Almond Bloom Fungicide Efficacy Trial

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Introduction

There are several fungal diseases that can infect almond trees during bloom, infecting and killing blossoms and ultimately reducing yield. Fungicides are commonly sprayed on almond trees, and other stone fruits, during bloom to prevent disease. In some instances fungicide resistance has developed in pathogen populations. Resistance to single site-specific fungicides (Strobilurins) have been reported. These new fungicides have low residual activity and are environmentally safe, but since they are single-site specific, resistance can also develop to them. Thus, it is important that growers practice a fungicide rotation program where different classes of fungicides are used so that pathogen resistance will not build up in response to the over use of any one fungicide or class of fungicides. It is also important that these new and previously registered fungicides are evaluated for disease efficacy by unbiased personnel that can extend such information to growers and PCAs.

Objective: To evaluate 'sequential treatments' of Aproach (Picoxystrobin + Cyproconazole), Fontelis (penthiopyrad), Quadris Top (difenoconazole + azoxystrobin), Bravo Weather Stick (chlorothalonil), Inspire EC (difenoconazole), experimental products from DuPont Crop Protection, Syngenta Crop Protection, and Nichino America, along with organic products Timorex Gold (tea tree oil), Microthiol Disperse (micronized wettable sulfur), and Regalia (extract of Reynoutria sachalinensis) in tank-mixtures and in various combinations and timings for the control of common almond bloom diseases: brown rot, shot-hole, scab, and rust.

Target Pathogens: Brown Rot (*Monilinia laxa* and *M. fructicola*) and Scab (*Cladosporium carpophilum*), Shot Hole (*Wilsonomyces carpophilus*), and Rust (*Tranzchelia discolor*).

Method

Replicated and randomized block experiment was placed in an experimental Almond orchard at the Kearney Research and Extension Center in order to evaluate the efficacy of the fungicides tested. Single tree replications are usually used since crop destruct is necessary when unregistered materials are studied. Different almond varieties are chosen for specific studies because some varieties are more resistant to certain diseases than others. Fungicide trials are rated for disease when symptoms are visible. Fungicides are grouped into their respective chemical classes and rated against each other for their efficacy to control certain diseases at a particular stage in almond development.

Application Timing and sampling: The trials first spray application of treatments was applied at 100% full bloom (FB) to the Butte variety on February 25th. The Carmel variety was treated at the same time at early petal fall (PF). The full bloom spray is primarily directed towards controlling brown rot. The second spray application was performed three weeks after petal fall (3WPF) on March 16th. The third application was performed 5 weeks after petal fall (5WPF) on March 30th. The second and third applications were primarily directed at controlling scab. Brown Rot was rated on the Butte variety on March 21st, 10 limbs per tree and percent infection determined per 100 blossoms. The Carmel trees were rated for scab on August 3rd, 222 nuts per tree were randomly sampled and taken back to the laboratory in order to determine incidence and severity.

Application Methods: TreatmentsTreatments were applied by ground application equipment, 100 gallon spray tanks, 300 gallon per acre rate, at approximately 2.5 gallons per tree, 200 psi, hand-held spray gun. Approximately 1.5 gallons of water is in the spray hose and was considered in our calculations. Calculations were based on 10 trees per treatment (8 trees were sprayed, 4 Carmel and 4 Butte), 1 tree was considered extra and one tree spray volume was determined to be contained in the hose. Nozzle orifice was 45. Overhead micro-sprinklers were run for 6 hours for 2 days after each application.

Results

Brown Rot Per 100 Flowers
Butte Variety

Treatment	Rates per acre	Brown Rot[a]	
12	A19649B Experimental[1,2,3], 5.13 fl oz	1.50	a
14	A20560C Experimental[1,2,3], 6.84 fl oz	2.50	a
04	Aproach + Fontelis 1.67 SC[1,2,3], 6 fl oz + 14 fl oz	3.25	a
16	R-106506 SC Experimental[1,2,3], 5.08 fl oz	4.00	a
13	A20259E Experimental[1,2,3], 13.7 fl oz	4.00	a
15	R-106506 SC Experimental[1,2,3], 3.38 fl oz	4.50	a
11	Quadris Top[1], 14 fl oz, Bravo[2] 4 pt (no DA), Inspire EC[3], 7 fl oz	4.50	a
09	RON94-112 Experimental[1,2,3], 43.4 fl oz (no Dyne-Amic)	4.75	a
05	Aproach + Fontelis 1.67 SC[1,2,3], 8 fl oz + 16 fl oz	5.25	ab
20	Fontelis[1,3], 20 fl oz, Regalia[2], 2 quarts	5.50	ab
08	RON94-112 Experimental[1,2,3], 43.4 fl oz	5.50	ab
10	RON94-112[1], 28.9 fl oz, RON94-374 Experimental[2,3], 28.9 fl oz	6.50	ab
07	RON94-112 Experimental[1,2,3], 28.9 fl oz	6.75	ab
06	Quadris Top[1,2,3], 12 fl oz	9.00	abc
03	Aproach 2.08 SC[1,2,3], 12 fl oz	9.00	abc
17	Timorex Gold[1,2,3], 1.5 L/Ha	10.50	abcd
02	Aproach 2.08 SC[1,2,3], 8 fl oz	15.75	bcd
01	Aproach 2.08 SC[1,2,3], 6 fl oz	19.75	cde
19	Microthiol Disperse[1,2,3], 20 lbs	21.00	de
18	Timorex Gold[1,2,3], 2.0 L/Ha	29.75	e
21	Untreated Control	48.25	f
22	Untreated Control	49.50	f

