Grape powdery mildew fungicide Trial 2, 2006

Location	Herzog Ranch, near Courtland, Sacramento Co., California
Principle investigator	Doug Gubler, Ph.D.
Research associates	Ken Asay, Chris Janousek, Doug Gubler
Cooperators	John, Cathy and Randy Baranek, Tom Herzog
Crop	Grape, 'Chardonnay' variety
Disease	Powdery mildew (*Uncinula necator*)

2a. Trial layout and method

Objective	Test the efficacy of fungicides for control of powdery mildew.		
Experimental design	Treatments are field applications to 3 vine plots, in a randomized complete block design, with 4 replicates.		
Application method	High pressure hand gun sprayers, backpack sprayers.		
Vine spacing	7 ft	Row spacing	11 ft
Treatment unit	3 vines	Treatment unit area	231 ft^2
Area/Treatment	924 ft^2	Area/Treatment	0.021 acres
Volume water/acre	190 gallons 240 gallons 260 gallons	Volume water/Treatment	4.0 gallons 5.0 gallons 5.5 gallons
Application frequency	Variable	Evaluation stage	Veraison

2b. Fungicide treatments

Trt. No.	Flag	Institution	Materials	Appl-ication	Interval	FP/acre	FP/Treat-ment	Notes
1	W		Untreated control					
2	KD	UC Davis	Flint alt Sovran alt Quintec alt Procure alt	AE BF CG DH	17-21 RI	2.2 oz alt 4.4 oz alt 6.5 fl oz alt 6.5 fl oz alt	1.3 g alt 2.6 g alt 4.1 ml alt 4.1 ml alt	
3	YS	Crompton	Procure 480SC	AB…	14	6.5 fl oz	4.1 ml	
4	YKS	Crompton	Procure 480SC alt Flint	AC… BD…	14 14	6.5 fl oz alt 2.2 oz	4.1 ml alt 1.3 g	
5	YD	Gowan	(Pristine + Latron B-1956) then (Vintage + Latron B-1956)	B C D E…	14-21 then 14-17	11.5 oz 4.4 oz 5.5 oz 6.5 oz	6.9 g 2.6 ml 3.2 ml 4.1 ml	+ 436 ml/acre Latron B-1956

Trt. No.	Flag	Institution	Materials	Appl-ication	Interval	FP/acre	FP/Treat-ment	Notes
6	OKS	Gowan	(Pristine + Latron B-1956) then (Rubigan EC + Latron B-1956)	B C D E…	14-21 then 14-17	11.5 oz 3.3 fl oz 4.4 fl oz 6.5 fl oz	6.9 g 2.1 ml 2.7 ml 4.1 ml	+ 436 ml/acre Latron B-1956
7	YRD	AgraQuest	Flint 50WG alt (Sonata ASO + Silwet L-77)	AC… BD…	14 14	2.2 oz alt (3.3 qt + 215 ml)	1.3 g alt (65.7 ml + 4.5 ml)	
8	OS	AgraQuest	Quintec 2.08 SC alt (Sonata ASO + Silwet L-77)	AC… BD…	14 14	5.5 fl oz alt (3.3 qt + 215 l)	3.4 ml alt (65.7 ml + 4.5 ml)	
9	RC	EcoSmart	Sporan EC	AB…	14	4.4 pt	43.8 ml	
10	GS	EcoSmart	Sporan EC alt Quintec	AC... BD...	14 14	4.4 pt alt 4.4 fl oz	43.8 ml alt 2.7 ml	
11	RD	Isagro-Ricerca USA	Eminent 1SL	AB…	14-21 RI	3.8 fl oz	2.4 ml	
12	LG	Isagro-Ricerca USA	Eminent 1SL	AB…	14-21 RI	4.4 fl oz	2.7 ml	
13	BS	Isagro-Ricerca USA	Eminent 1SL	AB…	14-21 RI	5.5 fl oz	3.4 ml	
14	OD	Bayer	USF2010 50 WG	AB…	21	4.4 oz	2.6 g	
15	GD	Bayer	Elite 45WP alt Flint 50WG	AC... BD...	14 21	4.4 oz 2.2 oz	2.6 g 1.3 g	
16	RKC	Syngenta	JMS Stylet Oil Abound	A BC…	 14	 16.8 fl oz	 10.5 ml	
17	P	DuPont	DPX LEM 17SC	AB…	7-10	2.2 oz ai	6.4 ml	
18	Pu	DuPont	DPX LEM 17SC	AB…	7-10	3.8 oz ai	11.2 ml	
19	YC	DuPont	DPX LEM 17SC	AB…	7-10	5.5 oz ai	16 ml	
20	YKC	DuPont	DPX LEM 17SC	AB…	7-10	7.0 oz ai	20.4 ml	
21	GKD	DuPont	Endura 70WG or Sovran		7-10	4.9 oz or 4.9 oz	3.0 g or 3.0 g	
22	KS	DuPont	Quintec 2.08SC	AB…	7-10	3.3 fl oz	2.1 ml	
23	RKS	DuPont	KQ926	AB…	7-10	2.5 fl oz	1.6 ml	
24	OKD	DuPont	DPX LEM17 alt KQ 926	AC… BD…	7-10	2.2 oz ai 2.5 fl oz	6.4 ml 1.6 ml	
25	KC	Natural Industries	Micro 108 + Silwet L-77	AB…	14	6.5 oz 215 ml	3.9 g 4.5 ml	

