
Final Report: Control of grape powdery mildew with synthetic, biological and organic fungicides: 2017 field trials

Ara Avadisi Abramians and W. Douglas Gubler

Department of Plant Pathology, University of California, Davis, CA, 95616

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Report Summary

Powdery mildew is caused by the biotrophic fungus *Erysiphe necator* (1); this polycyclic disease of grape causes losses to crop quality and yield and is considered one of the most economically important disease of grapes worldwide. This report details the findings of our annual powdery mildew fungicide trials on grapevine (*Vitis vinifera*, Cultivar Chenin blanc - 3yrs old). Along with Chardonay, Muscat blanc, Roussane and Carignane, Chenin blanc is one of the highly susceptible wine varieties (2). This trial was conducted on the research station at the Plant Pathology Department, University of California, Davis in 2017. Treatments were placed in two adjacent trials in the vineyard in a complete randomized design. Spraying commenced on April 14th. Due to late onset of infection, the entire vineyard was inoculated five times with powdery mildew conidial inoculum from June 5 – 12th. Conidial suspensions for the artificial infections were produced by cutting infected leaves and transferring them to a 5-gallon bucket with deionized water containing 0.1% Tween 20. Conidia were dispersed by gentle shaking. The conidial suspension was adjusted to a final concentration of about 40 000 conidia mL⁻¹ using a Fuchs–Rosenthal haemocytometer. The suspension was sprayed on the vines using a STIHL SR 430 Backpack Sprayer. One week after the last inoculation, scattered colonies emerged on the leaves. By late June, mildew was evident on untreated clusters. By the time of disease evaluation, disease incidence in some untreated plots reached 100%. Spraying was completed at veraison on July 23rd, and treatments were evaluated for disease incidence and severity on August 4th.

The trials consisted of soft chemistry products and synthetic fungicides. Spray frequencies varied from weekly applications to 21-day intervals. Some applications were based on the Gubler-Thomas Risk Index (RI), with application intervals based on the index.

Materials and Methods

A. Experimental design

Experimental design	Complete randomized design with 4 replicates.		
Experimental unit	2 adjacent vines = 1 plot		
Plot area	154 ft ² (row spacing = 11 ft, vine spacing = 7 ft)		
Area/treatment	616 ft ² (4 reps x 2 vines = 1 treatment)	Area/treatment	0.014 acre/treatment

Volume water/acre	50 gallons (pre-bloom in mid-April) = 0.7 gallons/4 replicates 100 gallons (pre-bloom to pea-sized berries, late April – early June) = 1.4 gallons/4 reps 150 gallons (late season) = 2.1 gallons/4 reps
Application method	STIHL SR 430 Backpack Sprayer

B. Experimental treatments

The treatments described in this report were conducted for experimental purposes only and crops treated in a similar manner may not be suitable for commercial or other use.

Trial I (Row 1 – Row 6 & Row 7 – Row 15 & Row 25 - Row27)

Trt.No.	Flag	Treatment	Frequency (days)	Application rate (per acre)	FP/4 Replicates
1	YD	Polymer	10	2 % (v/v)	53.5 ml at 50 g or 107.1 ml at 100 g or 160.6 ml at 150 g
2	YKD	Polymer	10	1 % (v/v)	26.8 ml at 50 g or 53.5 ml at 100 g or 80.3 ml at 150 g
3	RC	WXF-17001	7	0.25% (v/v)	6.7 ml at 50 g or 13.4 ml at 100 g or 20.1 ml at 150 g
4	PKS	WXF-17001	7	0.5% (v/v)	13.4 ml at 50 g or 26.8 ml at 100 g or 40.1 ml at 150 g
5	GS	MBI-10612	10 - 14 (RI)	1 qt	13.4 ml
6	GD	MBI-10612 + JMS Stylet Oil	10 - 14 (RI)	1 qt + 0.25% (v/v)	13.4 ml + 6.7 ml at 50 g, 13.4 ml

					at 100 g and 20.1 ml at 150 g
7	GKD	#1: MBI-10612 #2: Inspire super + JMS Stylet Oil #3: Luna Experience	#1: A , F at 10 - 14 (RI) intervals #2: B , D at 10 - 21 (RI) intervals #3: C , E at 14 - 21 (RI) intervals	#1: 1 qt #2: 10.5 fl oz + 0.25% (v/v) #3: 6 fl oz	#1: 13.4 ml #2: 4.4 ml + 6.7 ml at 50 g, 13.4 ml at 100 g and 20.1 ml at 150 g #3: 2.5 ml
8	KS	Sonata - Sulfur DF - Sylcoat	Start at Bloom 7-10	96 fl oz - 6 lbs - 4 fl oz	40.1 ml + 38.5 g + 1.7 ml
9	YKS	T17	Start at Bud Break 7 -14	18 fl oz./100g	3.7 ml at 50 g or 7.5 ml at 100 g or 11.2 ml at 150 g
10	KD	T17	Start at Bud Break 7-14	26 fl oz./100g	5.4 ml at 50 g or 10.8 ml at 100 g or 16.1 ml at 150 g
11	YKC	T17	Start at Bud Break 7-14	36 fl oz./100g	7.5 ml at 50 g or 14.9 ml at 100 g or 22.4 ml at 150 g
12	P	GC Pro	Start with RI then 7	3.0 lbs	19.2 g
13	Y	#1: Fracture #2: Serenade (Alt #1 and #2) (Standard)	10 - 14	#1: 24.4 fl oz #2: 20 oz	#1: 10.2 ml #2: 8 g
14	LG	Probiotic	7	1% (v/v)	26.8 ml at 50 g 53.5 ml at 100 g 80.3 ml at 150 g
15	Pu	Probiotic	7	10% (v/v)	267.7 ml at 50 g 535.3 ml at 100 g 802.9 ml at 150 g

16	B	#1: Antica + LactoPlant #2: Antica + Aicon + 3SE #3: Antica+Aicon+LactoPlant+3SE	#1: Soil Prep (Prebloom - one time application) #2: Foliar (Prebloom) #3: After bloom 7-10	#1: 5% (v/v) + 50 ml/g #2: 5% (v/v) +5% (v/v) +5 ml/g #3: 5% (v/v) +5% (v/v) +50ml+ 5ml/g	#1: 133.8 ml + 35 ml at 50 g #2: 133.8 ml + 133.8 ml + 3.5 ml at 50 g #3: 267.7 ml + 267.7 ml + 70 ml + 7.0 ml at 100 g or 401.5 ml + 401.5 ml + 105 ml + 10.5 ml at 150 g
17	R	#1: Antica + 3SE #2: Luna Exp + 3SE (Alt #1 and #2)	#1: 7 #2: 21	#1: 5% (v/v) + 5 ml/g #2: 6 fl oz.	#1: 133.8 ml + 3.5 ml at 50 g or 267.7 ml + 7.0 ml at 100 g or 401.5 ml + 10.5 ml at 150 g #2: 2.5 ml + 3.5 ml at 50 g, 7 ml at 100 g, 10.5 ml at 150 g
18	O	Regalia	7 - 14	4 qt.	53.5 ml
19	RD	Antica	7	5% (v/v)	133.8 ml at 50 g 267.7 ml at 100 g 401.5 ml at 150 g
20	OKS	Antica	7	10% (v/v)	267.7 ml at 50 g 535.3 ml at 100 g 802.9 ml at 150 g
21	K	OxiPhos	7 - 14	5 qt.	66.9 ml
22	PuY	Zivion	10 - 14	250 ppm	0.7 ml at 50 gal, 1.3 ml at 100 gal and 2 ml at 150 gal

23	BS	Zivion	10 - 14	500 ppm	1.3 ml at 50 gal, 2.7 ml at 100 gal, 4 ml at 150 gal
24	PGKC	Zivion	10 - 14	1000 ppm	2.7 ml at 50 gal, 5.3 ml at 100 gal and 8 ml at 150 gal
25	OY	Zivion + Raynox	10 - 14	500 ppm + 2 % (v/v)	1.3 ml at 50 gal, 2.7 ml at 100 gal, 4 ml at 150 gal + 53.5 ml at 50 gal, 107 ml at 100 gal and 160.6 ml at 150 gal
26	W	Control	None	None	None

