



North San Joaquin Valley Almond Day

Sponsored by UC Cooperative Extension

Coffee, donuts & snacks provided by:

Yosemite Farm Credit

Cumulative Chilling Hours

Nov. 1, 2011 - January 30, 2012

	2011-12	2010-11	Average
Denair	1011	804	--
Modesto	1105	881	971
Patterson	826	740	731
Oakdale	532	868	885



Management of Summertime Almond Diseases

Roger Duncan
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SCAB



RUST



**ALTERNARIA
LEAF SPOT**



Widespread rust and scab problems in almond orchards throughout California in 2011

WHY?

- Major resistance or efficacy problem? Probably not.
- Weather conditions in spring and early summer were conducive for disease development
 - Historically a problem in years with late spring & summer rains
- Increase in inoculum from 2010 season

Almond Scab

Cladosporium carpophilum



Almond Scab

Cladosporium carpophilum

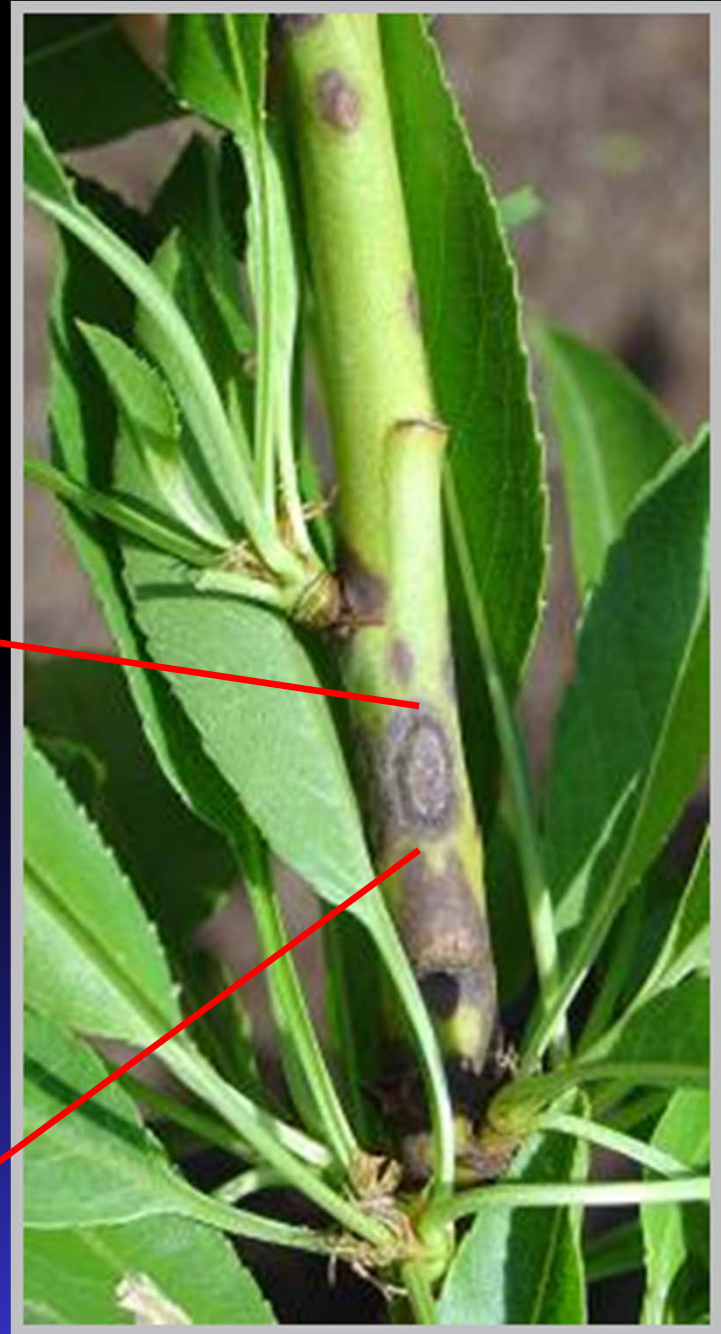
- Overwinters as mycelium in twig lesions