Note: 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. FP = formulated product; ai = active ingredient; alt = alternated with; RI = Gulber-Thomas powdery mildew risk index.

2c. Fungicide information

Institution	Product	Active Ingredient(s)	Concentration(s)	Contact
UCD	JMS Stylet Oil	mineral oil	99 %	
	Flint	tryfloxystrobin	50 %	
	Sovran	kersoxim methyl	50 %	
	Quintec	quinoxyfen	300 g/L	
UCD & Crompton	Procure 480SC	triflumizole	480 g/L	
Gowan	Pristine	pyroclostrobin boscalid	12.8 % 25.2 %	James Brazzle jbrazzle@gowanco.com
	Vintage	fenarimol	11.6 %	
	Rubigan EC	fenarimol	1 lb/gal	
	Latron B-1956	non-ionic surfactant	77 %	
AgraQuest	Flint 50WG	trifloxystrobin	50 %	Paul Walgenbach pwalgenbach@agraquest.com
	Sonata ASO	*Bacillus pumilus*	2.7 %	
	Silwet L-77	silicone surfactant	100 %	
EcoSmart	Sporan EC	rosemary oil clove oil thyme oil	18 % 10 % 10 %	Ramon Georgis rgeorgis@ecosmart.com
	Quintec	quinoxyfen	300 g/L	
Isagro-Ricera	Eminent 1SL	tetraconazole	11.6 %	Chris Leon cleon@isagro-usa.com
Bayer	USF2010 50WG	tebuconazole trifloxystrobin	25 % 25 %	Matt Ehlhardt matt.ehlhardt@bayercropscience.com
	Elite 45WP	tebuconazole	45 %	
	Flint WG	trifloxystrobin	50 %	
Syngenta	Abound	azoxystrobin	300 g/L	Tim Tripp tim.tripp@syngenta.com
DuPont	DPX LEM 17SC (=DPX LEM17 045)	unknown	20 %	Stephen Colbert stephen.f.colbert@usa.dupont.com
	Endura 70WG	boscalid	70 %	
	Quintec 2.08SC	quinoxyfen	300 g/L	
	KQ926	proquinazid	200 g/L	
Natural Industries	Micro 108	*Streptomyces lydicus*	10^8 CFU/g	Tim Lichatowich tim@naturalindustries.com
	Silwet L-77	silicone surfactant	100 %	