Trial II (Row 7 – Row 16)

Trt. No.	Flag	Treatment	Frequency (days)	Application rate (per acre)	FP/4 Replicates
1	O	SA-0040105 (SC)	14	3.2 fl. oz.	1.3 ml
2	KC	Mettle 125 ME	14	4.0 fl. oz.	1.7 ml
3	KD	Tolendo 45 WP	14	4.0 oz.	1.6 g
4	BD	Pristine	14	10 oz.	4 g
5	RD	Pyraziflumid SC + Sylcoat	21	1.7 fl. oz. + 0.25 % (v/v)	0.7 ml + 6.7 ml at 50 gal, 13.4 ml at 100 gal or 20.1 ml at 150
6	GKS	Pyraziflumid SC + Sylcoat	21	3.38 fl. oz. + 0.25 % (v/v)	1.4 ml + 6.7 ml at 50 gal, 13.4 ml at 100 gal or 20.1 ml at 150 gal

7	LG	#1: Luna Exp. #2: Pristine (Alt #1 and #2)	21	#1: 6 fl. oz. #2: 12.5 oz.	#1: 2.5 ml #2: 5 g
8	P	#1: Merivon #2: Vivando-Sylcoat #3: Laguna - Sylcoat #4: Pristine 38 WG - Sylcoat #5: Quintec 2.08 F - Sylcoat #6: Laguna - Sylcoat #7: Sonata - Sulfur DF - Sylcoat	#1: At Bloom #2: 14 days after spray #1 #3: 14 days after spray #2 #4: 14 days after spray #3 #5: 14 days after spray #4 #6: 14 days after spray #5 #7: 14 days after spray #6	#1: 4 fl. oz. #2: 15 fl. oz. - 4 fl. oz. #3: 7 fl. oz. - 4 fl. oz. #4: 12.5 oz. - 4 fl. oz. #5: 6.6 fl. oz. - 4 fl. oz. #6: 7 fl. oz. - 4 fl. oz. #7: 64 fl. oz. - 3 lbs - 4 fl. oz.	#1: 1.7 ml #2: 6.3 ml + 1.7 ml #3: 2.9 ml + 1.7 ml #4: 5 g + 1.7 ml #5: 2.8 ml + 1.7 ml #6: 2.9 ml + 1.7 ml #7: 26.8 ml + 19.2 g + 1.7 ml
9	YKS	#1: Luna Exp 400SC - Slycoat #2: Laguna, Sonata, Sulfur DF, Sylcoat #3: Quintec 2.08 F - Sylcoat #4: Laguna, Sonata, Sulfur DF, Sylcoat #5: Flint 50 WDG - Sylcoat #6: Laguna - Sonata - Sylcoat #7: Sonata - Sulfur DF - Sylcoat	#1: At Bloom #2: 14 days after spray #1 #3: 14 days after spray #2 #4: 14 days after spray #3 #5: 14 days after spray #4 #6: 14 days after spray #5 #7: 14 days after spray #6	#1: 8 fl. oz. - 4 fl. oz. #2: 7 fl. oz. - 64 fl. oz. - 3 lbs - 4 fl. oz. #3: 6.6 fl. oz. - 4 fl. oz. #4: 7 fl. oz. - 64 fl. oz. - 3 lbs - 4 fl. oz. #5: 2.0 oz. - 4 fl. oz. #6: 7 fl. oz. - 64 fl. oz. - 4 fl. oz. #7: 64 fl. oz. - 3 lbs - 4 fl. oz.	#1 - 3.3 ml + 1.7 ml #2 - 2.9 ml + 26.8 ml + 19.2 g + 1.7 ml #3 - 2.8 ml + 1.7 ml #4 - 2.9 ml + 26.8 ml + 19.2 g + 1.7 ml #5 - 0.8 g + 1.7 ml #6 - 2.9 ml + 26.8 ml + 1.7 ml #7 - 26.8 ml + 19.2 g + 1.7 ml
10	GKD	#1: Microthiol Dispers #2: Merivon #3: Vivando + Sylcoat #4: Pristine + Sylcoat #5: Quintec + Sylcoat #6: Switch + Sylcoat #7: Torino + Sylcoat	#1: 7 days prior to bloom #2: At Bloom #3: 14 #4: 14 #5: 14 #6: 14 #7: 14	#1: 5 lbs #2: 4 fl. oz. (no adjuvant) #3: 14 fl. oz. + 4 fl. oz./100gal #4: 12.5 oz + 4 fl. oz./100gal #5: 4 fl. oz. + 4 fl. oz./100gal #6: 14 oz. + 4 oz./100gal #7: 3.4 fl. oz. + 4oz./100gal	#1: 32.1 g #2: 1.7 ml #3: 5.9 ml + * #4: 5 g + * #5: 1.7 ml + * #6: 5.6 g + * #7: 1.4 ml + * * = 0.8 ml at 50gal, 1.7 ml at 100 gal and

					2.5 ml at 150 gal
11	B	Merivon	Bloom then 21 d	4 fl. oz. (No adjuvant)	1.7 ml
12	BS	Merivon	Bloom then 28 d	5.5 fl. oz. (No adjuvant)	2.3 ml
13	OKS	Torino SC + Sylcoat	Season long - RI	3.4 fl. oz. + 4 fl. oz.	1.4 ml + 1.7 ml
14	YD	GWN - 10511 + Sylcoat	Season long - RI	3.4 fl. oz. + 4 fl. oz.	1.4 ml + 1.7 ml
15	YC	#1: Mettle + Sylcoat #2: Torino SC + Sylcoat (Alt #1 and #2)	Season long - RI	#1: 5.0 fl. oz. + 4 fl. oz. #2: 3.4 fl. oz. + 4 fl. oz.	#1: 2.1 ml + 1.7 ml #2: 1.4 ml + 1.7 ml
16	KS	#1: Luna Exp. #2: SP2700 56% + Capsil #3: SP2700 56% + Capsil #4: Luna Exp. #5: Rest of apps.	<p>#1: 6 fl oz (2.5 ml) #2: (2 Weeks after Luna Exp.) SP2700 at 2500 times dilution circular irrigate root zone (use half gallon of solution) (3.8ml/0.5gal) + SP2700 at 7.8 oz. (3.1 g) foliar spray with Capsil 12 fl oz./100 gal (2.5 ml at 50, 5 ml at 100 gal and 7.5 ml at 150 gal) #3: (One Week after #2): SP2700 7.8 oz. (3.1 g/1.4gal) foliar spray + Capsil 12 fl oz/100gal (2.5 ml at 50, 5 ml at 100 gal and 7.5 ml at 150 gal) #4: One week after #3 - 6 fl. oz. (2.5 ml) #5: Rest of apps. 2 weeks after #4 - SP2700 7.8 oz. (3.1 g) foliar spray + Capsil 12 fl oz/100gal (2.5 ml at 50, 5 ml at 100 gal and 7.5 ml at 150 gal) every 7-10 days</p>		
17	YS	Luna Exp.	Two (2) Luna Exp. 6 fl. oz. (2.5 ml) and timing as treatment #2 of treatment 17 - Skip all SP2700 treatments		
18	GD	SP2700 56% SP + Capsil	<p>1st application: SP2700 at 2500 times dilution circular irrigate root zone (use half gallon of solution) (0.76 ml/0.5 gal) + SP2700 at 7.8 fl oz. (3.3 ml) foliar spray with Capsil 12 fl oz./100 gal (2.5 ml at 50, 5 ml at 100 gal and 7.5 ml at 150 gal) 2nd and rest of applications: SP2700 7.8 oz. (3.1g) foliar spray plus Capsil 12 fl oz/100 gal (2.5 ml at 50, 5 ml at 100 gal and 7.5 ml at 150 gal) every 7 days</p>		
19	YKC	Fervent 475 SC	14 (Season long)	8.5 fl. oz.	3.6 ml