Almond Scab

Cladosporium carpophilum

- Resumes growth in spring, produces conidia



Almond Scab

Cladosporium carpophilum

- Germination of conidia maximized in free water (or at least 98% RH)



- It takes 40 – 70 days for a lesion to appear after infection



Control is Fungicide Based

- Dormant treatments
 - Copper, Chlorothalonil
 - Reduces / delays production of conidia
- After petal fall treatments
 - Reduces / delays onset of symptoms

Dormant Applications	Incidence of Sporulating Twig Lesions (%)		
	April 14	May 3	May 24
Untreated	68 a	85 a	95 a
Badge SC + 4 gal oil	39 bc	83 ab	--
Kocide 3000 + 4 gal oil	10 de	64 bc	--
Bravo Weatherstick	42 b	60 cd	--
Bravo Weatherstick + oil	5 e	22 d	40 b

J. Adaskaveg

Kocide 3000 applied at 5 lb
 Badge SC applied at 14 pints
 Bravo applied at 6 pints

- All treatments reduced sporulation into April
- Only Bravo + oil reduced sporulation into late May

**EFFICACY AND TIMING OF FUNGICIDES,
BACTERICIDES, AND BIOLOGICALS
FOR
DECIDUOUS TREE FRUIT, NUT,
STRAWBERRY, AND VINE CROPS
2011**



**ALMOND
APPLE AND PEAR
APRICOT
CHERRY
GRAPE
KIWIFRUIT**

**PEACH
PISTACHIO
PLUM
PRUNE
STRAWBERRY
WALNUT**

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www.plpnem.ucdavis.edu

UC Kearney Agricultural Center

www.uckac.edu/plantpath

Statewide IPM Program

www.ipm.ucdavis.edu

Fungicide treatment timings for almond

Disease	Dormant	Bloom			Spring		Summer	
		Pink Bud	Full Bloom	Petal Fall	2W	5W	May	June
Anthracnose	-	++	+++	+++	+++	+++	+++	++
Brown Rot	-	++	+++	+	-	-	-	-
Green Fruit Rot	-	-	+++	-	-	-	-	-
Leaf Blight	-	-	+++	++	+	-	-	-
Scab	+	-	-	+	+++	+++	++	+/-
Shot Hole	+	+	++	+++	+++	++	-	-
Rust	-	-	-	-	-	+++	+++	+
Alternaria	-	-	-	-	-	++	+++	+
Hull Rot	-	-	-	-	-	-	-	July

+++ = most effective, ++ = moderately effective, + = least effective, and - = ineffective.

Fungicide Rating for Scab Control

Excellent & Consistent ****	Good & Reliable ***
Syllit (M7)	Adament (3/11)
Gem (11)	Inspire XT (3/3)
Abound (11)	Inspire Super (3/9)
Quilt Excell (3/11)	Quash (3)
Quadris top (3/11)	Chlorothalonil (M5)
Pristine (7/11)	CaptEvate (M4/17)
Luna Sensation (7/11)	PhD (19)
	Copper + oil (M1)

*Resistance against QoI fungicides (FRAC Group 11) is widespread in populations of *C. carpophilum*.

“Official” UC Rating of Alternative Fungicides for Scab

Most effective timing is two - five weeks after petal fall

++++ = excellent

+++ = very good

++ = good

+ = fair

+/- = minimal; often ineffective

---- = ineffective

Copper	++
Cinnacure	----
JMS Stylet Oil	----
Kaligreen	----
Messenger	----
Oxidate	----
Prev-am	----
Quiponin	ND
Serenade	----
Sonata	----
Sulfur	++
Trilogy	----
Sporan	----
Saf-T-Side	----
Stylet Oil	
Valero	----

Varietal Susceptibility to Scab

- Most Susceptible: Carmel, Merced, NePlus Ultra, Peerless, Price, Ruby, Sonora, Winters.
- Less Susceptible: Butte, Fritz, Mission, Monterey, Wood Colony, Thompson.
- Least Susceptible: Nonpareil