2d. Fungicide applications

Date	3 May 2006		4 May 2006		5 May 2006		11 May 2006		18 May 2006	
Vol	190 gal/acre		190 gal/acre		190 gal/acre		190 gal/acre		190 gal/acre	
1										
2	X									
3	X									
4	X									
5	X									
6	X									
7					X					
8					X					
9	X									
10	X								X	
11			X							
12			X							
13			X							
14					X					
15					X					
16	X									
17			X				X			
18			X				X			
19			X				X			
20			X				X			
21					X		X			
22					X		X			
23					X		X			
24			X				X			
25					X					

Date	19 May 2006		22 May 2006		24 May 2006		26 May 2006		31 May 2006	
Stage										
Vol	190 gal/acre		190 gal/acre		190 gal/acre		190 gal/acre		190 gal/acre	
1										
2							X			
3	X									
4	X									
5	X									
6	X									
7	X								X	
8	X									
9										
10										
11							X			
12							X			
13							X			
14							X			
15	X									
16	X								X	
17			X						X	
18			X						X	
19					X				X	
20					X				X	
21					X				X	
22					X				X	
23					X				X	
24					X				X	
25	X								X	

Date	1 June 2006		9 June 2006		12 June 2006		14 June 2006		15 June 2006	
Stage					Pea-sized grapes					
Vol	190 gal/acre		190 gal/acre		240 gal/acre		190 gal/acre		190 gal/acre	
1										
2					X					
3	X						X			
4	X						X			
5	X								X	
6	X								X	
7										
8	X									
9	X						X			
10	X						X			
11			X							
12			X							
13			X							
14									X	
15			X							
16									X	
17			X							
18			X							
19			X							
20			X							
21			X							
22			X							
23			X							
24			X							
25										

Date	16 June 2006		20 June 2006		23 June 2006		28 June 2006		29 June 2006	
Stage			up to small marble sized grapes				Small marble sized			
Vol	190 gal/acre		190 gal/acre		190 gal/acre		190 gal/acre		260 gal/acre	
1										
2									X	
3							X			
4							X			
5									X	
6									X	
7			X							
8			X							
9							X			
10							X			
11					X					
12					X					
13					X					
14										
15					X					
16							X			
17	X				X					
18	X				X					
19	X				X					
20	X				X					
21	X				X					
22	X				X					
23	X				X					
24	X				X					
25			X							

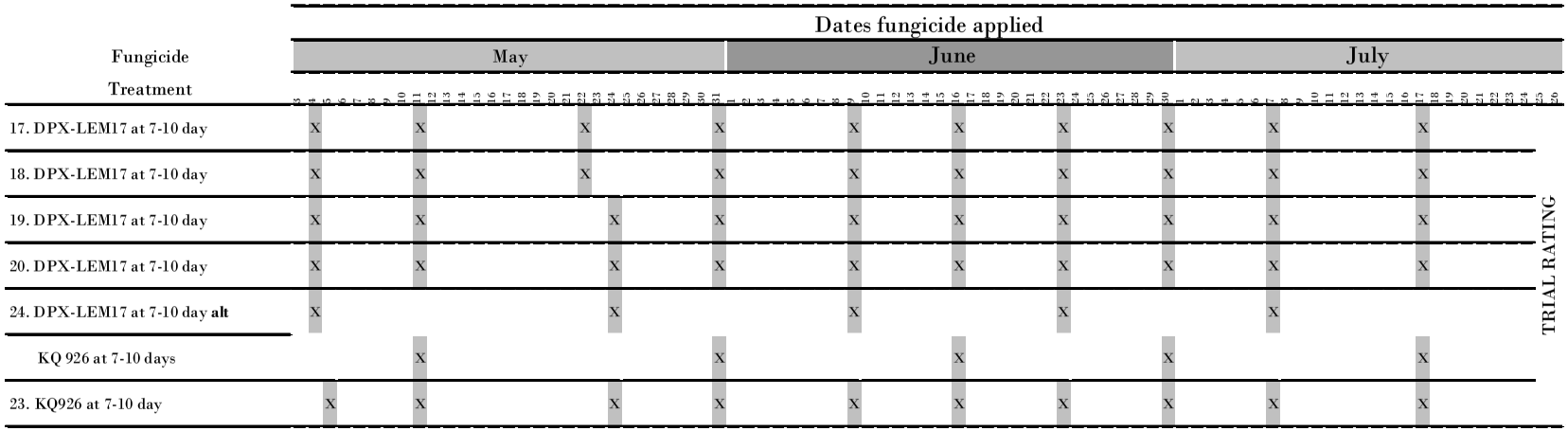
Date	30 June 2006		6 July 2006		7 July 2006		11 July 2006		13 July2006	
Vol	260 gal/acre		260 gal/acre		260 gal/acre		260 gal/acre		260 gal/acre	
1										
2										
3									X	
4									X	
5										
6										
7			X							
8			X							
9									X	
10									X	
11							X			
12							X			
13							X			
14			X							
15										
16									X	
17	X				X					
18	X				X					
19	X				X					
20	X				X					
21	X				X					
22	X				X					
23	X				X					
24	X				X					
25			X							