20	YKD	Prolivo + NIS	14 (Season long)	4 fl. oz. + 3 fl. oz./100 gal	1.7 ml + 0.6 ml at 50 gal, 1.3 ml at 100 gal and 1.9 ml at 150 gal
21	BKS	Prolivo + NIS	14 (Season long)	5 fl. oz. + 3 fl. oz./100 gal	2.1 ml + 0.6 ml at 50 gal, 1.3 ml at 100 gal and 1.9 ml at 150 gal
22	PKS	#1: Sovran #2: Rhyme #3: Quintec (Alt #1, #2 and #3)	14	#1: 4 oz. #2: 5 fl. oz. #3: 4 fl. oz.	#1: 1.6 g #2: 2 ml #3: 1.7 ml
23	Pu	#1: Luna Exp. 400 SC + Sylcoat #2: Quintec 2.08 SC + Sylcoat (Alt #1 and #2) (Standard)	21	#1: 8 fl. oz. + 0.125 % (v/v) #2: 4 fl. oz. + 0.125 % (v/v)	#1: 3.3 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal #2: 1.7 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal
24	R	#1: Aprovia + Sylcoat #2: Quintec 2.08 SC + Sylcoat (Alt #1 and #2)	14 - 21	#1: 10.5 fl. oz. + 0.125 % (v/v) #2: 4 fl. oz. + 0.125 % (v/v)	#1: 4.4 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal #2: 1.7 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal
25	RKD	#1: Aprovia TOP+ Sylcoat #2: Quintec 2.08 SC + Sylcoat (Alt #1 and #2)	14 - 21	#1: 13.5 fl. oz. + 0.125 % (v/v) #2: 4 fl. oz. + 0.125 % (v/v)	#1: 5.6 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal #2: 1.7 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal

26	GKC	#1: A20560+ Sylcoat #2: Quintec 2.08 SC + Sylcoat (Alt #1 and #2)	14 - 21	#1: 11.4 fl. oz. + 0.125 % (v/v) #2: 4 fl. oz. + 0.125 % (v/v)	#1: 4.8 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal #2: 1.7 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal
27	PKC	#1: A20560+ Sylcoat #2: Quintec 2.08 SC + Sylcoat (Alt #1 and #2)	14 - 21	#1: 13.5 fl. oz.+ 0.125 % (v/v) #2: 4 fl. oz. + 0.125 % (v/v)	#1: 5.6 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal #2: 1.7 ml + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal
28	RC	#1: Luna Exp #2: Rally #3: Quintec (Alt #1, #2 and #3)	#1: 21 #2: 14 - 21 #3: 21	#1: 6 fl. oz. #2: 2 oz. #3: 6.6 fl. oz.	#1: 2.5 ml #2: 0.8 g #3: 2.8 ml
29	OS	#1: Regalia #2: Luna exp. (Alt #1 and #2)	#1: 7 - 14 #2: 21	#1: 4 qt. #2: 6 fl. oz.	#1: 53.5 ml #2: 2.5 ml
30	GS	#1: Antica #2: Luna exp. (Alt #1 and #2)	#1: 7 - 14 #2: 21	#1: 5% (v/v) #2: 6 fl. oz.	#1: 133.8 ml at 50 gal, 267.7 ml at 100 gal and 401.5 ml at 150 gal #2: 2.5 ml
31	YR	Pristine + Sylcoat	10 - 14	12.5 oz. + 0.125 % (v/v)	5 g + 3.3 ml at 50 gal, 6.7 ml at 100 gal and 10 ml at 150 gal
32	Y	Pristine + 3SE	10 - 14	12.5 oz. + 5 ml/gal	5 g + 3.5 ml at 50 gal, 7 ml at 100 gal and 10.5 ml at 150 gal
33	W	Control	None	None	None

C. Maps

Trial I

PM - Trial I (Soft)

Row	1	2	3	4	5	6	7
YD	OKS	YKC	PKS	Y	KS		
YKD		O	B	GD			
RC	Pu	YKD	LG	KD	RD		
PKS	W	LG		W	RC		
GS	GD	PKS	Pu	GKD	GS		
GD		RD		YKS			
GKD	KS	YD	R	GS	P		
KS	P	B	O	YKC	PKS		
YKS	GKD	YKS	YKD	Y	RD		
KD	W	KD	RC	O	KS		
YKC	OKS	Y	GKD	KD	Pu		
P	RD	R	P	GD	YKD		
Y	O	GS	YKS	R	RC		
Pu	R	YKC	YD	YD	OKS		
LG	B	W	OKS	LG	B		

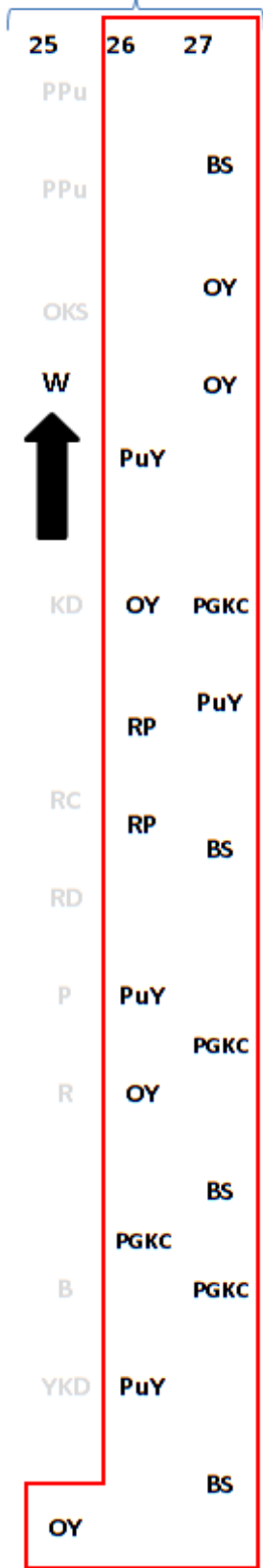
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PM - Trial II (Soft Treatment)

Row	7	8	9	10	11	12	13	14	15	16
O	OS	GS		PKS		K	BD	GD	PPu	
KC	RC	YR		YR	GD	LG	Pu	Y	BS	
KD	PKC	Y		PKC	P	KC		GS	GKC	
BD	GKC	PKS		OKS	GKS	PKS	GKD	KC	YKC	YR
K	RKD	YKC		O	W	BD		KS	BKS	RP
RD	R			GS	Y	YKC	W		PKS	
GKS	Pu	B		OS	YD	GKS	O	RC		GKD
LG	W	KD		KS	K	YKD	YC	YC	YS	
P	BKS	YKS		RKD	Y	BS	OS			R
YKS	YKD					GKC	PKC	R	YKD	PPu
GKD	YKC					YS	GD	B	YR	GKS
B	GD					RD	YD	KD	YKS	O
BS	YS					BD	YC	BKS	P	OKS
OKS	KS					YKD	RC		P	OKS
YD	YC					YD	YD	KD	YKS	O
LG						LG	KS	GS		RD
										RD
										OKS
										Pu