[a]Brown Rot = Brown Rot was rated on the Butte variety on March 21st, 10 limbs per tree and 10 blossoms per limb were rated for brown rot infections, determined per 100 blossoms. Data was analyzed by ANOVA with means separated by Fisher's Protected LSD ($\alpha = 0.05$) test. Means followed by the same letter are not significantly different. Most treatments significantly reduced the incidence of brown rot when compared to our two untreated controls.
[1]First trial application was performed at 100% full bloom Butte variety (FB) on February 25th, primarily for brown rot control.
[2]Second trial application was performed 3 weeks after petal fall (3WPF) on March 16th, on the Carmel variety for scab control.
[3]Third trial application was performed 5 weeks after petal fall (5WPF) on March 30th, on the Carmel variety for scab control.

Brown Rot Blosom Blight

Scab Incidence
Carmel Variety

Treatment	Rates per acre	Incidence[a]	
14	A20560C Experimental[1,2,3], 6.84 fl oz	4.50	a
06	Quadris Top[1,2,3], 12 fl oz	6.50	a
13	A20259E Experimental[1,2,3], 13.7 fl oz	11.25	a
12	A19649B Experimental[1,2,3], 5.13 fl oz	11.25	a
11	Quadris Top[1], 14 fl oz, Bravo[2] 4 pt (no DA), Inspire EC[3], 7 fl oz	12.50	a
19	Microthiol Disperse[1,2,3], 20 lbs	20.75	ab
05	Aproach + Fontelis 1.67 SC[1,2,3], 8 fl oz + 16 fl oz	37.25	abc
08	RON94-112 Experimental[1,2,3], 43.4 fl oz	38.75	abc
15	R-106506 SC Experimental[1,2,3], 3.38 fl oz	39.25	abc
10	RON94-112[1], 28.9 fl oz, RON94-374 Experimental[2,3], 28.9 fl oz	52.25	abcd
16	R-106506 SC Experimental[1,2,3], 5.08 fl oz	66.00	bcd
07	RON94-112 Experimental[1,2,3], 28.9 fl oz	68.25	bcd
09	RON94-112 Experimental[1,2,3], 43.4 fl oz (no Dyne-Amic)	72.25	cd
04	Aproach + Fontelis 1.67 SC[1,2,3], 6 fl oz + 14 fl oz	84.75	cd
02	Aproach 2.08 SC[1,2,3], 8 fl oz	87.75	cde
20	Fontelis[1,3], 20 fl oz, Regalia[2], 2 quarts	100.75	def
21	Untreated Control	135.75	efg
01	Aproach 2.08 SC[1,2,3], 6 fl oz	138.25	efg
22	Untreated Control	140.50	fg
17	Timorex Gold[1,2,3], 1.5 L/Ha	146.00	fg
18	Timorex Gold[1,2,3], 2.0 L/Ha	158.25	gh
03	Aproach 2.08 SC[1,2,3], 12 fl oz	197.50	h

[a]Incidence = number of nuts that have scab lesions on 100 nuts randomly sampled. 222 nuts per tree were randomly sampled on August 3, and taken back to the laboratory in order to determine incidence and severity.
Data was analyzed by ANOVA with means separated by Fisher's Protected LSD ($\alpha = 0.05$) test. Means followed by the same letter are not significantly different. Most treatments significantly reduced the incidence of almond scab when compared to our two untreated controls.
[1]First trial application was performed at 100% full bloom Butte variety (FB) on February 25th, primarily for brown rot control.
[2]Second trial application was performed 3 weeks after petal fall (3WPF) on March 16th, on the Carmel variety for scab control.
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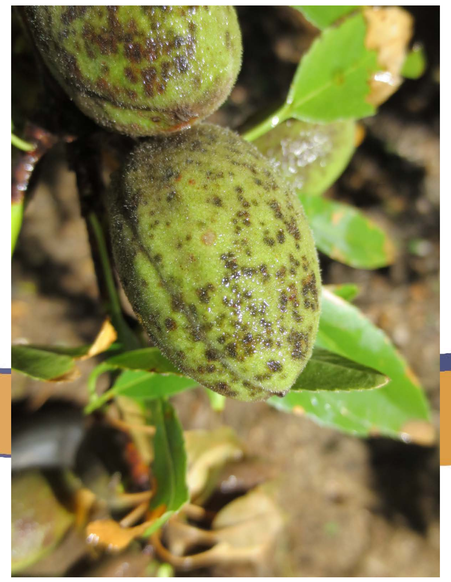

scab

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