Evaluation of fungicide programs for management of Botrytis bunch rot of grapes: 2015 field trial

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Summary

Bunch rot of grapes is caused by *Botrytis cinerea*, a fast-growing pathogen infecting numerous crops of commercial value. Bunch rot leads to a reduction in the yield and quality of table, raisin, and wine grapes, with high economic losses in some locations or years (Flaherty et al. 1992). Botrytis overwinters as sclerotia in mummified berries on the vine or ground or on dormant canes. The disease may first appear as shoot blight following frequent spring rains; flowers can become infected during bloom (Bulit and Dubos 1988). In infected fruits, disease symptoms are latent until late in the season. As sugar concentration increases in the berry, the fungus resumes growth and infects the entire fruit, often resulting in berry splitting and sporulation on the fruit surface (Flaherty et al. 1992). Free water is a requirement for the pathogen, and favorable conditions include humidity's exceeding 90% and temperatures between 15-27° (Bulit and Dubos 1988, Gubler et al. 2008, Steel et al., 2011). Along with leaf removal and other cultural controls, good spray coverage with a synthetic fungicide is currently the most effective form of disease management.

We examined the efficacy of 19 fungicide treatment programs for control of Botrytis bunch rot in Chardonnay grapes in Napa County, California in 2015. Materials included synthetic, biological, and organic treatments. Three applications were made between May and July 2015. Overall disease pressure was low.

Materials and Methods

A. Experimental design

The field trial were conducted using completely randomized design, with plot consisting of 2 adjacent vines (11 ft row spacing and 5 ft vine spacing). Each treatment consisted of 4 replicates (0.0101 acres). Fungicides were applied with backpack sprayers. Three applications were made during the growing season: May 6 (bloom), Jun 10 (pre-close), Jul 27 (veraison). Each application was made in 200 gallons/acre of water (2.0 gallons/treatment). Other pesticides were applied between bloom and harvest by the commercial vineyard managers for control of powdery mildew and vine mealy bug.

B. Experimental treatments

Table 1: Experimental fungicide treatments. "alt" = alternated with; "FP" = formulated product

No.	Flag	Product(s)	FP[1]/Acre	FP/Treatment
1	W	Untreated	none	none
2	BS	Pristine + Syl-Coat	23 oz + 8 fl/ 100 gal	6.6 g + 4.7 ml
3	YKS	Luna Tranquility + Syl-Coat	16 fl oz + 6.4 fl oz/ 100 gal	4.8 ml + 3.8 ml
4	GD	(Luna Experience then Serenade Optimum then Luna Tranquility) + Syl-Coat	(8.6 fl oz then 16 oz then 16 fl oz) + 6.4 fl oz/ 100 gal	(2.6 ml then 4.6 g then 4.8 ml) + 3.8 ml
5	YC	(Luna Experience then Serenade Optimum + Scala then Luna Tranquility) + Syl-Coat	(8.6 fl oz then 8 oz + 9 fl oz then 16 fl oz) + 6.4 fl oz/ 100 gal	(2.6 ml then 2.3 g + 2.7 ml then 4.8 ml) + 3.8 ml
6	RD	(Luna Experience then Elevate then Luna Tranquility) + Syl-Coat	(8.6 fl oz then 16 oz then 16 fl oz) + 6.4 fl oz/ 100 gal	(2.6 ml then 4.6 g then 4.8 ml) + 3.8 ml
7	PKS	K-PHITE 7LP + Tactic	3 qt + 6 fl oz/100 gal	28.7 ml + 3.5 ml
8	OS	K-PHITE 7LP + Latron	3 qt + 6 fl oz/100 gal	28.7 ml + 3.5 ml
9	YD	(Vangard (2x) then Elevate) + Dyneamic	(10 oz (2x) then 16 oz) + 0.25% (v/v)	(2.9 g (2x) then 4.5 g) + 18.9 ml
10	YKC	(Vangard then Fracture then Elevate) + Dyneamic	(10 oz then 18.3 fl oz then 16 oz) + 0.25% (v/v)	(2.9 g then 5.5 ml then 4.5 g) + 18.9 ml
11	KS	(Vangard then Fracture then Elevate) + Dyneamic	(10 oz then 24.4 fl oz then 16 oz) + 0.25% (v/v)	(2.9 g then 7.2 ml then 4.5 g) + 18.9 ml
12	RKD	(Fracture then Vangard then Elevate) + Dyneamic	(24.4 fl oz then 10 oz then 16 oz) + 0.25% (v/v)	(7.2 ml then 2.9 g then 4.5 g) + 18.9 ml
13	K	(Elevate then Fracture then Vangard) + Dyneamic	(16 oz then 24.4 fl oz then 10 oz) + 0.25% (v/v)	(4.5 g then 7.2 ml then 2.9 g) + 18.9 ml
14	GKS	GOP-Bran + GOP-1 Oil	7 oz/25 gal + 32 oz/25 gal	15.9 g + 75.7 ml
15	KD	Kenja 400SC	20 fl oz	6 ml
16	GS	Kenja 400SC	22 fl oz	6.6 ml
17	YS	AG Copp 75 + Microthiol Disperss + HML32	60 g/100 L + 5 lb + 1.25 L/100 L	4.5 g + 22.9 g + 94.6 ml
18	BKS	Elevate (standard)	16 oz	4.6 g
19	OKS	Timorex Gold (veraison)	2 L/Ha	8.2 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.

