

2015 Almond Bloom Fungicide Efficacy Trial

by

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Objective: To evaluate ‘sequential treatments’ of Fontelis (penthiopyrad), Bumper (propiconazole), Tebuconazole, Abound (azoxystrobin), Gem (trifloxystrobin), Bravo Weather Stick (chlorothalonil), Quadris Top (difenoconazole + azoxystrobin), Inspire Super (difenoconazole + propiconazole), Rovral (iprodione) + oil, Captan (phthalamide), Topsin (thiophanate-methyl), Luna Sensation (fluopyram + trifloxystrobin), Luna Experience (fluopyram + tebuconazole), Serenade Optimum (*Bacillus subtilis*), Pristine (pyraclostrobin + boscalid), Merivon (fluxapyroxad + pyraclostrobin), and Microthiol Disperse (micronized wettable sulfur) 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*).

Application Timing:

The orchard’s first spray, Rovral, was applied to all treatments by the grower at full bloom (FB) on February 24th. The orchard’s second spray, Pristine, was applied to all treatments at petal fall (PF) on March 5th. Our first scab application was applied 2 weeks after petal fall (2WPF) on March 20th. Our second application was performed 4 weeks after petal fall (4WPF) on April 3rd. Our third application was performed 8 weeks after petal fall (8WPF) on May 1st. Trial was rated on August 5th and 6th, 2015.

Application Methods:

Treatments were applied by ground application equipment, 100 gallon spray tanks, 200 gallon per acre rate, at approximately 1.65 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 7 trees per treatment (5 trees were sprayed), 1 tree was considered extra and one tree spray volume was determined to be contained in the hose. Nozzle orifice was 45.

Orchard: is located at North Ripon Road just south of Leroy, Ripon, CA 95366, and is approximately 15 years old. Trees are at 22 ft x 21 ft spacing, 94 trees per acre, 462 square feet per tree. Varieties include Carmel 25%, Fritz 25%, and Nonpareil 50%. Applications were made to the Carmel variety, which is more susceptible to several diseases. This orchard had received multiple QoI (Strobilurin) fungicide applications in past years, and as a consequence the grower (Travaille and Phippen, Inc.), PCA (Nick Gatzman), and I speculated that some pathogen resistance may have developed. Scab was severe on the Carmel Variety in 2011 and 2012 despite fungicide applications.

Trt No.	Treatment*	Timing	Rate Product/Acre	Product per tank	Flag color
1	Fontelis 1.67 SC	1, 2, 3	20 fl oz	38 ml	Pk/Bk Stp
2	Fontelis+ Bumper 3.6EC	1, 2, 3	20 fl oz + 8 fl oz	38 ml 15 ml	Red
3	Fontelis+ Tebucon 45DF	1, 2, 3	20 fl oz + 8 oz	38 ml 15 g	BL
4	Fontelis+ Abound 2.08F	1, 2, 3	20 fl oz + 12 fl oz	38 ml 23 ml	Gr/Wh Stp
5	Fontelis+ Gem 4.05SC	1, 2, 3	20 fl oz + 2.9 fl oz	38 ml 6 ml	Pur
6	Bravo Quadris Top Inspire Super	1 2 3	4 pt 14 fl oz 20 fl oz	125 ml 27 ml 38 ml	Yel/Bk Stp
7	Quadris Top Bravo Inspire Super	1 2 3	14 fl oz 4 pt 20 fl oz	27 ml 125 ml 38 ml	BK
8	Rovral + oil Captan 80 WG	1, 2 3	16 fl oz + 1% v/v 5 lb	30 ml+680 ml 144 g	Yel
9	Rovral + oil + Topsin M 4.5 F Captan 80 WG	1, 2 3	8 fl oz + 1% v/v + 10 fl oz 5 lb	15 ml + 680 ml +19 ml 144 g	Bl/Wh Stp
10	Rovral + oil + Topsin M 4.5 F Captan 80 WG	1, 2 3	11.4 fl oz +1% v/v + 14 fl oz 5 lb	22 ml + 680 ml + 27 ml 144 g	Gr/Bk Stp
11	Rovral + oil + +Topsin M 4.5 F Quadris Top Captan 80 WG	1 2 3	8 fl oz + 1% v/v + + 10 fl oz 14 fl oz 5 lb	15 ml+680 ml+ +19 ml 27 ml 144 g	Or/Bk Stp
12	Rovral + oil + +Topsin M 4.5 F Quadris Top Captan 80 WG	1 2 3	11.4 fl oz+1% v/v + 14 fl oz 14 fl oz 5 lb	22 ml+680ml + + 27 ml 27 ml 144 g	Bl+Wh
13	Luna Sensation SC	1, 2, 3	6.0 fl oz	12 ml	GR
14	Luna Experience	1, 2, 3	6.0 fl oz	12 ml	Bl Dot
15	Luna Experience Gem + Serenade	1, 3 2	6.0 fl oz 3.5 fl oz+ 8 oz	12 ml 7 ml + 15 g	Or Dot
16	Pristine	1, 2, 3	14.5 oz	27 g	Red+Wh
17	Merivon SC	1, 2, 3	6.5 fl oz	13 ml	Pur+Wh
18	Microthiol Disperse	1, 2, 3	20 lbs	578 g	Gr+Wh
19	Untreated	-----	-----	---	Bk+Wh
20	Untreated	-----	-----	---	WH

