

Epidemiology and Control of Almond Scab and Alternaria Leaf Spot

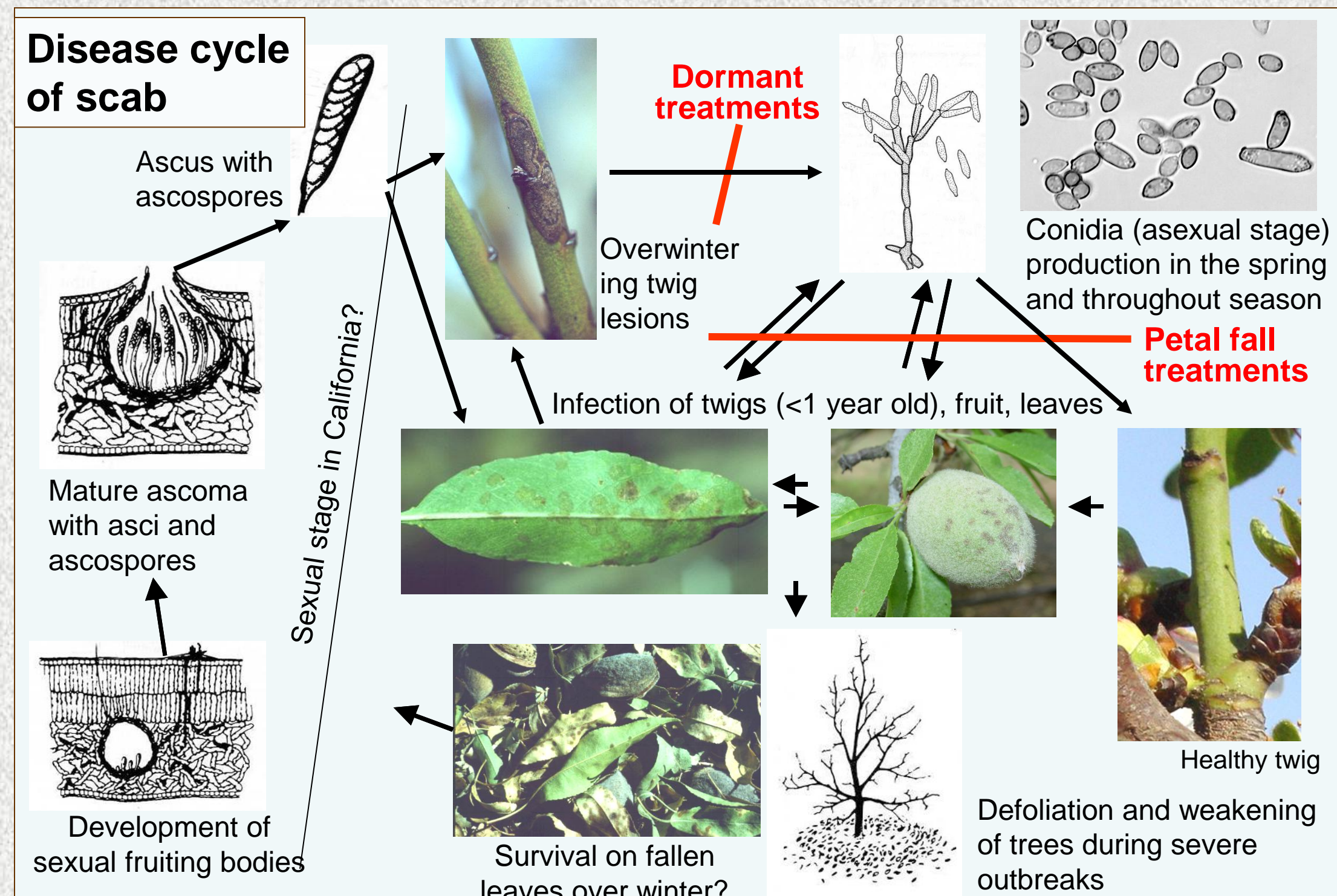
J.E. Adaskaveg, University of California, Riverside

D. Thompson, H. Förster, and D. Cary (UC Riverside), J. Connell (UCCE Butte Co.), R. Buchner (UCCE Tehama Co.), B. Krueger (UCCE, Glenn Co.), and Craig Kallsen (UCCE, Kern Co.)