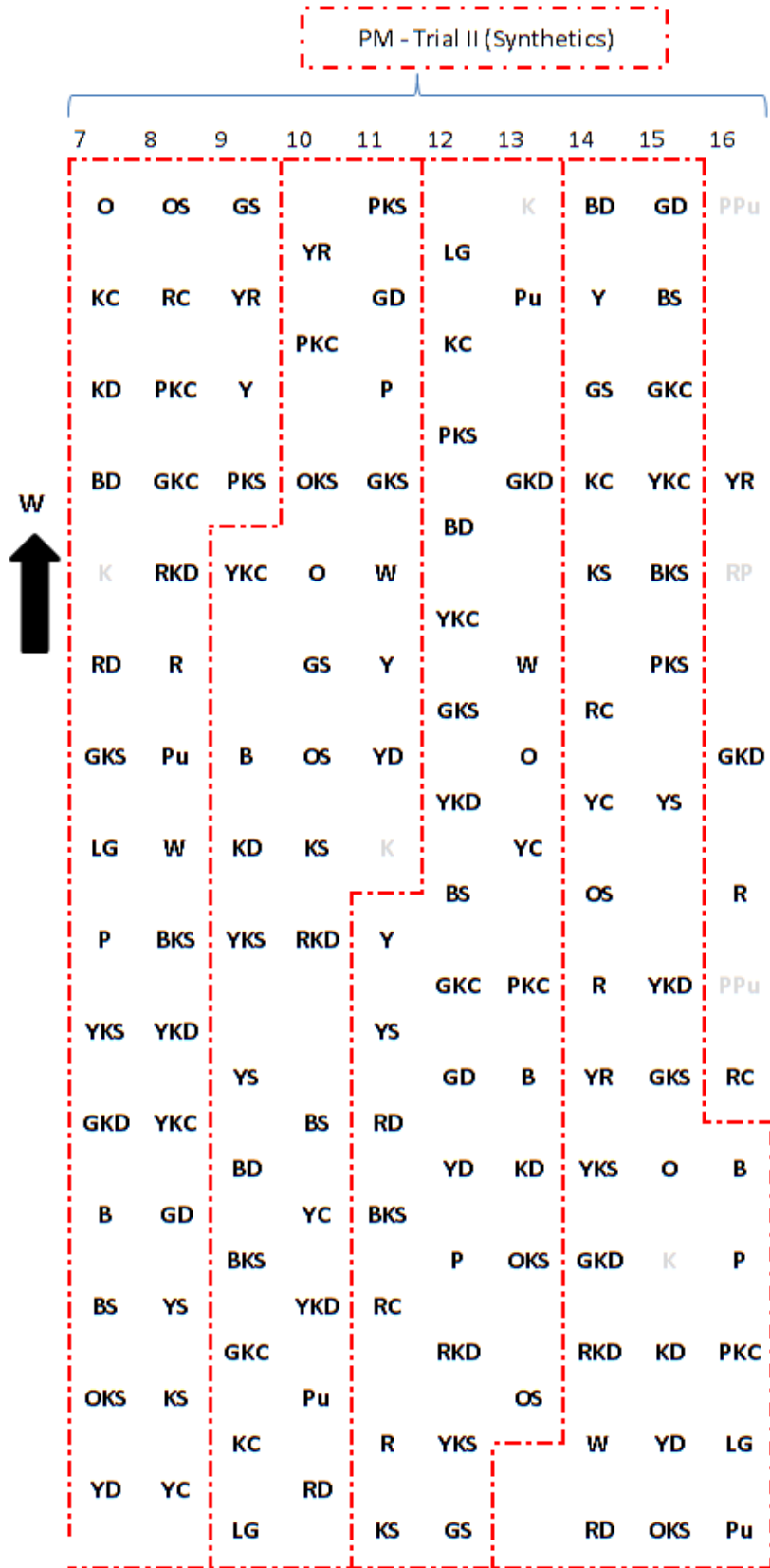
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PM - Trial II (Soft)



Color		Pattern	
Y	Yellow	D	Checker
K	Black	C	Dot
R	Red	S	Stripe
P	P		
G	Green		
Pu	Purple		
LG	Lime Green		
B	Blue		
O	Orange		
W	White		

Trial II



Color		Pattern	
Y	Yellow	D	Checker
K	Black	C	Dot
R	Red	S	Stripe
P	P		
G	Green		
Pu	Purple		
LG	Lime Green		
B	Blue		
O	Orange		
W	White		

D. Application history: **Trial I**

Trt No.	Treatment	April							May							June							July													
1	Polymer 1:50		x				x			x					x				x							x					x					x
2	Polymer 1:100		x				x			x					x				x							x					x				x	
3	WXF-17001 0.25% v/v		x				x			x					x				x							x					x				x	
4	WXF-17001 0.5% v/v		x				x			x					x				x							x					x				x	
5	MBI-10612 1 qt		x				x			x					x				x							x					x				x	
6	MBI-10612 + JMS Stylet Oil 1 qt + 0.25% v/v		x				x			x					x				x							x					x				x	
7	MBI-10612 1 qt		x				x			x					x				x							x					x				x	
	Inspire super + JMS Stylet Oil 10.5 fl oz + 0.25% v/v						x								x											x										
	Luna Experience 6 fl oz																																			x
8	Sonata - Sulfur DF - Sylcoat 96 fl oz - 6 lbs - 4 fl oz																																			x
9	T17 18 fl oz./100gal		x				x			x					x					x						x					x				x	
10	T17 26 fl oz./100gal		x				x			x					x					x						x					x				x	
11	T17 36 fl oz./100gal		x				x			x					x					x						x					x				x	
12	GC Pro 3.0 lbs																																			
13	Fracture 24.4 floz		x				x																													
	Serenade 20 oz/A																																			
14	Probiotic 1:100		x				x			x					x					x						x					x				x	
15	Probiotic 1:10		x				x			x					x					x						x					x				x	
16	Antica + LactoPlant 5% v/v + 200 mL/16Lit		x																																	
	Antica + Aicon + SE 5% v/v +5% v/v +20 mL/16 Lit																																			
	Antica+Aicon+LactoPlant+SE 5% v/v +5% v/v +200mL+20mL/16Lit																																			
17	Antica + SE 5% v/v + 20 mL/16 Lit																																			
	Luna Experience SE 6 fl oz/A																																			
18	Regalia 2-4 Quarts/A		x				x			x					x					x						x					x				x	
19	Antica 5% v/v		x				x			x					x					x						x					x				x	
20	Antica 10% v/v		x				x																													
21	Zivion 250 ppm																																			
22	Zivion 500 ppm																																			
23	Zivion 1000 ppm																																			
24	Zivion + Rainox 500 ppm + 2%v/v																																			

Trial II

Trt. No.	Treatment	May												June												July											
1	SA-0040105 (SC) 3.2 fl oz/A	x				x				x				x				x				x				x				x				x			
2	Mettle 125 ME 4.0 fl oz/A	x				x				x				x				x				x				x				x				x			
3	Tolendo 45 WP 4.0 oz wt/A	x				x				x				x				x				x				x				x				x			
4	Pristine 10 oz wt/A	x				x				x				x				x				x				x				x				x			
5	OxiPhos 5Quarts/A								x								x																				
6	Pyraziflumid SC + Sylcoat 1.7 fl oz + 0.25% v/v	x				x				x				x				x				x				x				x				x			
7	Pyraziflumid SC + Sylcoat 3.38 fl oz + 0.25% v/v	x				x				x				x				x				x				x				x				x			
8	#1 - Luna Exp 6 fl oz/A	x																																			
	#2 - Pristine 12.5 oz/A					x																															
9	#1 - Merivon 4 fl oz/A									x																											
	#2 - Vivando-Sylcoat 15 fl oz - 4 fl oz																																				
	#3 - Laguna - Sylcoat 7 fl oz - 4 fl oz																																				
	#4 - Pristine 38 WG - Sylcoat 12.5 oz - 4 fl oz																																				
	#5 - Quintec 2.08 F - Sylcoat 6.6 fl oz - 4 fl oz																																				
	#6 - Laguna - Sylcoat 7 fl oz/A - 4 fl oz																																				
	#7 - Sonata - Sulfur DF - Sylcoat 64 fl oz/A - 3 lbs/A - 4 fl oz/A																																				
10	#1 - Luna Exp 400SC - Sylcoat 8 fl oz - 4 fl oz																																				
	#2 - Laguna, Sonata, Sulfur DF, Sylcoat 7 fl oz - 64 fl oz - 3 lbs - 4 fl oz																																				
	#3 - Quintec 2.08 F - Sylcoat 6.6 fl oz/A - 4 fl oz/A																																				
	#4 - Laguna, Sonata, Sulfur DF, Sylcoat 7 fl oz - 64 fl oz - 3 lb - 4 fl oz																																				
	#5 - Flint 50 WDG - Sylcoat 2.0 oz - 4 fl oz																																				
	#6 - Laguna - Sonata - Sylcoat 7 fl oz - 64 fl oz - 4 fl oz																																				
	#7 - Sonata - Sulfur DF - Sylcoat 64 fl oz - 3 lbs - 4 fl oz																																				
11	#1 - Microthiol Dispers 5 lbs																																				
	#2 - Merivon 4 oz. (no adjuvant)																																				
	#3 - Vivando + Sylcoat 14 oz. + 4 oz./100g																																				
	#4 - Pristine + Sylcoa 12.5 oz + 4 fl oz/100g																																				
	#5 - Quintec + Sylcoat 4 oz. + 4oz/100g																																				
	#6 - Switch + Sylcoat 14 oz. + 4 oz./100g																																				
	#7 - Torino + Sylcoat 3.4 oz. + 4oz./100g																																				
12	Merivon 4 oz.																																				
13	Merivon 5.5 oz.																																				
14	Torino SC + Sylcoat 3.4 oz. + 4 fl oz/	x				x				x				x				x				x				x				x							
15	GWN - 10511 + Sylcoat 3.4 oz + 4 fl oz	x				x				x				x				x				x				x				x							
16	#1 - Mettle + Sylcoat 5.0 oz + 4 fl oz	x																																			
	#2 - FB Trino SC + Sylcoat 3.4 oz + 4 fl oz																																				