Date	14 July 2006		17 July 2006		20 July 2006	
Vol	260 gal/acre		260 gal/acre		260 gal/acre	
1						
2			X			
3						
4						
5	X	3.9 ml Vintage				
6	X	4.1 ml Rubigan				
7					X	
8					X	
9						
10						
11						
12						
13						
14						
15	X					
16						
17			X			
18			X			
19			X			
20			X			
21			X			
22			X			
23			X			
24			X			

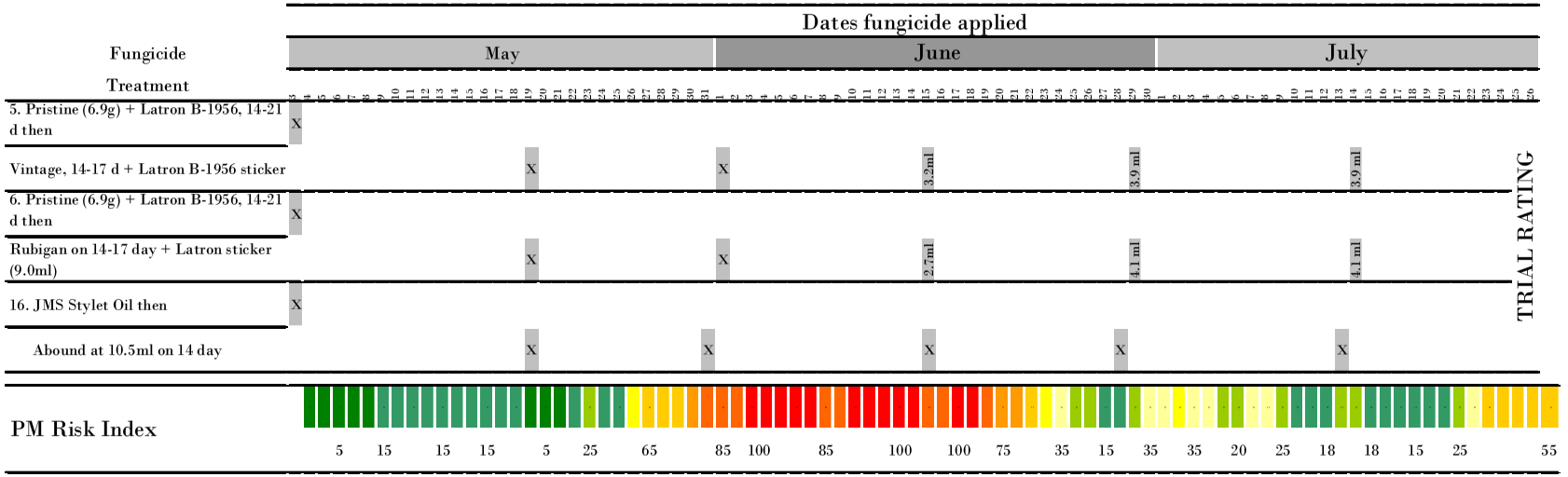
Additional notes on applications:

May 19, 2006: Disease spotted on one end vine within the trial.
22-26 May: Most products applied at 88% of acreage rate.
May 24: Disease spotted in one control vine—3 leaves.
May 31: Disease moving into controls. 10 % leaf infection, no fruit infection.
June 7: Disease on untreated leaves 50%, on fruit 2%.
June 9: Treatment 15- Both Flint and Elite were sprayed on the same day.
June 28: Began manual thinning of vines, which lasted one week.
June 29: Spray volume was increased from 190 gal/acre to 260 gal/acre.
July 20: Silwet L-77 sticker increased to 6.2 ml (per 4 plots) for treatments 7, 8, and 25.

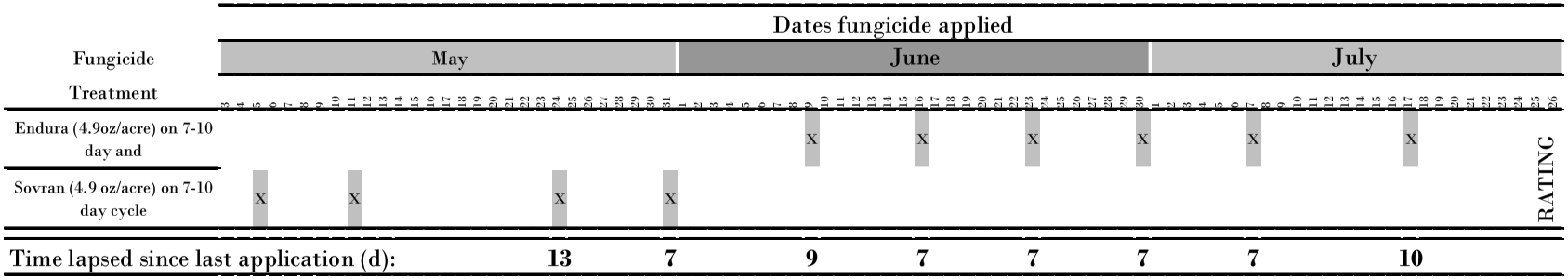
DPX-LEM17 SC and KQ926 applications



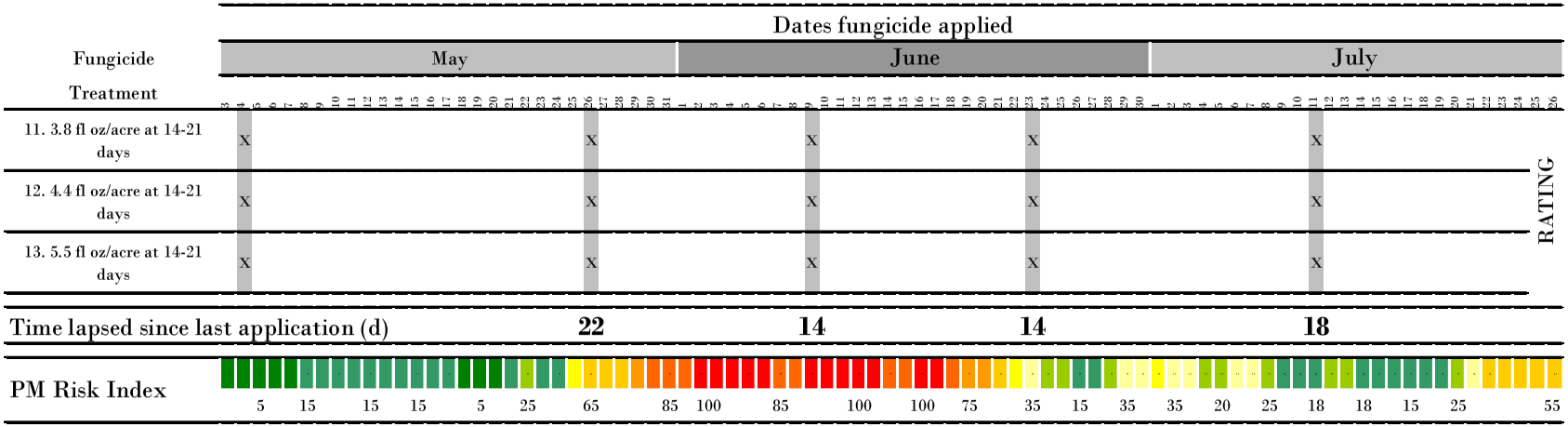
Vintage, Rubigan and Abound application frequency