Almond Scab (*Fusicladium carpophilum*)



Leaf and fruit symptoms.



Alternaria Leaf Spot of almond (*Alternaria* spp.)



Early tree defoliation and new leaf development eventually weakens the tree.

Scab, Alternaria leaf spot, and hull rot have increased with changes in almond production

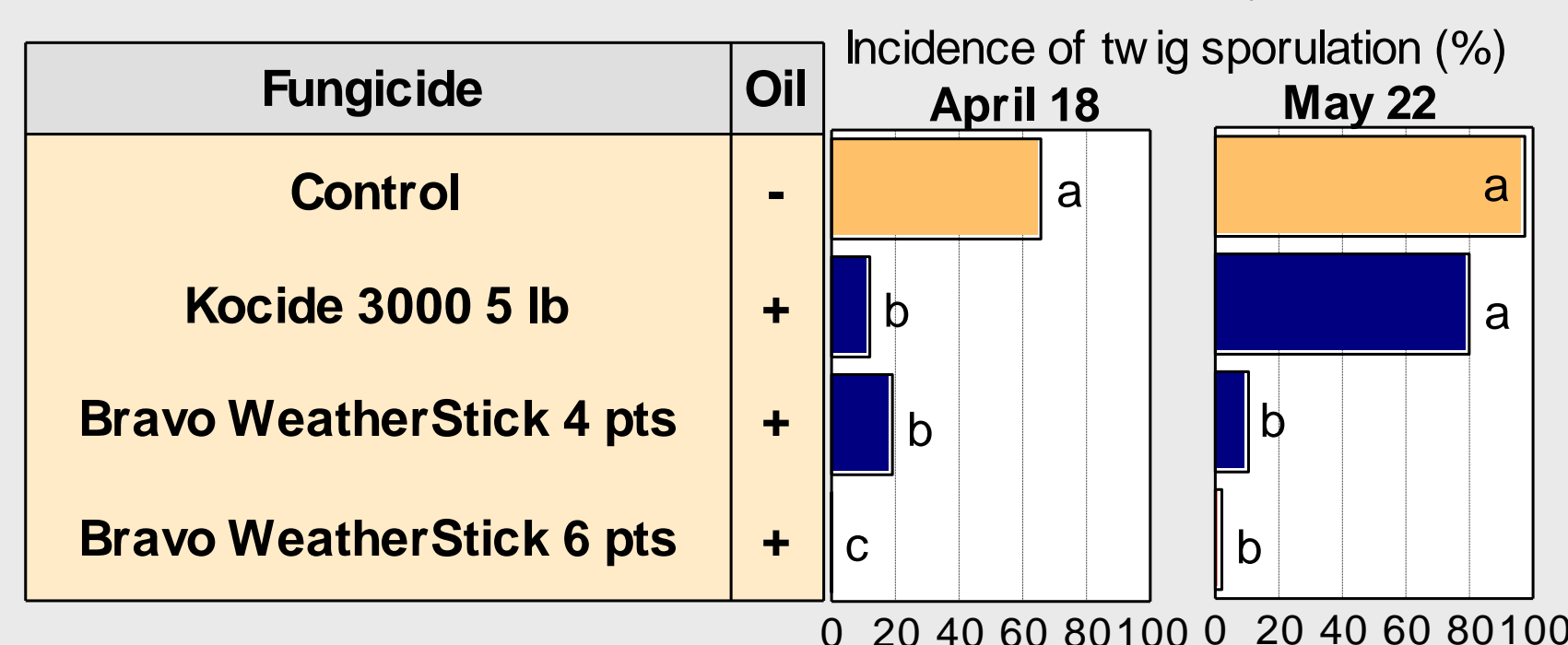
Changing practice	Effects
High-density planting	Less air circulation, increase in shading and orchard humidity
Higher nitrogen fertilization	Rapid growth, plant tissues more susceptible
Increase in irrigation duration	Increase in orchard humidity
Planting in areas less suitable for almond production	Environments may be more favorable for disease. Increased stress on trees.

