Cooperative Research Project, Doug Gubler, U.C. Davis Dept. of Plant Pathology

Trial name.....	**Grape powdery mildew fungicide trial 2 2005**	Update: 31 May 05
Location.....	Courtland, Sacramento Co. (Herzog Ranch)	
Investigators	Doug Gubler, 530.752.0304	
Cooperators.....	John, Cathy, Randy Baranek, Tom Herzog, Herzog Ranch	
Crop.....	Grape 'Chardonnay'	
Disease.....	Powdery mildew, *Erysiphe necator*	

Method

Objective.....	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 5 replications.		
Application method	high pressure hand gun sprayer		
Vine spacing	7'	Row spacing	12'
Treatment unit	3 vines	Treatment unit area.....	252 ft^2
Area/Treatment, sq ft...	1260	Area/Treatment, acre	0. 0289256
Vol. Water/acre, gal.....	138	Vol. water/trt, gal.....	4-5.25 (6.25-7.5 gal tank)
Appox.App timing.....	A=budbreak; B = pre-bloom; C=bloom, D=berry set, E=pre-close, F=close, G=veraison		
		Evaluation stage.....	3 weeks after final app.

Protocol

	Colo	Sponsor	Materials	Appln	Interval	FP/A		FP/Trt		Notes	Tol	FP/tk
1	W	lab	Untreated								Y	
2	GS	lab	Sulfur DF	B-G	7-10	5	lb	65.7			Y	102.7
3	BD	lab	Abound	B-G	14	15.4	fl oz	13.19			Y	20.6
4	BS	lab	Flint	B-G	14	2	oz	1.64			Y	2.57
5	RKC	Biowork	MilStop	B-G	7-10	2.5	lb	32.86			Y	51.3
6	GKS	Biowork	MilStop	B-G	7-10	5.0	lb	65.72			Y	102.7
7	B	Biowork	MilStop alt/w Quintec 250SC	B-G C-G	10-14 14-21	2.5 5	lb foz	32.86 4.28			Y	51.3 6.69
8	KC	Biowork	Kaligreen + Latron	B-G	7-10	5 5	lb floz	65.72 4.28			Y	102.7 6.69
9	OD	Biowork	Kaligreen + Latron alt/w Quintec 250SC	B-F C-G	10-14 14-21	2.5 5 5	lb floz floz	32.86 4.28 4.28			Y	51.3 6.69 6.69
10	O	JMS	Stylet oil alt/w Abound	C-F D-G	14	2.76 15.4	gal fl oz	302.5 13.19		2%	Y	472.7 20.6
11	OC	JMS	Stylet oil alt/w Flint	C-F D-G	14	2.76 2	gal oz	302.5 1.64		2%	Y	472.7 2.57
12	OKD	Rotem BKG	Nutrol + Sulfur 80DF+ Breakthru	B-G	7-10	7 1.5 5.2	lb lb fl oz	92 19.72 4.45			Y	143.8 30.8 6.96
13	OKS	Rotem BKG	Peak-Vant + Sulfur 80DF	B-G	7-10	7 1.5	lb lb	92 19.72			Y	143.8 30.8
14	OS	Rotem BKG	Nutrol + Breakthru alt/w Quintec 250SC	B-F C-G	7-10 21	10 5.2 6	lb fl oz fl oz	131.4 4.45 5.14			Y	205.4 6.96 8.03
15	OYS	Rotem BKG	PeakVant alt/w Quintec 250SC	B-F C-G	7-10 21	10 6	lbs fl oz	131.4 5.14			Y	205.4 8.03
16	P	Ecosmar	Sporan 2 alt/w Sulfur 80DF	B-F C-G	7-10	1.38 5	gal lb	151.2 65.7		1%	Y	236.3 102.7
17	YC	Ecosmar	Sporan 2	B-G	7-10	1.38	gal	151.2		1%	Y	236.3
18	PKD	Ecosmar	Sporan 2	B-G	7-10	2.76	gal	302.5		2%	Y	472.7
19	R	PetroCan	Green alt/w Abound	B-F C-G	14	2.76 15.4	gal fl oz	302.5 13.19		2%	Y	472.7 20.6