Rust

Tranzschelia discolor





Tranzschelia discolor
Affects most stone fruit



Phragmidium tuberculatum



Puccinia triticinia

- Overwintering inoculum is from infected leaves remaining from previous season
- Spores viable on attached leaves for ~ 5 months
 - Viable ~ 1 month on detached leaves
- Spring infections due to late spring / summer rains
- Requires free moisture for 12 hours
- Exacerbated by high nitrogen fertilization





Fungicide treatment timings for almond

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Anthracnose	-	++	+++	+++	+++	+++	+++	++
Brown Rot	-	++	+++	+	-	-	-	-
Green Fruit Rot	-	-	+++	-	-	-	-	-
Leaf Blight	-	-	+++	++	+	-	-	-
Scab	+	-	-	+	+++	+++	++	+/-
Shot Hole	+	+	++	+++	+++	++	-	-
Rust	-	-	-	-	-	+++	+++	+
Alternaria	-	-	-	-	-	++	+++	+
Hull Rot	-	-	-	-	-	-	-	July

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Control of Almond Rust



- Begin with fall defoliation
 - Zinc sulfate + urea
- Fungicide application 5 weeks after petal fall
- If weather similar to 2010 & 2011, apply second (different) fungicide ~ 1 month later
- **Goal: Use each fungicide class only once per season or rotate between pre-mixtures containing different classes.**

Fungicide Rating for Rust Control

Excellent & Consistent ****	Good & Reliable ***
Quash (3)	Adament (3/11)
Quadris top (3/11)	Bumper/Tilt (3)
Quilt Xcel (3/11)	Inspire Super (3/9)
Abound (11)	Luna Sensation (7/11)
Gem (11)	Pristine (7/11)
Chlorothalonil (M5)	Maneb (M3)
	PhD (19)

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Copper	----
Cinnacure	----
JMS Stylet Oil	----
Kaligreen	----
Messenger	----
Oxidate	ND
Prev-am	ND
Quiponin	ND
Serenade	ND
Sonata	ND
Sulfur	+++
Trilogy	+/-
Sporan	+/-
Saf-T-Side	----
Stylet Oil	
Valero	ND

Alternaria leaf spot caused by the *A. alternata* complex*



* *Alternaria alternata*,
A. arborescens,
A. tenuissima





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Brown Rot	-	++	+++	+	-	-	-	-
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Leaf Blight	-	-	+++	++	+	-	-	-
Scab	+	-	-	+	+++	+++	++	+/-
Shot Hole	+	+	++	+++	+++	++	-	-
Rust	-	-	-	-	-	+++	+++	+
Alternaria	-	-	-	-	-	++	+++	+
Hull Rot	-	-	-	-	-	-	-	July

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Fungicide Rating for Alternaria Control

Excellent & Consistent ****	Good & Reliable ***
Quash (3)	Inspire XT (3/3)
Ph-D (19)	Inspire Super (3/9)
	Luna Sensation (7/11)
	Pristine (7/11)
	Quadris Top (3/11)
	Quilt Xcel (3/11)
	Rovral - oil (2)
	Abound (11)*
	Gem (11)*