Carmel Variety

Treatment	Rates per acre
1	Fontelis 1.67 SC ^{1,2,3} , 20 fl oz
2	Fontelis + Bumper 3.6EC ^{1,2,3} , 20 fl oz + 8 fl oz
3	Fontelis + Tebucon 45DF ^{1,2,3} , 20 fl oz + 8 oz
4	Fontelis + Abound 2.0 8F ^{1,2,3} , 20 fl oz + 12 fl oz
5	Fontelis + Gem 4.05SC ^{1,2,3} , 20 fl oz + 2.9 fl oz
6	Bravo (Chlorothalonil) ¹ 4 pt, Quadris Top ² 14 fl oz, Inspire Super ³ 20 fl oz
7	Quadris Top ¹ 14 fl oz, Bravo (Chlorothalonil) ² 4 pt, Inspire Super ³ 20 fl oz
8	Rovral + oil ^{1,2} , 16 fl oz+1% v/v, Captan 80 WG ³ , 5 lbs
9	Rovral + oil + Topsin M 4.5F ^{1,2} , 8 fl oz+1% v/v + 10 fl oz, Captan 80 WG ³ , 5 lbs
10	Rovral + oil + Topsin M 4.5F ^{1,2} , 11.4 fl oz+1% v/v + 14 fl oz, Captan 80 WG ³ , 5 lbs
11	Rovral +oil +Topsin M 4.5F ¹ , 8 fl oz+1% v/v+10 fl oz, Quadris Top ² ,14 fl oz, Captan ³ , 5lbs
12	Rovral +oil +Topsin M 4.5F ¹ , 11.4 fl oz+1% v/v+14 fl oz, Quadris Top ² ,14 fl oz, Captan ³ , 5lbs
13	Luna Sensation SC ^{1,2,3} , 6 fl oz
14	Luna Experience ^{1,2,3} , 6 fl oz
15	Luna Experience ^{1,3} , 6 fl oz, Gem 4.05SC+Serenade Optimum ² , 3.0 fl oz + 8 oz
16	Pristine ^{1,2,3} , 14.5 oz
17	Merivon SC ^{1,2,3} 6.5 fl oz
18	Microthiol Disperse ^{1,2,3} 20 lbs
19	Untreated Control
20	Untreated Control

The orchard's first spray, Rovral, was applied to all treatments by the grower at full bloom (FB) on February 24th. The orchard's second spray, Pristine, was applied to all treatments at petal fall (PF) on March 5th. The following trial applications are outlined above:

¹First trial application was performed 2 weeks after petal fall (2WPF) on March 20th.

²Second trial application was performed 4 weeks after petal fall (4WPF) on April 3rd.

³Third trial application was performed was 8 weeks after petal fall (8WPF) on May 1st. The trial was rated on August 5th and 6th, 2015.