17	#1- Luna Exp. 6 fl oz	X																			
	#2- SP2700 at 2500 times dilution root zone						X														
	#2- SP2700 + Capsil 7.8 oz + 12 fl oz/100 gal																				
	#3- SP2700 + Capsil 7.8 oz + 12 fl oz/100 gal							X													
	#4- Luna Exp. 6 fl oz								X												
#5- SP2700 + Capsil 7.8 oz + 12 fl oz/100 gal									X		X	X	X	X	X	X	X	X	X	X	
18	Luna Exp 6 fl oz	X							X												
19	#1- SP2700 at 2500 times dilution root zone	X																			
	#1- SP2700 + Capsil 7.8 oz + 12 fl oz/100 gal #2 (and rest) - SP2700 + Capsil 7.8 oz + 12 fl oz/100 gal	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
20	Fervent 475 SC 8.5 fl oz	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
21	Prolivo + NIS 4 fl oz + 4 fl oz/100 gal	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
22	Prolivo + NIS 5 fl oz + 4 fl oz/100 gal	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23	#1- Sovran 4oz	X							X									X			
	#2 - Rhyme 5 fl oz					X						X									X
	#3 - Quintec 4 fl oz							X						X							
24	#1-Luna Exp. 400 SC + Sylcoat 8 fl oz + 0.125 %w/v	X							X						X						
	#2-Quintec 2.08 SC + Sylcoat 4 fl oz + 0.125 %w/v				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25	#1- Aprovia + Sylcoat 10.5 fl oz + 0.125 %w/v	X							X						X						X
	#2 - Quintec 2.08 SC + Sylcoat 4 fl oz + 0.125 %w/v				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	#1- Aprovia TDP+ Sylcoat 13.5 fl oz + 0.125 %w/v	X							X						X						
	#2 - Quintec 2.08 SC + Sylcoat 4 fl oz + 0.125 %w/v				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
27	#1- A20560+ Sylcoat 11.4 fl oz + 0.125 %w/v	X							X						X						
	#2 - Quintec 2.08 SC + Sylcoat 4 fl oz + 0.125 %w/v				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
28	#1- A20560+ Sylcoat 13.5 fl oz + 0.125 %w/v	X							X						X						X
	#2 - Quintec 2.08 SC + Sylcoat 4 fl oz + 0.125 %w/v				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
29 (Standard)	#1 - Luna Exp 6 fl oz	X												X							
	#2 - Rally 2 oz				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	#3: Quintec 6.6 oz							X													X
30	#1: Regalia 2-4 Quarts	X							X								X				
	#2: Luna Exp. 6 fl oz				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
31	#1: Antica 5% w/v	X												X							X
	#2: Luna Exp. 6 fl oz				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
32	Pristine + Sylcoat 12.5 oz. + 0.125 % (w/v)	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
33	Pristine + 3SE 12.5 oz. + 5 ml/gal	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

E. Vine Management

During the application period, vines were irrigated by drip irrigation. Sucker shoot removal and leafing were done during the duration of trial.

F. Data Collection and Statistics

Daily temperature, precipitation and Gubler-Thomas Risk Index values were obtained from a CIMIS weather station in west Davis (CI006). The temperature data is shown in Figure 1.

Fourteen precipitation events were recorded between April 6th through July 30th (Figure 2). Powdery mildew incidence and severity were assessed in each plot by evaluating twenty-five random clusters. Incidence was defined as the proportion of clusters in a plot having some living powdery mildew. Severity was determined by estimating the percentage of area of a cluster that was infected; the severity value of all clusters was then averaged to give a plot-wide estimate of disease severity. Mean incidence and severity values for each treatment were computed. Trial models were analyzed using the ANOVA Tests for data. Means comparisons were made using Fisher's LSD with $\alpha=0.05$.

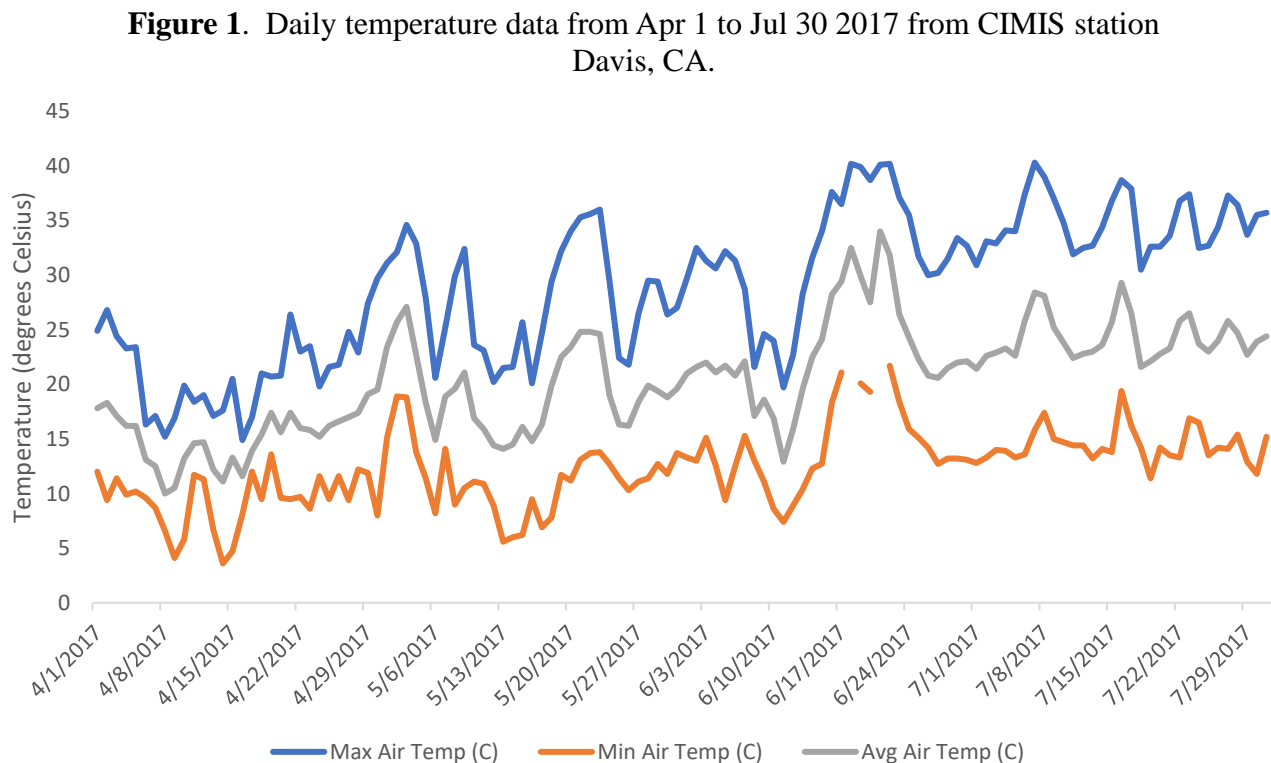


Figure 2. Daily precipitation data from Apr 1 to Jul 30 2017 from CIMIS station, Davis, CA.