Endura applications



Eminent applications



2e. Plot map

Trial V then Dirt Road

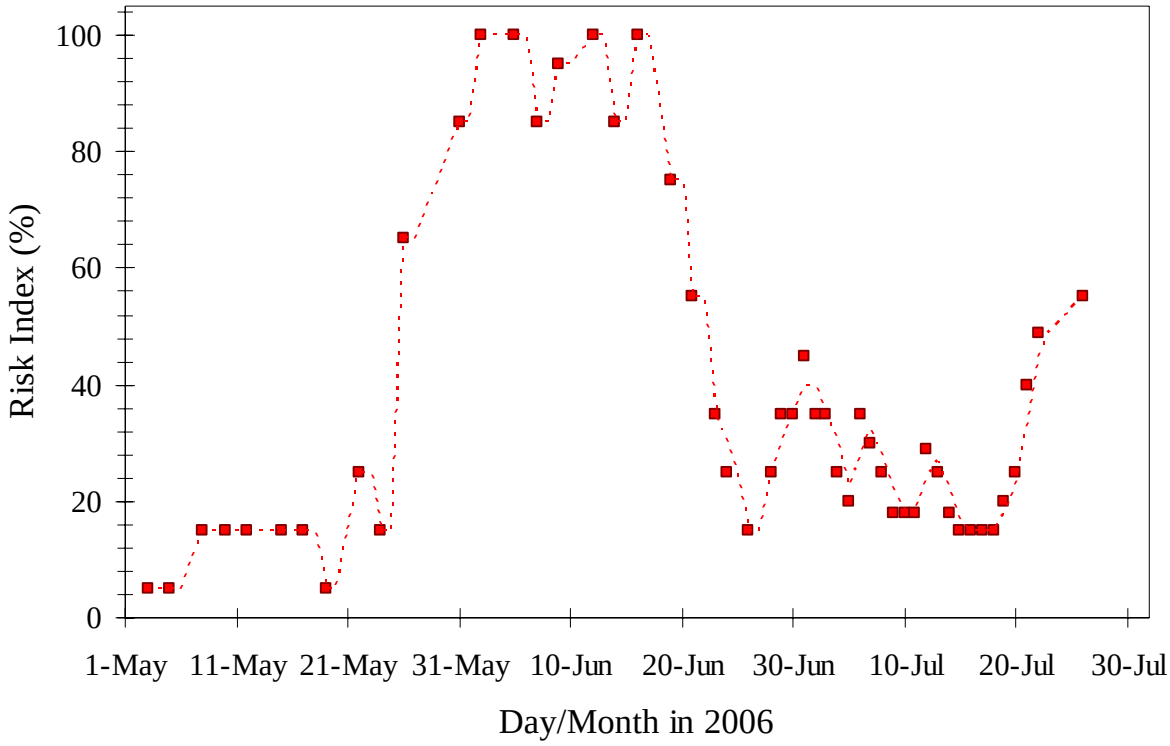
Row 65	Row 64	Row 63	Row 62	Row 61	Row 60	Row 59	Row 58
X	X	X	X	X	X	X	X
W	X	**BS**	**GS**	**KD**	X	**KC**	X
KC	**OKD**	**OD**	**LG**	**OKD**	**YD**	**GS**	**GD**
YC	**KD**	**GD**	**RD**	**GS**	**RC**	**W**	**KS**
P	**OKS**	**RKC**	X	**P**	**GD**	**P**	**YKC**
Pu	**OS**	**P**	**RC**	**RD**	**W**	**RKC**	**BS**
BS	**RD**	**Pu**	**OS**	**BS**	**OD**	**LG**	**OS**
YKS	**RC**	**YC**	**YRD**	**YKC**	**LG**	**YC**	**RD**
RKC	**GD**	**YKC**	**OKS**	**OS**	**YRD**	**KD**	**YRD**
GS	**LG**	**GKD**	**YD**	**RKC**	**YC**	**OKD**	**RKS**
YRD	**RKS**	**KS**	**YKS**	**KC**	**RKS**	**RC**	**YD**
YD	**KS**	**RKS**	**YS**	**KS**	**Pu**	**GKD**	**OKS**
GKD	**OD**	**OKD**	**KD**	**YS**	**GKD**	**OD**	**YKS**
YS	**YKC**	**KC**	**W**	**YKS**	**OKS**	**YS**	**Pu**
X	X	X	X	X	X	X	X
Block 4		**Block 3**		**Block 2**		**Block 1**	