Carmel Variety

Treatment	Rates per acre	Incidence ^a
6	Bravo (Chlorothalonil) ¹ 4 pt, Quadris Top ² 14 fl oz, Inspire Super ³ 20 fl oz	0.0 a
11	Rovral +oil +Topsin ¹ , 8 fl oz+1% v/v+10 fl oz, Quadris ² ,14 fl oz, Captan ³ , 5lbs	0.2 a
18	Microthiol Disperse ^{1,2,3} 20 lbs	0.4 a
3	Fontelis + Tebucon 45DF ^{1,2,3} , 20 fl oz + 8 oz	0.6 a
17	Merivon SC ^{1,2,3} 6.5 fl oz	0.6 a
7	Quadris Top ¹ 14 fl oz, Bravo (Chlorothalonil) ² 4 pt, Inspire Super ³ 20 fl oz	0.8 a
12	Rovral +oil+Topsin ¹ , 11.4floz+1% v/v+14 floz, Quadris ² ,14 floz,Captan ³ , 5lbs	0.8 a
13	Luna Sensation SC ^{1,2,3} , 6 fl oz	1.6 a
14	Luna Experience ^{1,2,3} , 6 fl oz	1.8 a
15	Luna Experience ^{1,3} , 6 fl oz, Gem+Serenade Optimum ² , 3.0 fl oz + 8 oz	2.8 ab
2	Fontelis + Bumper 3.6EC ^{1,2,3} , 20 fl oz + 8 fl oz	2.8 ab
10	Rovral + oil + Topsin ^{1,2} , 11.4 fl oz+1% v/v + 14 fl oz, Captan ³ , 5 lbs	6.8 b
9	Rovral + oil + Topsin ^{1,2} , 8 fl oz+1% v/v + 10 fl oz, Captan ³ , 5 lbs	7.0 b
16	Pristine ^{1,2,3} , 14.5 oz	16.6 c
5	Fontelis + Gem 4.05SC ^{1,2,3} , 20 fl oz + 2.9 fl oz	21.0 cd
4	Fontelis + Abound 2.0 8F ^{1,2,3} , 20 fl oz + 12 fl oz	24.2 d
8	Rovral + oil ^{1,2} , 16 fl oz+1% v/v, Captan 80 WG ³ , 5 lbs	24.6 de
1	Fontelis 1.67 SC ^{1,2,3} , 20 fl oz	29.4 e
19	Untreated Control	35.0 f
20	Untreated Control	35.4 f

^aIncidence = number of nuts that have scab lesions on 45 nuts randomly sampled per tree. Three people rated each tree (Cheryl, Scotty, and Stephen). 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. The trial was rated on August 5th and 6th, 2015. All treatments significantly reduced the incidence of almond scab when compared to our two untreated controls.

The following trial applications are outlined above:

¹First application was performed 2 weeks after petal fall (2WPF) on March 20th.

²Second application was performed 4 weeks after petal fall (4WPF) on April 3rd.

³Third application was performed was 8 weeks after petal fall (8WPF) on May 1st.

Carmel Variety

Treatment	Rates per acre	Severity ^a
6	Bravo (Chlorothalonil) ¹ 4 pt, Quadris Top ² 14 fl oz, Inspire Super ³ 20 fl oz	0.0 a
11	Rovral +oil +Topsin ¹ , 8 floz+1% v/v+10 floz, Quadris ² ,14 floz, Captan ³ , 5lbs	0.8 a
7	Quadris Top ¹ 14 fl oz, Bravo (Chlorothalonil) ² 4 pt, Inspire Super ³ 20 fl oz	0.8 a
18	Microthiol Disperse ^{1,2,3} 20 lbs	0.8 a
3	Fontelis + Tebucon 45DF ^{1,2,3} , 20 fl oz + 8 oz	2.0 a
12	Rovral +oil+Topsin ¹ , 11.4floz+1% v/v+14 floz, Quadris ² ,14 floz,Captan ³ , 5lbs	2.0 a
14	Luna Experience ^{1,2,3} , 6 fl oz	3.8 a
13	Luna Sensation SC ^{1,2,3} , 6 fl oz	6.2 a
17	Merivon SC ^{1,2,3} 6.5 fl oz	7.0 a
2	Fontelis + Bumper 3.6EC ^{1,2,3} , 20 fl oz + 8 fl oz	9.4 a
15	Luna Experience ^{1,3} , 6 fl oz, Gem+Serenade Optimum ² , 3.0 fl oz + 8 oz	11.4 a
10	Rovral + oil + Topsin ^{1,2} , 11.4 fl oz+1% v/v + 14 fl oz, Captan ³ , 5 lbs	26.2 a
9	Rovral + oil + Topsin ^{1,2} , 8 fl oz+1% v/v + 10 fl oz, Captan ³ , 5 lbs	40.6 a
16	Pristine ^{1,2,3} , 14.5 oz	135.0 b
8	Rovral + oil ^{1,2} , 16 fl oz+1% v/v, Captan 80 WG ³ , 5 lbs	211.4 c
4	Fontelis + Abound 2.0 8F ^{1,2,3} , 20 fl oz + 12 fl oz	263.8 cd
5	Fontelis + Gem 4.05SC ^{1,2,3} , 20 fl oz + 2.9 fl oz	267.4 cd
1	Fontelis 1.67 SC ^{1,2,3} , 20 fl oz	337.8 d
19	Untreated Control	471.4 e
20	Untreated Control	493.8 e

