

Evaluation of fungicide programs for control of powdery mildew on grapevines, 2021.

Experimental and registered fungicides were tested in various combinations for the control of powdery mildew in a 10-yr-old 'Chenin Blanc' vineyard at the University of California Davis Plant Pathology Field Research Facility in Davis, CA. Rows were spaced 11 feet apart and vines 7 feet apart. Fungicide treatments were applied from mid-Apr until mid-Jul. The spray volume was gradually increased from 50 to 150 gal/A as the vines grew to ensure complete coverage. Treatments were applied to run-off using a mist blower backpack sprayer (Stihl SR 450). Treatments were performed in a complete randomized block design with four replicates of two vines each. Trial I consisted of synthetic fungicides and combinations of soft chemistry and synthetic products. Trial II consisted of soft chemistry products, including biologicals, sulfurs, nutrient applications, oils, and other materials. Spray frequencies varied from 7-day to 21-day intervals. During the spray period, vines were irrigated by drip irrigation. Sucker shoot removal and leafing were carried out on 19 Jun. Treatments were evaluated for disease incidence and severity on 20 Jul. A total of twenty-five random clusters were evaluated per replicate. Incidence was defined as the proportion of clusters in a plot showing symptoms and/or signs of powdery mildew. Severity was determined by estimating the percentage of the 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. Trials data were analyzed using ANOVA and means were compared using Fisher's LSD test ($\alpha=0.05$).

Temperatures were mild and dry throughout the growing season, five precipitation events of 0.02, 0.01, 0.02, 0.01, and 0.08 in. were recorded on 2, 20, and 25 Apr, 13, and 14, respectively. First signs of powdery mildew were observed in mid-May on leaves and in mid-Jun on berries. Overall, the disease pressure was low. By the time of evaluation, disease incidence and severity in the untreated control had reached 71% and 46.1%, respectively. All treatments showed a significant reduction in disease incidence and severity compared to the untreated control in both trials. In Trial I, a program consisting of synthetic fungicides and combinations of soft chemistry alternated with synthetic products completely controlled the disease, except for ReyZox 15.1 fl oz, which was the least effective treatment. The experimental materials in rotation and combination with conventional fungicides also provided satisfactory disease control. In Trial II, programs consisting of sulfur at various concentrations completely controlled the disease. Similarly, programs of sulfur in rotation with experimental fungicides also provided very good control. The least effective treatment was MinerALL 4.25 lb/100 gal. All other treatments provided at least 75% or greater control of disease severity. Phytotoxicity was observed on berries for treatment EXP1 256 fl oz + Dyne-Amic 0.125 % v/v, and on leaves for treatment PureSpray Green 1 gal (pre-bloom), then Sulfur Dry-Flowable 5 lb (after bloom) and for treatment PureSpray Foliar 22 E 0.5 gal (pre-bloom), then Sulfur Dry-Flowable 5 lb (after-bloom).

Trial I

Treatment and rate/A ^z	Application date (Julian day)	Powdery mildew on the cluster ^y	
		Incidence, %	Severity, %
Luna Experience 8.6 fl oz	102, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
Vivando 10.3 oz	103, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
Rally 5 fl oz,	103		
Quintec 5 fl oz	117		
Mettle 4 fl oz	131		
Pristine 18.5 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz	158		
Luna Experience 8.6 fl oz	172		
Vivando 15 fl oz	189		
Rally 5 fl oz + Embrace EA 16 fl oz	104		
Quintec 5 fl oz + Embrace EA 16 fl oz	117		
Mettle 4 fl oz + Embrace EA 16 fl oz	131		
Pristine 18.5 fl oz + Embrace EA 16 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz + Embrace EA 16 fl oz	158		
Luna Experience 8.6 fl oz + Embrace EA 16 fl oz	172		
Vivando 15 fl oz + Embrace EA 16 fl oz	189		
Rally 5 fl oz + Syl-Tac EA 16 fl oz	104		
Quintec 5 fl oz + Syl-Tac EA 16 fl oz	117		
Mettle 4 fl oz + Syl-Tac EA 16 fl oz	131		
Pristine 18.5 fl oz + Syl-Tac EA 16 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz + Syl-Tac EA 16 fl oz	158		
Luna Experience 8.6 fl oz + Syl-Tac EA 16 fl oz	172		
Vivando 15 fl oz + Syl-Tac EA 16 fl oz	189		
Rally 5 fl oz + OR-278-F 32 fl oz	104		
Quintec 5 fl oz + OR-278-F 32 fl oz	117		
Mettle 4 fl oz + OR-278-F 32 fl oz	131		
Pristine 18.5 fl oz + OR-278-F 32 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz + OR-278-F 32 fl oz	158		
Luna Experience 8.6 fl oz + OR-278-F 32 fl oz	172		
Vivando 15 fl oz + OR-278-F 32 fl oz	189		