	Colo	Sponsor	Materials	Appln	Interval	FP/A		FP/Trt		Notes	Tol	FP/tk
		PetroCa	15E alt/w	B-F	14	1.38	gal	151.2		1%	Y	236.3
20	RC	n	Abound	C-G		15.4	fl oz	13.19				20.6
		PetroCa	15E alt/w	B-F	14	1.38	gal	151.2		1%	Y	236.3
21	PU	n	Flint	C-G		2	oz	1.64				2.57
		PetroCa	Green	A,B	14	2.76	gal	302.5		2%	Y	472.7
22	RKD	n	Green	C-G	14	1.38	gal	151.2		1%		236.3
		NuFarm	Champ 2F +	B-G	7-10	2.3	pt	31.51			Y	49.2
23	RKS		Microsulf			5	lb	65.72				102.7
		PDB	Elexa 4x +	C-F	7-14	3.45	gal	378.1		2.5%	Y	590.8
			Silwett alt/w			5	floz	4.28		.03%		6.69
24	YKD		Sporan 2 4x	D-G	7-14	1.38	gal	151.2		1%		236.3
		PDB	Elexa 4x +	C-F	7-14	3.45	gal	378.1		2.5%	Y	590.8
			Silwett alt/w			5	floz	4.28		.03%		6.69
25	Y		Flint 3x	D-G	14-21	2	oz	1.64				2.57
		PDB	Elexa 4x +	C-F	7-14	3.45	gal	378.1		2.5%	Y	590.8
			Silwett alt/w			5	floz	4.28		.03%		6.69
26	YKC		Quintec 3x	D-G	14-21	6	floz	5.14				8.03
		PDB	Elexa 4x +	C-E	7-14	3.45	gal	378.1		2.5%	Y	590.8
			Silwett fol/by			5	floz	4.28		.03%		6.69
27	YKS		Flint 3x	FG	14-21	2	oz	1.64				2.57
28	YRD	NatInd	Micro 108	B-G	7-10	9	oz	7.39			Y	11.55

Notes:

1. Tol indicates whether all products in the treatment have an EPA tolerance for grapes, and the crop can be harvested.

Sponsor	Product	Active Ingr.	Conc.	Tol.	Mfr	Contact
Rotem BKG	Nutrol	monopotassiumphosphate phosphate P_2O_5 potash K_2O	0-52-34 52 34	Y	Rotem BKG	Ariana Cohen
	Peak-Vant	monopotassiumphosphate phosphate P_2O_5 potash K_2O	0-50-30 50% 30%	Y	Rotem BKG	
	Sulfur 80DF	sulfur		Y	Wilbur Ellis	
	Breakthru			Y	WFS	
	Quintec 250SC	quinoxyfen		Y	DowAgro	
Bioworks	Milstop	Potassium bicarbonate		Y	Bioworks	Randy Martin
	Quintec 250SC	Quinoxyfen		Y	DowAgro	
Ecosmart	Sporan 2			Y		Ramon Georges
JMS	Stylet oil	mineral oil		Y		Jeff Simons
	Abound 2.08F	azoxystrobin	300 g/L	Y		
	Flint 50WDG	trifolxystrobin	50%	Y		
Lab	Sulfur DF	sulfur	80%	Y	Wilbur Ellis	
	Abound 2.08F	azoxystrobin	300g/L	Y	Syngenta	
	Flint 50WG	trifloxystrobin	50%	Y	Bayer	
NuFarm	Champ 2F	Copper hydroxide		Y	NuFarm	Phil Grau
	Microsulf	Sulfur	80%	Y		
PetroCan	Puresrpay Green	petroleum oil (organic)		Y	PetroCanada	Michael Fefer
	Purespray 15E	petroleum oil		Y		
	Abound 2.08F	azoxystrobin	300 g/L	Y	Syngenta	
	Flint 50WDG	trifolxystrobin	50%	Y	Bayer	
Plant Def Booster	Elexa	chitosan	4%	Y	Glycogenisis	Steve Whitesides
	Flint 50WG	trifloxyrobin	50%	Y	Bayer	
	Quintec 250SC	quinoxyfen	250g/L	Y	DowAgro	
Natural Industries	Micro 108	*Streptomyces lydicus*	10^8CFU/g		Natural Industries	Tim Lichatowich