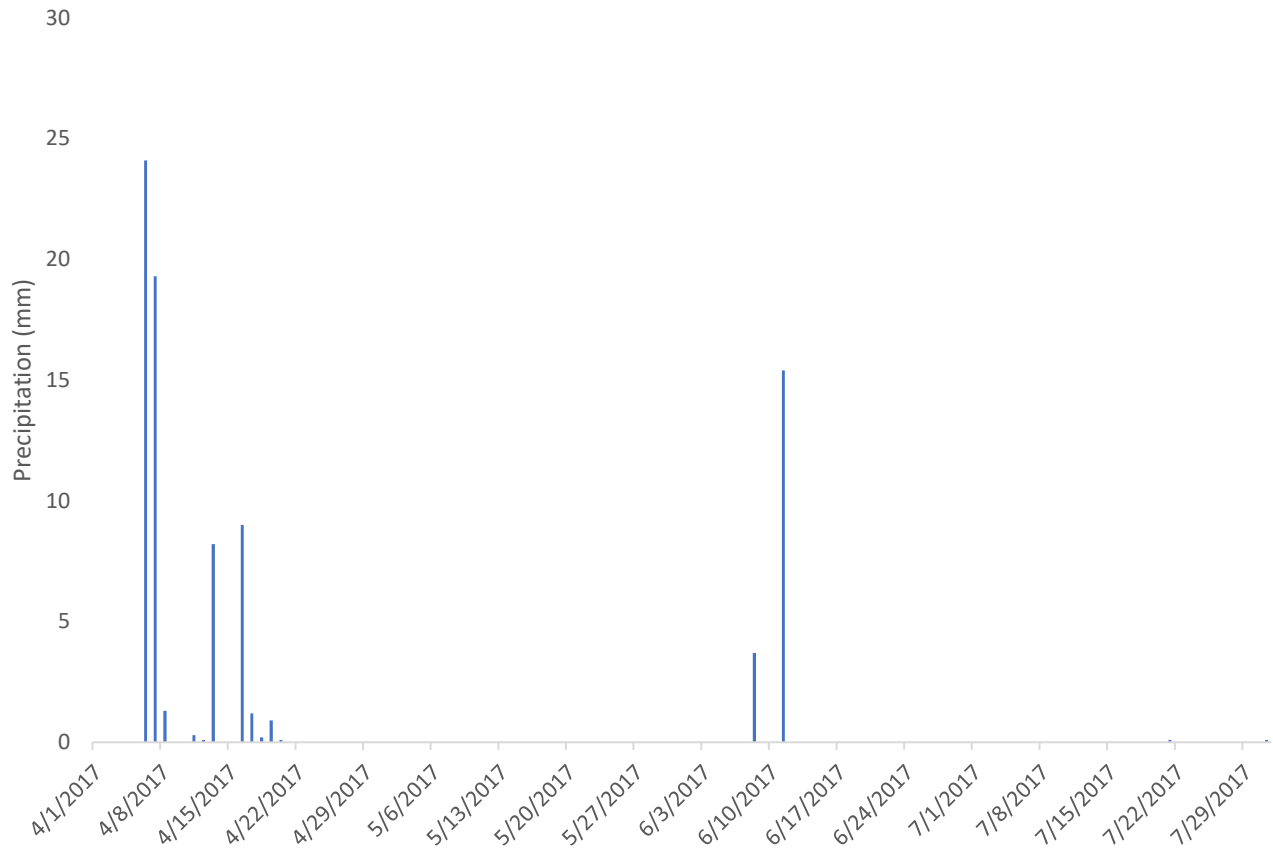
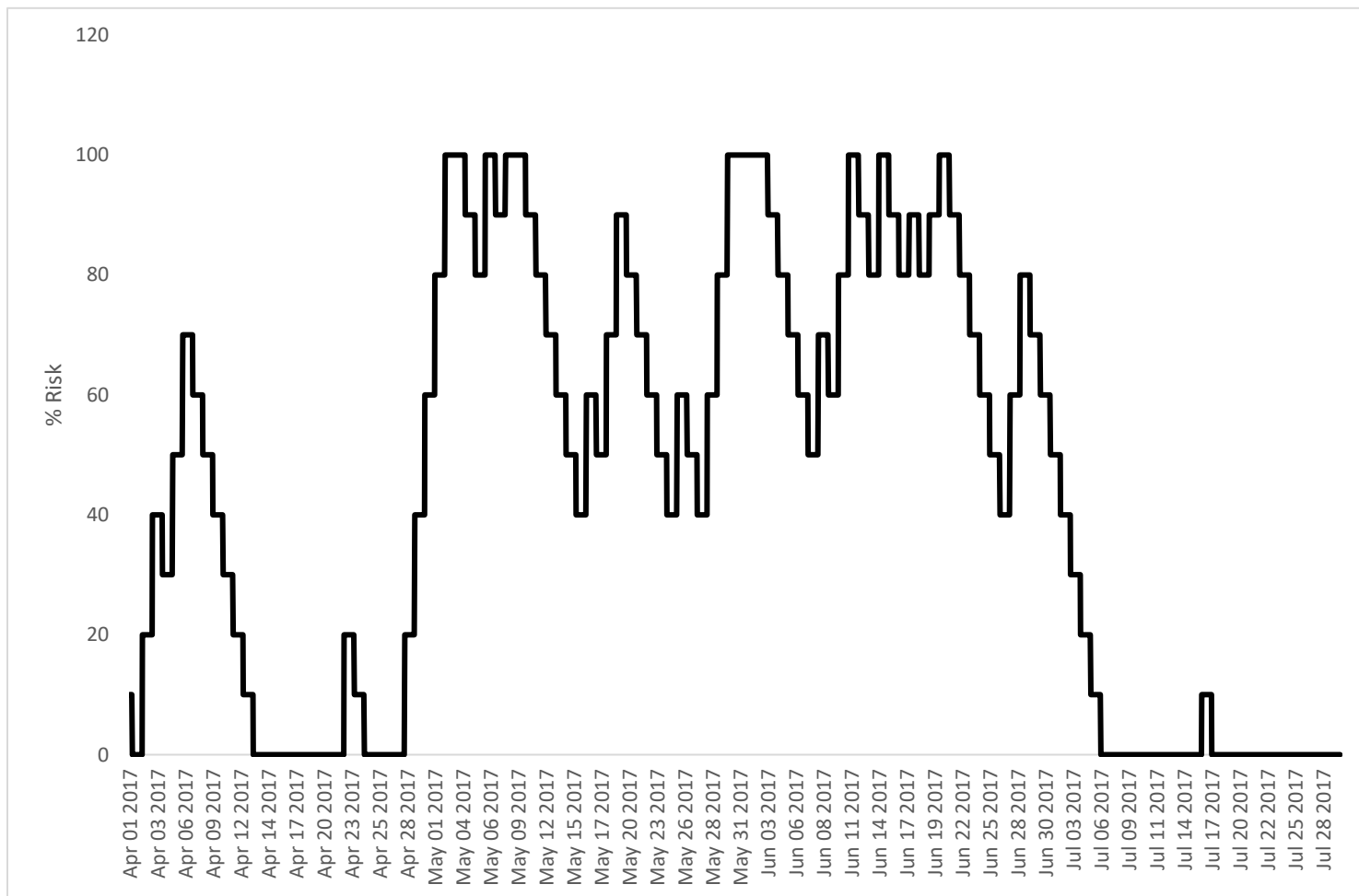


Figure 3. Thomas-Gubler Risk Index data from Apr 1 to Jul 27, 2017 from CIMIS weather station in west Davis. Y-axis shows data points indicate risk index > 60 (high risk), between 30 and 60 (moderate risk) and below 30 (no risk).