Conditions that weaken trees and favor plant pathogens

Field trials on scab management in 2013

1. Dormant applications with chlorothalonil to reduce inoculum in the spring

cv. Carmel, Butte Co.
Application: Jan 2013, Evaluation: April 18 and May 22.



- Chlorothalonil-oil was more effective than copper-oil and sporulation of twig lesions was delayed into late spring.
- The 6-pt rate of Bravo WeatherStick was more effective than the 4-pt rate.
- Bravo by itself is also effective, but effectiveness is much increased in combination with oil.
- In 2011/2012, Bravo-oil applied in mid-December was similarly effective as when applied in mid-January.

- At locations with high disease levels, a dormant application should be done
- Bravo WeatherStick received a Section 2(ee) registration for dormant application between Dec. 1 and Jan. 10 (before bud swell)
- Full registration is planned through IR-4 to change PHI to 60 days and rate to 6 pts/A (pending for 2015).
- Additional benefit: Align scab treatments with Alternaria treatments

Timing of scab and Alternaria treatments without and with the use of a scab dormant application

Disease	Dor-mant	Bloom			Spring		Summer	
		Pink bud	Full bloom	Petal fall	Two week	Five week	May	June
Scab	++	-	-	+	+++	+++	+/-	+/-
Scab Dormant Chlorothalonil+oil	++	-	-	-	+++	+++	+++	+/-
Alternaria	-	-	-	-	+++	+++	+++	+++

Note: - = no application; + = application timing slightly beneficial to +++ = application timing very beneficial,

2. In-season applications

Treatment	Rate (A)	4/23	5/15	Incidence (%)	Severity rating
Control	---	---	---	a	a
Ph-D 11.3DF + NuFilm P	6 oz	@	@	bc	bc
Syllit 65WG	2 lb	@	@	bcd	bcd
Syllit + Tebuconazole*	2 lb + 6 oz	@	@	e	e
Syllit + Tebuconazole*	1.5 lb + 6 oz	@	@	e	de
Luna Experience	6 fl oz	@	@	e	de
Luna Sensation	5 fl oz	@	@	cde	cde
Merivon	5 fl oz	@	@	e	e

cv. Monterey, Colusa Co., 2013

New, highly effective fungicides:
Single: Quash, Ph-D, Luna Sensation, Syllit (registered in Nov. 2012)
Pre-mixtures: Quadris Top, Inspire Super, Merivon (scheduled for 2014)

Treatment	Rate (A)	Application				Incidence on fruit (%)
		4-18	5-22	4/18 & 5/22/12	5/22 & 6/12/12	
Control	---	---	---	a	a	
Bravo	4 pts/A	@	@	bc	a	
Fontelis	14 fl oz	@	@	bc	ab	
Quash + Ph-D*	3.5 oz + 6.2 oz	@	@	cd	c	
Luna Sensation	5 fl oz	@	@	b	a	
Inspire Super + Surf.	20 fl oz	@	@	d	bc	
Quadris Top	14 fl oz	@	@	cd	c	
Merivon	6.5 fl oz	@	@	bcd	a	
Syllit	32 oz	@	---	cd	ab	
Bumper	4 fl oz	---	@	---	---	

cv. Carmel, Butte Co., 2012

The first in-season scab application has to be timed at initiation of twig lesion sporulation for best efficacy. For most fungicides, programs starting early (A) were more effective than later (B) applications.