Materials

Applications

Date	**5/11**	**5/18**	**5/26**	**6/2**	**6/10**	**6/15**	**6/30**	**7/7**	**7/14**	**7/21**
App #	1	2	3	4	5	6	7	8	9	10
Stage										
Vol	138 gal/A	138 gal/A	138 gal/A	6 gla/trt	6 gla/trt	6 gla/trt	6 gla/trt	6 gla/trt	6 gla/trt	6 gla/trt
1										
2	AX	BX	CX	D	X	X	X	X	X	X
3	AX		X		X	2%Oil	X		X	
4	AX		X		X	2%Oil	X		X	
5	X	X	X	X	X	2%Oil	X	X	X	X
6	X	X	X	X	X	2%Oil	X	X	X	X
7	X		X	X	X	2%Oil	X		X	
8	X sulfur	X	X	X	X	2%Oil	X	X	X	X
9	X Sulfur, SnotKal		X	X	X	2%Oil	X		X	
10	X		X		X	2%Oil	X		X	
11	X		X		X	2%Oil	X		X	
12	X	X	X **2.5L bp	X	X	X	X	X	X	X
13	X	X	X **2.5L bp	X	X	X	X	X	X	X
14	X	X	X **2.5L bp	X	X	2%Oil	X			X
15	X	X	X 2.5L bp	X	X	2%Oil	X			X
16	X	X	X 2.5L bp		X	2%Oil	X	X	X	X
17	X	X	X 2.5L bp	X	X	2%Oil	X	X	X	X
18	X	X	X 2.5L bp	X	X	2%Oil	X	X	X	X
19	X		X 2.5L bp		X	2%Oil	X		X	
20	X		X 2.5L bp		X	2%Oil	X		X	
21	X		X		X	2%Oil	X		X	
22	X		X		X	2%Oil	X		X	
23	X	X	X	X	X	X	X	X	X	X
24	X	X	X	X	X	2%Oil	X	X	X	X
25	X	X	X	X	X	2%Oil	X	X		X
26	X	X	X	X	X	2%Oil	X	X		X
27	X	X	X 2.5L bp	X	X	2%Oil	X	X		X
28	X	X	X	X	X	2%Oil	X	X	X	X