Rally 5 fl oz + OR-009-E 32 fl oz	104		
Quintec 5 fl oz + OR-009-E 32 fl oz	117		
Mettle 4 fl oz + OR-009-E 32 fl oz	131		
Pristine 18.5 fl oz + OR-009-E 32 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz + OR-009-E 32 fl oz	158		
Luna Experience 8.6 fl oz + OR-009-E 32 fl oz	172		
Vivando 15 fl oz + OR-009-E 32 fl oz	189		
Rally 5 fl oz + OR-295-E 32 fl oz	104		
Quintec 5 fl oz + OR-295-E 32 fl oz	117		
Mettle 4 fl oz + OR-295-E 32 fl oz	131		
Pristine 18.5 fl oz + OR-295-E 32 fl oz	144	0.0 a	0.0 a
Inspire Super 20 fl oz + OR-295-E 32 fl oz	158		
Luna Experience 8.6 fl oz + OR-295-E 32 fl oz	172		
Vivando 15 fl oz + OR-295-E 32 fl oz	189		
Gatten 6.4 fl oz + Dyne-Amic 0.25% v/v	104, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
Cevya 5 oz + Dyne-Amic 0.125% v/v	104, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
Ninja/SP2700 SP 2% 8 oz + Capsil 12 fl oz	104, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
PureSpray Green 1 gal	104, 111, 118, 125, 132, 139		
Inspire Super 20 fl oz	146		
Luna Experience 8.6 fl oz	160	0.0 a	0.0 a
Vivando 15 fl oz	174		
Merivon 4 fl oz	190		
PureSpray Foliar 22 E 0.5 gal	104, 111, 118, 125, 132, 139		
Inspire Super 20 fl oz	146		
Luna Experience 8.6 fl oz	160	0.0 a	0.0 a
Vivando 15 fl oz	174		
Merivon 4 fl oz	190		
Microthiol Disperss 5 lb	103, 118, 132, 146, 160, 174, 190		
EXP14 3 lb + Embrace-EA 16 fl oz	111, 125, 139, 153, 167, 181	0.0 a	0.0 a
Microthiol Disperss 5 lb	104, 118, 132, 146, 160, 174, 190		
EXP14 3 lb+ Glacier EA 16 fl oz	111, 125, 139, 153, 167, 181	0.0 a	0.0 a
Microthiol Disperss 5 lb	103, 118, 132, 146, 160, 174, 190		
EXP14 3 lb + Syl-Coat 4 fl oz	111, 125, 139, 153, 167, 181	0.0 a	0.0 a
Sulfur DF 5 lb	102		
BTS-EXP-100 27.4 fl oz	117		
Quintec 4 fl oz	131		
Mettle 4 fl oz	144	0.0 a	0.0 a
BTS-EXP-100 27.4 fl oz	158		
Inspire Super 20 fl oz	172		
Luna Experience 8.6 fl oz	189		
Flint Extra 3.5 oz + Syl-Coat 0.125% v/v	102		
Prolivo 5 oz + Syl-Coat 0.125% v/v	117		
Luna experience 6.4 oz + Syl-Coat 0.125% v/v	131		
Quintec 4 oz + Syl-Coat 0.125% v/v	144	0.0 a	0.0 a
Torino 3.4 oz + Syl-Coat 0.125% v/v	158		
Luna Sensation 6.4 oz + Syl-Coat 0.125% v/v	172		
Vivando 15.4 fl oz + Syl-Coat 0.125% v/v	189		
Trionic 8 oz + Microthiol Disperss 3 lb	103		
Quintec 4 oz + Microthiol Disperss 3 lb	117		
Rhyme 5 oz + Microthiol Disperss 3 lb	131		
Inspire Super 20 oz + Microthiol Disperss 3 lb	144	0.0 a	0.0 a
Torino 3.4 oz + Microthiol Disperss 3 lb	158		
Torino 3.4 oz + PHD 6.2 oz + Microthiol Disperss 3 lb	172		
Luna Experience 8.6 oz + Microthiol Disperss 3 lb	189		
Trionic 8 oz + Vacciplant 16 oz + Microthiol Disperss 3 lb	103		
Quintec 4 oz + Microthiol Disperss 3 lb	117		
Trionic 8 oz + Vacciplant 16 oz + Microthiol Disperss 3 lb	131		
Inspire Super 20 oz + Microthiol Disperss 3 lb	144	0.0 a	0.0 a
Torino 3.4 oz + PHD 6.2 oz + Microthiol Disperss 3 lb	158		
Vacciplant 16 oz + Luna Experience 8.6 fl oz + Microthiol Disperss 3 lb	172		
Vivando 15fl oz	189		
Quintec 5 fl oz	131		
Esendo 2.8 lb + Syl-Coat 0.125% v/v	144		
Pristine 18.5 fl oz	158	0.0 a	0.0 a
Inspire Super 20 fl oz	172		
Esendo 2.8 lb + Syl-Coat 0.125% v/v	189		