Summary: Management of scab with fungicides



- An effective 3-spray program includes dormant & two applications after twig infection sporulation.
- Multi-site fungicides with low resistance potential (chlorothalonil, mancozeb, captan, ziram) should be in rotations with the newer single-site and pre-mix fungicides.
- Syllit 65WG is a new scab material and should be used at 16-32 oz/A.
- Mancozeb (Manzate/Dithane) was registered in 2013 to replace maneb.
- Single-site fungicides should not be applied once disease is developing.**

Field trials on Alternaria leaf spot management 2013

Treatment	Rate (A)	5-29	6-18	7-16	Incid. (%)	Severity rating	Defoliation rating
Control	---	---	---	---	a	a	a
Custodia	17.25 fl oz	@	@	@	bc	b	b
Captan Gold + Custodia	2.5 lb + 17.25 fl oz	@	@	@	bc	b	b
Quadris Top + Dyne-Amic	14 fl oz + 16 fl oz	@	@	@	bc	b	b
Bravo Weather-Stick	4 pt	@	@	---	bc	b	b
A13703N + Dyne-Amic	14 fl oz + 16 fl oz	@	@	@	bc	b	b
Bravo Weather-Stick	4 pt	@	@	---	bc	b	b
Inspire Super + Dyne-Amic	20 fl oz + 16 fl oz	@	@	@	bc	b	b
Catamaran	4 pt	@	@	@	b	b	b
Viathon	32 fl oz	@	@	@	b	b	b
Ph-D 11.3DF	6.2 oz	@	---	---	c	b	b
Quash 50WG	3.5 oz	---	@	---	---	---	---
Ph-D + Inspire Super + D.	6.2 + 20 + 16 fl oz	---	---	@	---	---	---

cv. Monterey, Colusa Co.

Disease incidence and severity on leaves and defoliation reduced by all treatments.

Treatment	Rate	cv. Monterey			Incid. (%)	Severity	cv. Fritz Incid. (%)
		5-8	5-30	6-20			
Control	---	---	---	---	a	a	a
Ph-D + NF-P	6 oz	@	@	@	cdef	def	cd
CHA-1323 (Rhyme)	5 fl oz	@	@	@	abcd	cde	bc
EXP13-D1	11 fl oz	@	@	@	bcde	cdef	cd
EXP13-D1- Abound 2F	7 + 12 fl oz	@	@	@	cdef	def	d
Ph-D + Quash 50WG + NF-P	6.2 + 2.5 + 8 oz	---	@	@	def	ef	c
Pristine 38WG	14.5 oz	@	@	@	f	f	cd
Merivon	6.5 fl oz	@	@	@	cdef	def	cd
Bravo Weather-Stick	4 pts	@	---	---	abc	cd	c
Quadris Top - Dyne-Amic	14-16 fl oz	@	@	@	cdef	def	c
Bravo Weather-Stick	4 pts	@	---	---	cdef	def	c
A13703N - Dyne-Amic	14-16 fl oz	@	@	@	cdef	def	c
Bravo Weather-Stick	4 pts	@	---	---	cdef	def	c
Inspire Super - Dyne-Amic	20 fl oz	@	@	@	ef	def	b
Luna Sensation	5 fl oz	@	---	---	ef	def	b
Luna Experience	6 fl oz	---	@	---	---	---	---

cv. Monterey and Fritz, Kern Co.

At low disease incidence (i.e., cv. Fritz) most treatments are more effective than on the more susceptible cv. Monterey.

Summary: Management of Alternaria leaf spot

- Late-spring/early-summer applications (based on the DSV model).
- Highly effective: Quash, Ph-D, Inspire Super, Quadris Top, Luna Sensation, Luna Experience, Merivon - have to be strictly used in rotations and mixtures for resistance management.
- Other components of an integrated approach in disease management are highly critical.

Integrated management of main flower, foliar, and fruit fungal diseases of almond in an annual 5- to 6-spray program

Dormant	Feb./March (bloom)	May	June	July (hull split)
Chlorothalonil -oil: Scab, (insect pests)	1-2 applications: Brown rot, shot hole, jacket rot	1 application: Alternaria, scab, rust, (mites)	1 applications: Alternaria, scab, rust, Monilinia hull rot	1 application: Rhizopus hull rot, (NOW)

Choose fungicides for each application timing that are active against all diseases present at an orchard site (see: www.ipm.ucdavis.edu). Some sprays can be combined with insecticide/miticide applications.