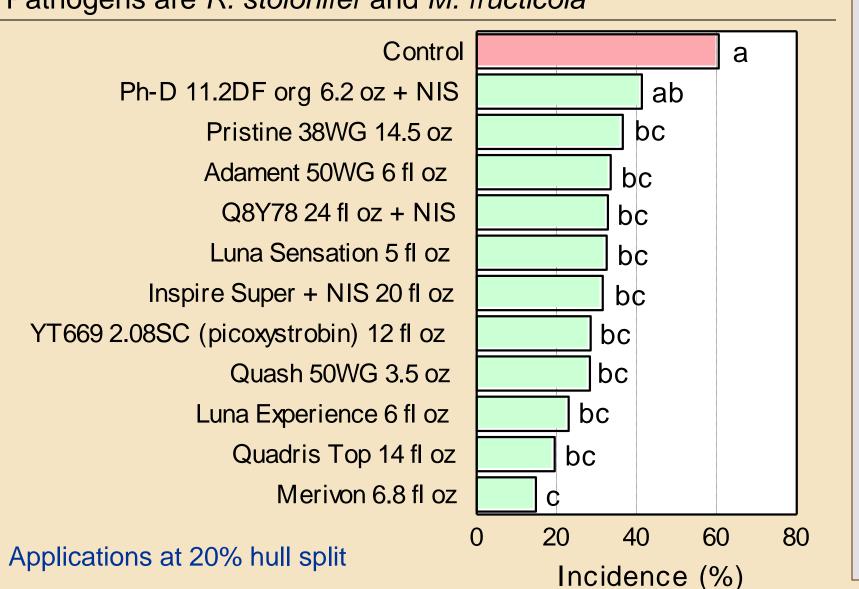






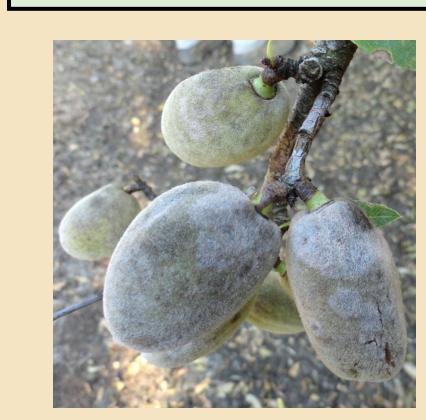
1) and 2): Hull rot caused by Rhizopus stolonifer with infected fruit and associated dieback after the infection progressed in the branch. 2) Hull rot caused by Monilinia fructicola and dieback.

Test plot on cv. Nonpareil, Colusa Co. -Pathogens are R. stolonifer and M. fructicola



- Fungicide treatments *are effective* in reducing hull rot caused by *R*. stolonifer, but <u>not</u> by M. fructicola.
 - Rhizopus hull rot: no differences in application timings (early split or 20% split) possibly because of the long hull split duration within an orchard. Applications during the stages when susceptibility is high and with NOW applications.
 - Monilinia hull rot: earlier application timings need to be tested (M. fructicola infects younger tissues - R. stolonifer generally infects senescent tissues).
- PGRs (e.g., ethephon) that were evaluated in 2010 possibly can be used to accelerate hull rot for late-maturing varieties.
- For the most effective integrated management of hull rot, hull split should be induced simultaneously with proper water management (i.e., deficit irrigation).

Etiology of a new 'powdery mildew-like' disease





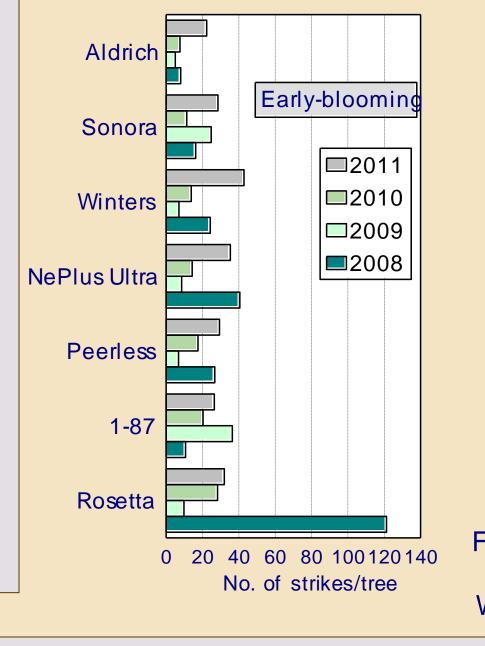


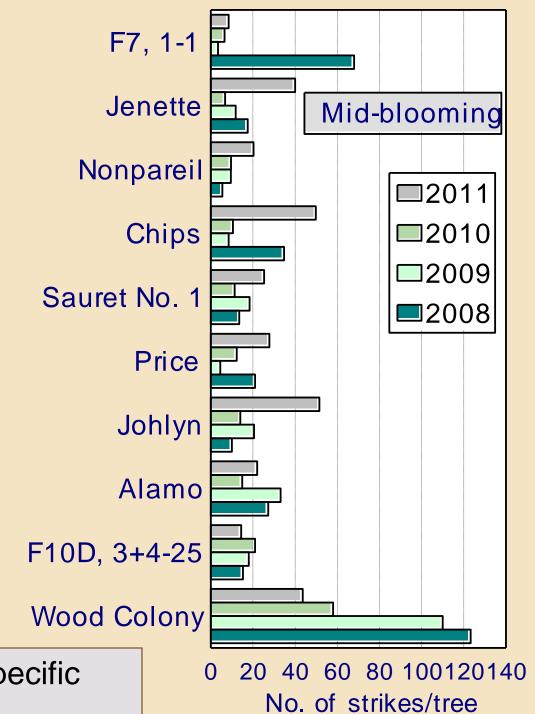


- Powdery mildew-like symptoms on almond fruit have been observed at numerous locations in recent years.
- A high incidence at one location in 2011.
- A fungus was consistently isolated and identified by morphology and DNA sequence analysis: Acremonium sp.
- Inoculations are planned for 2012 to verify pathogenicity of the fungus (Koch's postulates).
- The disease is most likely not caused by a powdery mildew fungus, but by a species of *Acremonium* that produces white (later more orangish) superficial growth similar to mildew on fruit.
- Economic importance of this pathogen is currently not known.

Natural host susceptibility of almond cultivars against BRBB, SH, and BB – UC Davis

- Brown Rot Blossom blight: In the high-rainfall spring season in 2011, some cultivars that previously were less susceptible (e.g., Chips, Johlyn, Jennette, Plateau, Livingston, 2-19E) showed a high incidence of disease, similar to highly susceptible cultivars such as Wood Colony and 25-75.
- Shot hole: Incidence was similar for most cultivars but severity was lowest for cvs. Monterey, Carmel, and Fritz.





□2011 Carmel □2009 Plateau ____ 2-19E Ferragnes F7,4-7 Merced Livingston Mission = LeGrand Padre 0 20 40 60 80 100 120

Late-blooming

No. of strikes/tree

- Bacterial blast: A range of susceptibilities was observed. In specific orchard comparisons:
- Sonora more susceptible than Butte (2 studies)
- Wood Colony, Merced, Mission, and Ruby were less susceptible.