Quintec 5 fl oz	131		
Quintec 2 fl oz + Howler 2.5 lb + Syl-Coat 0.125%	144		
Pristine 18.5 fl oz	158	0.0 a	0.0 a
Inspire Super 20 fl oz	172		
Quintec 2 fl oz + Howler 2.5 lb + Syl-Coat 0.125%	189		
Quintec 5 fl oz	131		
Theira 3 lb + Syl-Coat 0.125% v/v	144		
Pristine 18.5 fl oz	158	0.0 a	0.0 a
Inspire Super 20 fl oz	172		
Theira 3 lb + Syl-Coat 0.125% v/v	189		
Parade 3.1 fl oz + Dyne-Amic 0.25% v/v	104, 117, 131, 144, 158, 172, 189	0.0 a	0.0 a
Proливо 5 oz + Syl-Coat 4 fl oz/100 gal	103, 117, 131, 144, 158, 172, 189	1.0 a	0.0 a
Trionic 8 oz + Microthiol Disperss 3 lb	103		
Quintec 4 oz + Microthiol Disperss 3 lb	117		
Trionic 8 oz + Microthiol Disperss 3 lb	131		
Inspire Super 20 oz + Microthiol Disperss 3 lb	144	1.0 a	0.0 a
Torino 3.4 oz + Microthiol Disperss 3 lb	158		
Torino 3.4 oz + PHD 6.2 oz + Microthiol Disperss 3 lb	172		
Luna Experience 8.6 oz + Microthiol Disperss 3 lb	189		
ReyZox 11.8 fl oz	102, 117, 131, 144, 158, 172, 189	1.0 a	0.10 a
Quintec 5 fl oz	131		
Howler 5 lb + Syl-Coat 0.125% v/v	144		
Pristine 18.5 fl oz	158	4.0 ab	0.7 a
Inspire Super 20 fl oz	172		
Howler 5 lb + Syl-Coat 0.125% v/v	189		
ReyZox 18.4 fl oz	102, 117, 131, 144, 158, 172, 189	8.0 ab	0.89 a
ReyZox 15.1 fl oz	102, 117, 131, 144, 158, 172, 189	14.0 b	1.50 a
Untreated control	Not Applicable	71.0 c	46.1 b
LSD		9.7	8.9

^z Products with a '+' sign in between indicates a tank mix.

^y Means followed by the same letter within a column are not significantly different according to Fisher's LSD with $\alpha=0.05$.