^aSeverity = total number of scab lesions counted on 45 nuts randomly sampled per tree. Three people rated each tree (Cheryl, Scotty, and Stephen). 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. The trial was rated on August 5th and 6th, 2015. All treatments significantly reduced the severity of almond scab when compared to our two untreated controls.

The following trial applications are outlined above:

¹First application was performed 2 weeks after petal fall (2WPF) on March 20th.

²Second application was performed 4 weeks after petal fall (4WPF) on April 3rd.

³Third application was performed was 8 weeks after petal fall (8WPF) on May 1st.

Carmel Variety

Treatment	Rates per acre	Diseased nuts ^a
6	Bravo (Chlorothalonil) ¹ 4 pt, Quadris Top ² 14 fl oz, Inspire Super ³ 20 fl oz	3.2 a
17	Merivon SC ^{1,2,3} 6.5 fl oz	5.0 a
18	Microthiol Disperse ^{1,2,3} 20 lbs	6.4 a
7	Quadris Top ¹ 14 fl oz, Bravo (Chlorothalonil) ² 4 pt, Inspire Super ³ 20 fl oz	7.0 a
14	Luna Experience ^{1,2,3} , 6 fl oz	7.8 a
3	Fontelis + Tebucon 45DF ^{1,2,3} , 20 fl oz + 8 oz	8.2 a
2	Fontelis + Bumper 3.6EC ^{1,2,3} , 20 fl oz + 8 fl oz	10.8 a
11	Rovral +oil +Topsin ¹ , 8 floz+1%v/v+10 floz, Quadris ² ,14 floz, Captan ³ , 5lbs	11.2 a
15	Luna Experience ^{1,3} , 6 fl oz, Gem+Serenade Optimum ² , 3.0 fl oz + 8 oz	12.0 a
13	Luna Sensation SC ^{1,2,3} , 6 fl oz	19.8 a
12	Rovral +oil+Topsin ¹ , 11.4floz+1%v/v+14 floz, Quadris ² ,14 floz,Captan ³ , 5lbs	21.2 a
10	Rovral + oil + Topsin ^{1,2} , 11.4 fl oz+1%v/v + 14 fl oz, Captan ³ , 5 lbs	31.4 ab
9	Rovral + oil + Topsin ^{1,2} , 8 fl oz+1%v/v + 10 fl oz, Captan ³ , 5 lbs	68.4 bc
1	Fontelis 1.67 SC ^{1,2,3} , 20 fl oz	78.6 c
4	Fontelis + Abound 2.0 8F ^{1,2,3} , 20 fl oz + 12 fl oz	81.4 c
16	Pristine ^{1,2,3} , 14.5 oz	85.4 c
8	Rovral + oil ^{1,2} , 16 fl oz+1%v/v, Captan 80 WG ³ , 5 lbs	95.4 cd
5	Fontelis + Gem 4.05SC ^{1,2,3} , 20 fl oz + 2.9 fl oz	98.4 cd
19	Untreated Control	129.6 d
20	Untreated Control	173.8 e

Diseased nuts^a = number of diseased nuts counted while walking around a single tree in two minutes. The average number of nuts (both healthy and diseased) that could be counted in two minutes was 185. The trial was rated on August 5th and 6th, 2015. Three people rated each tree (Cheryl, Scotty, and Stephen). 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. All treatments significantly reduced the number of scab diseased nuts counted in two minutes when compared to our two untreated controls. The following trial applications are outlined above:

¹First application was performed 2 weeks after petal fall (2WPF) on March 20th.

²Second application was performed 4 weeks after petal fall (4WPF) on April 3rd.

³Third application was performed was 8 weeks after petal fall (8WPF) on May 1st.