Detailed fungicide applications

Trt#	Materials	5/11	5/18	5/26	6/2	6/10	6/15	6/30	7/7	7/14	7/21
1	Untreated										
2	Sulfur DF	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7
3	Abound	13.19		13.19		13.19	2%Oil	13.19		13.19	
4	Flint	1.64		1.64		1.64	2%Oil	1.64		1.64	
5	MilStop	32.86	32.86	32.86	32.86	32.86	2%Oil	32.86	32.86	32.86	32.86
6	MilStop	65.72	65.72	65.72	65.72	65.72	2%Oil	65.72	65.72	65.72	65.72
	MilStop alt/w	32.86		32.86		32.86	2%Oil			32.86	
7	Quintec 250SC			4.28	4.28			4.28			
	Kaligreen +	65.72	65.72	65.72	65.72	65.72	2%Oil	65.72	65.72	65.72	65.72
8	Latron	4.28	4.28	4.28	4.28	4.28		4.28	4.28	4.28	4.28
	Kaligreen +	32.86		32.86		32.86	2%Oil			32.86	
	Latron alt/w	4.28		4.28		4.28				4.28	
9	Quintec 250SC				4.28			4.28			
	Stylet oil alt/w	302.5		302.5		302.5	2%Oil			302.5	
10	Abound			13.19				13.19			
	Stylet oil alt/w	302.5		302.5		302.5	2%Oil			302.5	
11	Flint			1.64				1.64			
	Nutrol +	92	92	92	92	92	92	92	92	92	92
	Sulfur 80DF+	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72
12	Breakthru	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
	Peak-Vant +	92	92	92	92	92	92	92	92	92	92
13	Sulfur 80DF	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72	19.72
	Nutrol +	131.4	131.4	131.4		131.4	2%Oil				131.4
	Breakthru alt/w	4.45	4.45	4.45		4.45					4.45
14	Quintec 250SC	5.14			5.14			5.14			
	PeakVant alt/w	131.4	131.4	131.4		131.4	2%Oil				131.4
15	Quintec 250SC			5.14	5.14			5.14			
	Sporan 2 alt/w	151.2	151.2	151.2		151.2	2%Oil		151.2		151.2
16	Sulfur 80DF			65.7				65.7		65.7	
17	Sporan 2	151.2	151.2	151.2	151.2	151.2	2%Oil	151.2	151.2	151.2	151.2
18	Sporan 2	302.5	302.5	302.5	302.5	302.5	2%Oil	302.5	302.5	302.5	302.5
	Green alt/w	302.5		302.5		302.5	2%Oil			302.5	
19	Abound			13.19				13.19			
	15E alt/w	151.2		151.2		151.2	2%Oil			151.2	
20	Abound			13.19				13.19			
	15E alt/w	151.2		151.2		151.2	2%Oil			151.2	
21	Flint			1.64				1.64			
	Green	302.5		302.5		302.5	2%Oil	302.5		302.5	
22	Green										
	Champ 2F +	31.51	31.51	31.51	31.51	31.51	31.51	31.51	31.51	31.51	31.51
23	Microsulf	65.72	65.72	65.72	65.72	65.72	65.72	65.72	65.72	65.72	65.72
	Elexa 4x +	378.1	378.1	378.1			2%Oil	378.1		378.1	
	Silwett alt/w	4.28	4.28	4.28				4.28		4.28	
24	Sporan 2 4x		151.2		151.2	151.2			151.2		151.2

	Elexa 4x +	378.1	378.1	378.1			2%Oil	378.1			
	Silwett alt/w	4.28	4.28	4.28				4.28			
25	Flint 3x		1.64		1.64	1.64			1.64		1.64
	Elexa 4x +	378.1	378.1	378.1			2%Oil	378.1			
	Silwett alt/w	4.28	4.28	4.28				4.28			
26	Quintec 3x		5.14		5.14	5.14			5.14		5.14
	Elexa 4x +	378.1	378.1	378.1			2%Oil	378.1			
	Silwett fol/by	4.28	4.28	4.28				4.28			
27	Flint 3x		1.64		1.64	1.64			1.64		1.64
28	Micro 108	7.39	7.39	7.39	7.39	7.39	2%Oil	7.39	7.39	7.39	7.39

Calendar

Date	Activity
Week of 5/8/05	Cool and rainy
Week of 5/15/05	Started off cool rainy and then on 19-20 moderate temps. 21st, 22nd hot but rai gained pts on both days
5/26	Sprayed some trtmts with backpack. Reduced vol to 3 gal/trtmt.
6/10	High disease presence due to weather conditions and no leaf removal
6/16	Sprayed stylet oil for all treatments, including guard rows and end vines of each row.
7/21	Last day to spray
8/8	Disease rating. Severity of 35 clusters in each plot (replication) was evaluated.