Trial II

Treatment and rate/A	Application date (Julian day)	Powdery mildew on the cluster ^y	
		Incidence, %	Severity, %
Microthiol disperss 3 lb	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
Microthiol disperss 4 lb	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
Microthiol disperss 5 lb	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
Sulfur Dry-Flowable 5 lb	104		
CeraSulfur (BC1320) 3.3 pt	111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
Sulfur Dry-Flowable 5 lb	104		
CeraSulfur (BC1320) 5.5 pt	111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
Sulfur Dry-Flowable 5 lb	104		
CeraSulfur (BC1320) 4.38 pt	111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
PureSpray Foliar 22 E 0.5 gal	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
PureSpray Green 1 gal	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
PureSpray Green 1 gal	104, 111, 118, 125, 132		
Sulfur Dry-Flowable 5 lb	139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
microSURE™ 4.36 gal	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
NSTKI-014 5 lb	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a
NSTKI-014 3 lb	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	0.0 a	0.00 a

NSA 1% v/v + Nordox 4 oz/100 gal + HML Silco 2 pt/100 gal	104, 118, 132		
NSA 1% v/v + Sulfur Dry-Flowable 5 lb+ HML Silco 1 qt/100 gal	111, 125,	0.0 a	0.00 a
NSA 1% v/v + Nordox 4 oz/100 gal + HML Potum 2.5 lb/100 gal,	139, 153, 167, 181		
NSA 1% v/v + HML Potum 2.5 lb/100 gal+ HML Silco 1 qt/100 gal	146, 160, 174, 190		
NSA 1% v/v + Nordox 4 oz/100 gal+ HML Silco 1 qt /100 gal	104, 118, 132		
NSA 1% v/v + HML Potum 2.5 lb/100 gal + HML Silco 1 qt/100 gal	111, 125,	0.0 a	0.00 a
NSA 1% + Nordox 34 oz/100 gal + HML Potum 2.5 lb/100 gal	139, 153, 167, 181		
NSA 1% v/v + HML Potum 2.5 lb/100 gal + HML Silco 1 qt/100 gal	146, 160, 174, 190		
Sulfur Dry flowable 5 lb	102, 111, 118, 125, 132	1.0 a	0.05 a
BTS-EXP-100 27.4 fl oz + Kinetic Adj 0.125% v/v	139, 146, 153, 160, 167, 174, 181, 190		
NSA 1.4 % v/v	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	1.0 a	0.01 a
Regalia 2 qt	103, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	1.0 a	0.02 a
PureSpray Foliar 22 E 0.5 gal	104, 111, 118, 125, 132	2.0 a	0.06 a
Sulfur Dry-Flowable 5 lb	139, 146, 153, 160, 167, 174, 181, 190		
Sulfur Dry flowable 5 lb	104, 111, 118, 125, 132	2.0 a	0.04 a
BTS-EXP-100 27.4 fl oz	139, 146, 153, 160, 167, 174, 181, 190		
EXP1 256 fl oz + Dyne-Amic 0.125% v/v	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	3.0 a	0.60 a
MinerALL 8.5 lb/100 gal	102, 117, 131, 144, 158, 172, 189	4.0 ab	0.99 a
EXP2 128 fl oz + Dyne-Amic 0.125% v/v	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	6.0 abc	0.55 a
OR 009-A 50 fl oz	104, 117, 131, 144, 158, 172, 189	12.0 abcd	1.30 a
Nanospada 3.3 gal/100 gal	104, 111, 118, 125, 132, 139, 146, 153, 160, 167, 174, 181, 190	13.0 abcd	1.03 a
CS 2005 20 oz/100 gal	104, 117, 131, 144, 158, 172, 189	17.0 abcd	5.52 ab
Boost Biomes BC18 5*10 ¹³ CFU	104, 117, 131, 144, 158, 172, 189	22.0 bcd	2.65 ab
Serenade ASO 4 qt	102, 117, 131, 144, 158, 172, 189	24.0 cd	5.19 ab
MinerALL 4.25 lb/100 gal	102, 117, 131, 144, 158, 172, 189	26.0 d	12.02 b
Untreated Control	Not Applicable	71.0 e	46.13 c
LSD		16.8	9.5

^z Products with a '+' sign in between indicate a tank mix.

^y Means followed by the same letter within a column are not significantly different according to Fisher's LSD test ($\alpha=0.05$).