Results

Table 1. Disease incidence and severity in trial I. Product names are followed by rate (per acre) and the frequency of application. Treatment means followed by the same letter are not significantly different according to Fisher's LSD at $\alpha=0.05$; alt = alternated with.

Treatment	Mean Incidence (%)	Mean Severity (%)
Antica + SE 5% (v/v) + 5 ml/gal 7d alt Luna Exp + 3SE 6 fl oz + 5 ml/gal 21d	2.00 j	0.04 k
MBI-10612 1 qt 10 - 14d (RI) then Inspire super + JMS Stylet Oil 10.5 fl oz + 0.25% (v/v) 10 - 21d (RI) then Luna Experience 6 fl oz 14 - 21d (RI) then second treatment then third then first treatment.	3.00 j	0.15 k
Sonata 96 fl oz + Sulfur DF 6 lbs + Sylcoat 4 fl oz Start at Bloom 7-10d	7.00 ij	0.20 k
GC Pro 3.0 lbs start with RI then 7d	8.00 ij	0.33 k
T17 36 fl oz./100gal Start at Bud Break 7-14d	9.68 hij	0.60 ijk
Polymer 2 % (v/v) 10d	11.11 hij	0.388889 jk
Polymer 1 % (v/v) 10d	12.00 hij	0.46 jk
WXF-17001 0.25% (v/v) 7d	15.63 ghi	0.58 ijk
MBI-10612 1 qt 10 - 14d (RI)	20.62 efgh	2.04 ghijk
OxiPhos 5 qt 7 - 14d	24.18 efg	2.626374 ghijk
MBI-10612 1 qt + JMS Stylet Oil 0.25% (v/v) 10 - 14d (RI)	24.21 efg	1.231579 hijk
Regalia 4 qt. 7 - 14d	28.00 ef	3.11 ghijk
Probiotic 1% (v/v) 7d	35.05 de	3.340206 ghijk
Antica + LactoPlant 5% (v/v) + 50 ml/gal Soil Prep (Prebloom - one-time application) and Antica + Aicon + 3SE 5% (v/v) +5% (v/v) +5 ml/gal Foliar (Prebloom) then Antica+Aicon+LactoPlant+3SE 5% (v/v) +5% (v/v) +50ml+ 5ml/gal after bloom 7-10d	42.00 cd	4.63 fghij
T17 18 fl oz./100 gal start at bud break 7 -14d	42.86 cd	8.326531 def
Zivion 500 ppm + Raynox 2%v/v 10-14d	43.00 cd	3.84 ghijk

Antica 10% (v/v) 7d	43.00	cd	6.21	efg
Zivion 500 ppm 10 -14d	44.74	cd	5.552632	fgh
Fracture 24.4 fl oz 10 - 14d alt Serenade 20 oz 10 - 14d	45.00	cd	4.76	fghi
Antica 5% (v/v) 7d	45.00	cd	13.25	c
Zivion 250 ppm 10 - 14d	47.73	bc	10.23864	cde
T17 26 fl oz./100 gal start at bud break 7-14d	48.00	bc	13.76	c
Probiotic 10% (v/v) 7d	48.45	bc	10.86598	cd
Zivion 1000 ppm 10 -14d	58.00	b	20.65	b
Untreated Control	76.00	a	41.56	a

Table 2. Disease incidence and severity in trial II. Product names are followed by rate (per acre) and the frequency of application. Treatment means followed by the same letter are not significantly different according to Fisher's LSD at $\alpha=0.05$; alt = alternated with.

Treatment	Mean Incidence (%)	Mean Severity (%)
Merivon 4 fl oz at bloom then Vivando + Sylcoat 15 fl oz + 4 fl oz 14 d then Laguna + Sylcoat 7 fl oz + 4 fl oz 14d after 2nd spray then Pristine 38 WG + Sylcoat 12.5 oz + 4 fl oz 14d after 3rd spray then Quintec 2.08 F + Sylcoat 6.6 fl oz + 4 fl oz 14d after 4th spray then Laguna + Sylcoat 7 fl oz + 4 fl oz 14d after 5th spray then Sonata + Sulfur DF + Sylcoat 64 fl oz + 3 Ibs + 4 fl oz 14d after 6th spray	0.00 e	0.00 c
Pristine 12.5 oz + Sylcoat 0.125 % (v/v) 10 - 14d	0.00 e	0.00 c
Luna Exp 400SC 8 fl oz + Slycoat 4 fl oz then Laguna 7 fl oz + Sonata 64 fl oz + Sulfur DF 3 Ibs + Sylcoat 4 fl oz then Quintec 2.08 F 6.6 fl oz + Sylcoat 4 fl oz then Laguna 7 fl oz + Sonata 64 fl Oz + Sulfur DF 3 Ibs + Sylcoat 4 fl oz then Flint 50 WDG 2.0 oz + Sylcoat 4 fl oz then Laguna 7 fl oz + Sonata 64 fl oz + Sylcoat 4 fl oz then Sonata 64 fl oz + Sulfur DF 3 Ibs + Sylcoat 4 fl oz. Treatments were applied at at 14d intervals starting at the bloom.	0.00 e	0.00 c
Prolivo 4 fl oz + NIS 3 fl oz/100 gal 14d (Season long)	0.00 e	0.00 c
Luna Exp 6 fl oz 21d Alt Pristine 12.5 oz 21d	0.00 e	0.00 c
A20560 13.5 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d Alt Quintec 2.08 SC 4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d	0.00 e	0.00 c

SA-0040105 (SC)3.2 fl oz 14d	0.00	e	0.00	c
Aprovia TOP 13.5 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d Alt Quintec 2.08 SC 4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d	0.00	e	0.00	c
Luna Exp 6 fl oz 21d then Rally 2 oz 14 - 21d then Quintec 6.6 fl oz 21d then start the sequence over	0.00	e	0.00	c
Aprovia 10.5 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d Alt Quintec 2.08 SC 4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d	0.00	e	0.00	c
Luna Exp. 400 SC 8 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d Alt Quintec 2.08 SC 4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d	0.00	e	0.00	c
Antica 5% (v/v) 7- 14d Alt Luna exp. 6 fl oz 21d	0.00	e	0.00	c
Pyraziflumid SC 3.38 fl oz + Sylcoat 0.25 % (v/v) 21d	0.00	e	0.00	c
Microthiol Dispers 5 lbs 7d prior to bloom then Merivon 4 fl oz (no adjuvant) at bloom (the rest of the treatments 14d) Vivando 14 fl oz + Sylcoat 4 fl oz/100gal then Pristine 12.5 oz + Sylcoat 4 fl oz/100gal then Quintec 4 fl oz + Sylcoat 4 fl. oz/100gal then Switch + Sylcoat 14 oz + 4 oz/100gal then Torino 3.4 fl oz + Sylcoat 4 oz/100gal	0.00	e	0.00	c
A20560 11.4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d Alt Quintec 2.08 SC 4 fl oz + Sylcoat 0.125 % (v/v) 14 - 21d	0.00	e	0.00	c
Prolivo 5 fl oz + NIS 3 fl oz/100 gal 14d season long	0.00	e	0.00	c
Pristine 10 oz 14d season long	0.00	e	0.00	c
Luna Exp. 6 fl oz then 2wk later SP2700 at 2500 times dilution soil app + SP2700 at 7.8 oz foliar spray + Capsil Capsil 12 fl oz/100 gal then 1wk later SP2700 7.8 oz + Capsil 12 fl oz/100gal (foliar) then 1wk later Luna Exp 6 fl oz then the rest 2wk after SP2700 7.8 oz + Capsil 12 fl oz/100gal (foliar) 7-10d	1.00	de	0.01	c
Mettle 5.0 fl oz + Sylcoat 4 fl oz Alt Torino SC 3.4 fl oz + Sylcoat 4 fl oz Season long - RI	1.00	de	0.10	c
Regalia 4 qt 7 - 14d Alt Luna exp 6 fl oz 21d	1.00	de	0.01	c
Sovran 4 oz Alt Rhyme 5 fl oz Alt Quintec 4 fl oz Alt 14d	1.00	de	0.01	c
Torino SC 3.4 fl oz + Sylcoat 4 fl oz Season long - RI	2.00	cde	0.06	c
Tolendo 45 WP 4.0 oz 14d	2.00	cde	0.06	c
Mettle 125 ME 4.0 fl oz 14d	2.00	cde	0.04	c
Pristine 12.5 oz + 3SE 5 ml/gal 10 - 14d	2.00	cde	0.07	c