***Abound & Gem not as effective at high temp & RH**

Hull Rot



Rhizopus

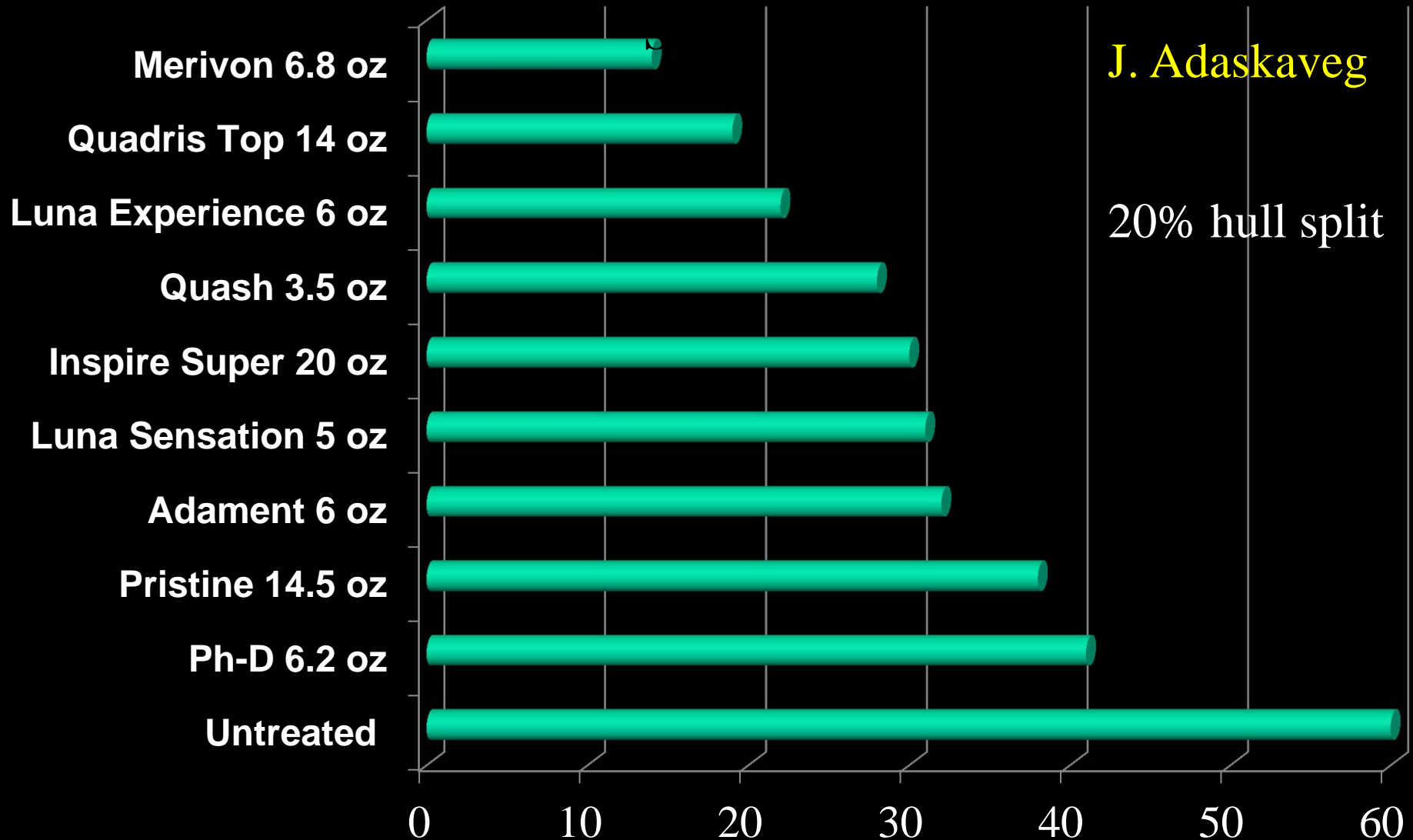


Monilinia

Hull rot is best managed with cultural controls

- Regulated deficit irrigation no later than first blank split
- Avoid excessive nitrogen
- Pruning / wider density planting?
Probably not.

Effect of Hull Split Sprays on Hull Rot Caused by *Rhizopus stolonifer*



So far, fungicide sprays have
NOT proven effective against hull
rot caused by *Monilinia fructicola*

Cadillac Program for Almond Summer Disease Control

- Fall defoliation to reduce rust overwintering inoculum
 - 20 lbs Zinc sulfate + 20 lbs urea
- Delayed dormant spray with chlorothalonil + oil
- Rust / scab spray 5 weeks after petal fall
- If weather similar to 2010 & 2011, apply second (different) fungicide ~ 1 month later
 - Ph-D, Quash, - something that gets Alternaria
- **Goal: Use each fungicide class only once per season or rotate between pre-mixtures containing different classes.**

Thank you for
your attention