Grass
Dirt Road
Waterway

X = vines not used in the experiment.

2f. Herzog Ranch 2006 PM risk index

All Risk Index data from: www.precisionagrilab.com/Diseasemaps

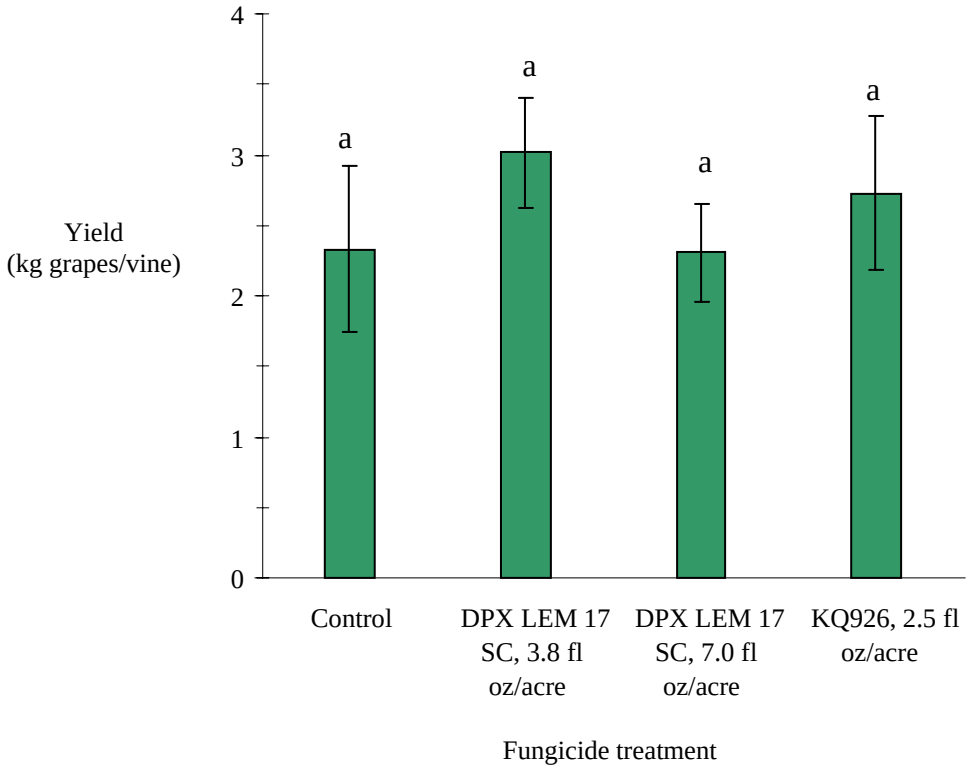


2g. Results

Table 1. Trial 2 mean powdery mildew severity (±1 S.E.). Non-significant groups of means are represented by the same letter (Tukey-Kramer test). All treatments consisted of 4 replicates.