TRIAL 2 PLOT MAP

N

67	66	65	64	63	62	61	60	59
YKS	PKD	B	OC	P	O	OKD	OKS	Y
W	O	RKC	PU	RKS	BS	KC	BD	OYS
RKD	BS	KC	YKD	OS	OD	YKS	YRD	RC
OKS	OKD	OD	RKS	OC	PU	PKD	RKD	B
OYS	GS	RC	P	R	YKC	RKC	W	YKD
GKC	YKC	Y	YC	GS	GKC	YC	OD	RKC
BD	YRD	OS	R	P	YKC	YRD	W	R
RC	OKD	PU	OC	RC	Y	OYS	OS	PU
R	GKC	KC	GS	KC	RKD	O	OKD	RKS
B	RKS	RKC	YKC	OKS	YC	OC	BD	BS
PKD	OS	OD	YC	PKD	GKC	GS	YKS	YKD
YKS	BD	OYS	O	B	RKC	YC	PU	O
OKS	W	YKD	RKD	R	GS	W	PKD	OS
Y	BS	P	OYS	YRD	B	OKD	OC	Y
YRD	RC	OS	P	BD	YKD	OD	X	X
BS	OKS	RKS	Y	RKD	X	X	X	
KC	GKC	YKC	X	X	X			
YKS	X	X	X					
X	X							

Results

Thirty five clusters from each plot (3 vines) were evaluated for powdery mildew on August 8, 2005. Disease severity on each cluster was rated as percentage of berries with symptoms over the total number of berries in the cluster. Incidence was calculated as percentage of number of clusters with powdery mildew over the total number of cluster in the plot (35 clusters in this observation). The data was analyzed by using SAS program. Analysis of variance was performed by GLM procedure and treatment effects were examined with multiple comparison statement by Duncan's test at P=0.05.

There was a treatment effect and all treatments significantly reduced powdery mildew severity and incidence (Table 1). In this case, Flint, Elexa alternated with either Flint or Quintec, Nutrol + Breakthru alternated with Quintec, and PeakVant alternated with Quintec were the most effective applications. Sporan, Sulfur, and Stylet oil were less effective. Elexa alternated with Sporan was not as effective as Elexa alternated with either Quintec or Flint. MilStop was more effective used alone than alternated with Quintec. PeakVant was better alternated with Quintec than alterlated with Sulfur. Higher dosage increased the efficacy of fungicides, such as Sporan, and MilStop. Abound, Micro 108, JMS Stylet Oil, Green, and Kaligreen performed in the middle range.

TABLE 1. Powdery mildew rating in trial 2

Trt#	Treatment	Severity (%)	Incidence (%)
4	Flint	1.84p	24.22k
26	Elexa+ Silwett alt/w Quintec	1.87p	24.32kj
25	Elexa + Silwet alt/w Flint	2.14p	33.33kj
14	Nutrol + Breakthru alt/w Quintec	3.80po	53.53i
27	Elexa + Silwett fol/by Flint	3.97po	40.00j
12	Nutrol + Sulfur + Breakthru	7.92no	55.23i
15	PeakVant alt/w Quintec	9.26n	57.32i
24	Elexa+ Silvwett alt/w Sporan	12.11nm	67.86h
23	Champ 2F + Microsulf	14.16ml	52.50i
8	Kaligreen + Latron	17.22kl	74.86fgh
10	Stylet oil alt/w Abound	17.77kjl	81.60fe
5	MilStop	18.51kjl	76.02fgh
22	Green	18.62kjl	91.72dbac
19	Green alt/w Abound	19.90kji	87.57de
6	MilStop	22.40hji	100.00a
20	15E alt/w Abound	24.06hgi	91.43dbac
9	Kaligreen + Latron alt/w Quintec	25.05hg	73.99gh
28	Micro 108	26.01hg	78.16fg
3	Abound	27.56fg	80.11fg
11	Stylet oil alt/w Flint	31.69fe	89.38dec
17	Sporan 2	35.59e	99.42ba
2	Sulfur DF	41.90d	98.30bac
21	15E alt/w Flint	42.73bc	99.42ba
16	Sporan 2 alt/w Sulfur	46.47bc	95.48dbac
7	MilStop alt/w Quintec	47.44c	100.00a
13	Peak-Vant + Sulfur	57.07b	100.00a
18	Sporan 2	59.44b	90.91dbec
1	Untreated	100.00a	100.00a

Values in a column followed by the same letter are not significantly different according to Duncan's test at P=0.05.