Merivon 4 fl oz (No adjuvant) bloom then 21 d	2.00	cde	0.03	c
GWN 10511 3.4 fl oz + Sylcoat 4 fl oz	2.08	cde	0.05	c
1st app SP2700 at 2500 times dilution soil app + SP2700 at 7.8 fl oz (foliar) + Capsil 12 fl oz/100-gal rest of applications: SP2700 7.8 oz (foliar) + Capsil 12 fl oz/100 gal 7 d	2.11	cde	0.16	c
Pyraziflumid SC 1.7 fl oz + Sylcoat 0.25 % (v/v) 21d	4.00	cd	0.13	c
Fervent 475 SC 8.5 fl oz 14d (Season long)	5.00	c	0.06	c
Luna Exp 6 fl oz (2x) 2nd app 4wks after 1st	20.21	b	5.80	b
Untreated Control	80.00	a	35.81	a

Acknowledgements

Thanks to the various industry donors for providing of testing materials. We thank Ian Bay for assisting with disease evaluation in the field. We thank Trang T. Nguyen for assisting with other aspects of the trials.

Appendix: Materials

Product	Active ingredient(s) and concentration	Manufacturer or distributor	Chemical class (after Adaskaveg et al. 2008)
Antica	lactic acid (10%)	Ahcil Laboratories	unknown
LactoPlant	Lactic acid based	Ahcil Laboratories	unknown
3SE	Seaweed Based	Ahcil Laboratories	adjuvant
A20560	proprietary	N/A	proprietary
Aicon	Azadirachtin	Ahcil Laboratories	Botanical Insecticide
Aprovia	proprietary	N/A	proprietary
Aprovia TOP	proprietary	N/A	proprietary
Capsil	polyether-polymethylsiloxane- copolymer (100%)	Aquatrols	adjuvant
Fervent 475 SC	isofetamid and tebuconazole	ISK Biosciences	SDHI (7) and DMI (3)
Flint 50 WDG	trifloxystrobin (50%)	Bayer Crop Science	QoI (11)
Fracture	BLAD (20%)	FMC Corporation	plant extract
GC Pro	Sodium Carbonate Peroxyhydrate (85.00%)	BioSafe Systems, LLC	Inorganic
GWN - 10511	proprietary	N/A	proprietary
Inspire super	difenoconazole (8.4%), cyprodinil (24.1%)	Syngenta Crop Protection, Inc.	DMI (3)/anilinopyrimidine (9)

JMS Stylet Oil	paraffinic oil (97.1%)	JMS Flower Farms, Inc.	oil
Laguna	Difenoconazole (23.2%)	Wilbur-Ellis	DMI-triazole (3)
Luna Experience	fluopyram (17.54%), tebuconazole (17.54%)	Bayer CropScience	SDHI (7)/DMI-triazole (3)
MBI-10612	proprietary	N/A	proprietary
Merivon*	pyraclostrobin (21.26%) / fluxapyroxad (21.26%)	BASF	SDHI (7)/QoI (11)
Mettle 125 ME	tetraconazole (11.6%)	Gowan Co.	DMI-triazole (3)
Microthiol Dispers	sulfur (80%)	United Phosphorus Inc.	mineral (M2)
OxiPhos	Mono- and di-potassium salts of phosphorus acid (27.1%) Hydrogen Peroxide (14.0%)	BioSafe Systems, LLC	oxidizer
Polymer 1	proprietary	N/A	proprietary
Pristine	pyraclostrobin (12.8%) boscalid (25.2%)	BASF	SDHI (7)/QoI(11)
Pristine 38 WG	pyraclostrobin (12.8%) boscalid (25.2%)	BASF	SDHI (7)/QoI(11)
Probiotic	proprietary	N/A	proprietary
Proливо + NIS	Pyriofenone (27.3%)	Summit Agro USA	apressoria formation inhibitor
Pyraziflumid SC	proprietary	N/A	proprietary
Quintec 2.08 F	quinoxifen (22.6%)	Dow AgroSciences LLP	quinoline (13)
Rayinox	carnauba wax, organically modified clay	Valent BioSciences Corporation	sunburn protectant
Rally 40 WSP	myclobutanil (40%)	Dow AgroSciences LLC	DMI-triazole (3)
Regalia	extract of <i>Reynoutria sachalinensis</i> (5%)	Marrone Bio Innovations	plant extract
Rhyme	flutriafol (22.7 %)	Cheminova Inc	DMI-triazole (3)
SA-0040105 (SC)	proprietary	N/A	proprietary

Serenade	<i>Bacillus subtilis</i> QST 713 (26%)	Bayer CropScience	biological
Sonata	<i>Bacillus pumilus</i> QST 2808 (1.38%)	Bayer CropScience	biological
Sovran	kresoxim-methyl (50%)	Chemnova	QoI (11)
SP2700 56% SP	proprietary	N/A	proprietary
Sulfur DF	sulfur (80%)	Wilbur-Ellis	Inorganic (M2)
Switch	cyprodinil (37.5%), fludioxonil (25%)	Syngenta Crop Protection	anilinopyrimidine (9)/phenylpyrrole (12)
Sylcoat	polyether-polymethylsiloxanecopolymer and Polyether (100%)	Wilbur-Ellis	adjuvant
T17	proprietary	N/A	proprietary
Tolendo 45 WP	Tebuconazole (45.0%)	Rotam North America, Inc	DMI-triazole (3)
Torino SC	cyflufenamid (10%)	Gowan Co.	phenyl-acetamide (U6)
Vivando	metrafenone (25.2%)	BASF	benzophenone (U8)
WXF-17001	proprietary	N/A	proprietary
Zivion™ M	Natamycin (10.34%)	DSM Food Specialties B.V.	unknown

Appendix sources: (1) Adaskaveg, et al. 2012. Efficacy and timing of fungicides, bactericides and biologicals for deciduous tree fruit, nut, strawberry, and vine crops 2012, available at <http://ucanr.edu/sites/plp/files/146650.pdf>. (2) Gubler Lab field trials, available at http://plantpathology.ucdavis.edu/Cooperative_Extension/ (3) product-specific MSDS and/or labels.

*Not registered, label withdrawn or inactive



Figure 4: A: Treated (Luna Exp. 400 SC + Sylcoat alt Quintec 2.08 SC + Sylcoat) vs. B: untreated clusters of Chenin blanc.

Literature Cited

- 1- Wilcox, Wayne Frank, et al. *Compendium of Grape Diseases, Disorders, and Pests*. APS Press, The American Phytopathological Society, 2015.
- 2- Vasquez, Stephen. "Grape Cultivar Susceptibility to Grapevine Powdery Mildew." UC Cooperative Extension.