Treatment description	Disease severity	Significance groups (at $p<0.05$)
Untreated control	99.9 (±0.1)	a
Sporan EC oil, 14 days, 4.4 pints/acre	56.3 (±15.5)	b
Micro 108 + Silwet L-77, 14 days, 6.5 oz/acre	49.6 (±15.7)	bc
Eminent, 14-21 days, 4.4 fl oz/acre	21.7 (±4.2)	bcd
Eminent, 14-21 days, 3.8 fl oz/acre	21.6 (±3.2)	bcd
Pristine then Vintage, 14-21 then 14-17 days	21.2 (±6.7)	cde
Sporan alt Quintec, 14 d, 4.4 pts/acre alt 4.4 fl oz/acre	19.3 (±3.2)	cdef
Procure, 14 days, 6.5 fl oz/acre	17.0 (±6.6)	cdefg
Flint alt Sovran alt Quintec alt Procure, 17-21 days	7.7 (±3.2)	defg
Elite alt Flint, 14 alt 21 days	6.9 (±2.9)	defg
DPX LEM 17 SC, 7-10 days, 2.2 oz ai/acre	5.6 (±1.0)	defg
Pristine then Rubigan, 14-21 then 14-17 days	4.7 (±1.3)	defg
Eminent, 14-21 days, 5,5 fl oz/acre	4.5 (±2.5)	defg
Procure alt Flint, 14 days, 6.5 fl oz/acre alt 2.2 oz/acre	4.2 (±0.7)	defg
USF2010, 21 days, 4.4 oz/acre	3.9 (±1.8)	defg
Quintec alt Sonata ASO + Silwet L-77, 14 days	3.6 (±2.1)	defg
Endura, Sovran mix, 7-10 days, 4.9 oz/acre	2.4 (±1.7)	defg
Abound, 14 days, 16.8 fl oz/acre	2.2 (±1.1)	defg
Flint alt Sonata ASO + Silwet L-77, 14 days	1.6 (±1.1)	efg
DPX LEM 17 SC alt KQ926, 7-10 days	1.5 (±0.6)	efg
KQ926, 7-10 days, 2.5 fl oz/acre	1.1 (±0.7)	fg
DPX LEM 17 SC, 7-10 days, 3.8 oz ai/acre	1.1 (±0.4)	fg
DPX LEM 17 SC, 7-10 days, 7.0 oz ai/acre	0.9 (±0.6)	g
DPX LEM 17 SC, 7-10 days, 5.5 oz ai/acre	0.7 (±0.3)	g
Quintec, 7-10 days, 3.3 fl oz/acre	0.5 (±0.3)	g

Figure 1. Mean per-vine grape yield (±1 S.E.) in selected treatments from trial 2. There was no significant difference between treatments (Type III, 2 factor ANOVA: p>0.6).



2h. Conclusions

Powdery mildew severity was reduced in all treatments relative to unsprayed controls. All 7-10 day treatments reduced powdery mildew cover below 6%. Several other products reduced PM severity to <10%, including Abound and USF2010. Dosage dependent-effects of DPX LEM 17 SC and Eminent fungicides on powdery mildew severity were implicated by the data, but because of low replication, *a posteriori* Tukey-Kramer comparisons did not show significant differences. For the subset of treatments investigated, there was no difference in fruit yield between control plots and sprayed plots.

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