C. Trial Map

Table 2: Map layout

← S

		W
		BS
		YKS
	RD	GD
	KD	YC
RKD	GKS	RD
BS	BKS	PKS
RKD	KS	OS
RD	YS	YD
KS	K	YKC
W	YD	KS
PKS	W	RKD
YS	YKC	K
K	PKS	GKS
KD	YKS	KD
YKC	GS	GS
OS	YC	YS
GS	BS	BKS
YC	OS	YC
BKS	GD	YS
GKS	BKS	YKC
YD	GD	RKD
GD	YKS	K
YKS	KD	PKS
OKS	GS	RD
OKS	OS	GKS
OKS	KS	YD
OKS	BS	W

D. Disease and Statistical Analysis

Disease was assessed on Sep 30, 2015. Botrytis bunch rot incidence and severity were assessed in each plot by evaluating twenty five random clusters from the 2 vine plots. Incidence was defined as the number of clusters in a plot having some Botrytis bunch rot over the clean clusters in the same 2 vine plots. Severity was determined by estimating the percentage of berries in each cluster. 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 along with standard error were computed. Trial models were analyzed using the ANOVA Tests for data. Means comparisons were made using Student's t test at α=0.05.

E. Weather and Disease

Figure 1: Precipitation history from May 1 to Sep 30, 2015. Data are from a CIMIS station 109 (http://www.cimis.water.ca.gov). Six precipitation events were recorded as follows: May 14 (0.51 mm), Jun 9 and 10 (0.76 and 3.81 mm), Jul 9 (1.02 mm), Sep 13 (0.25 mm) and Sep 16 (3.3 mm).

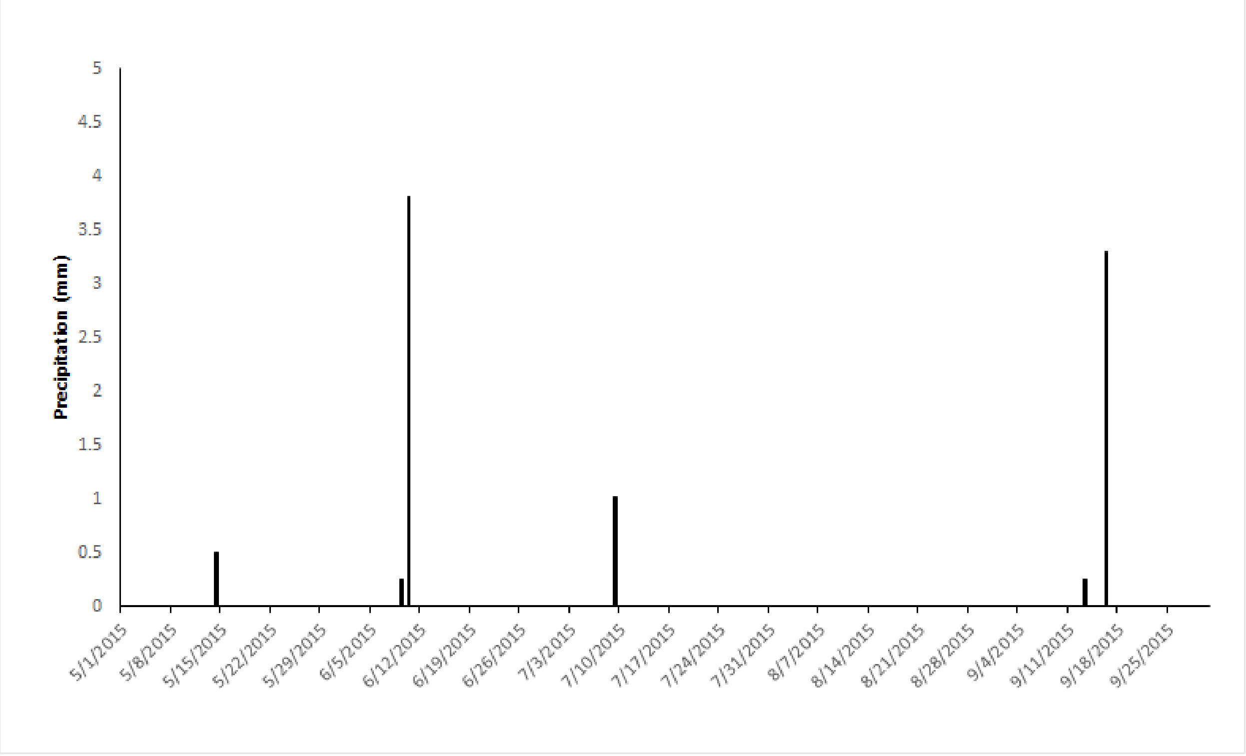
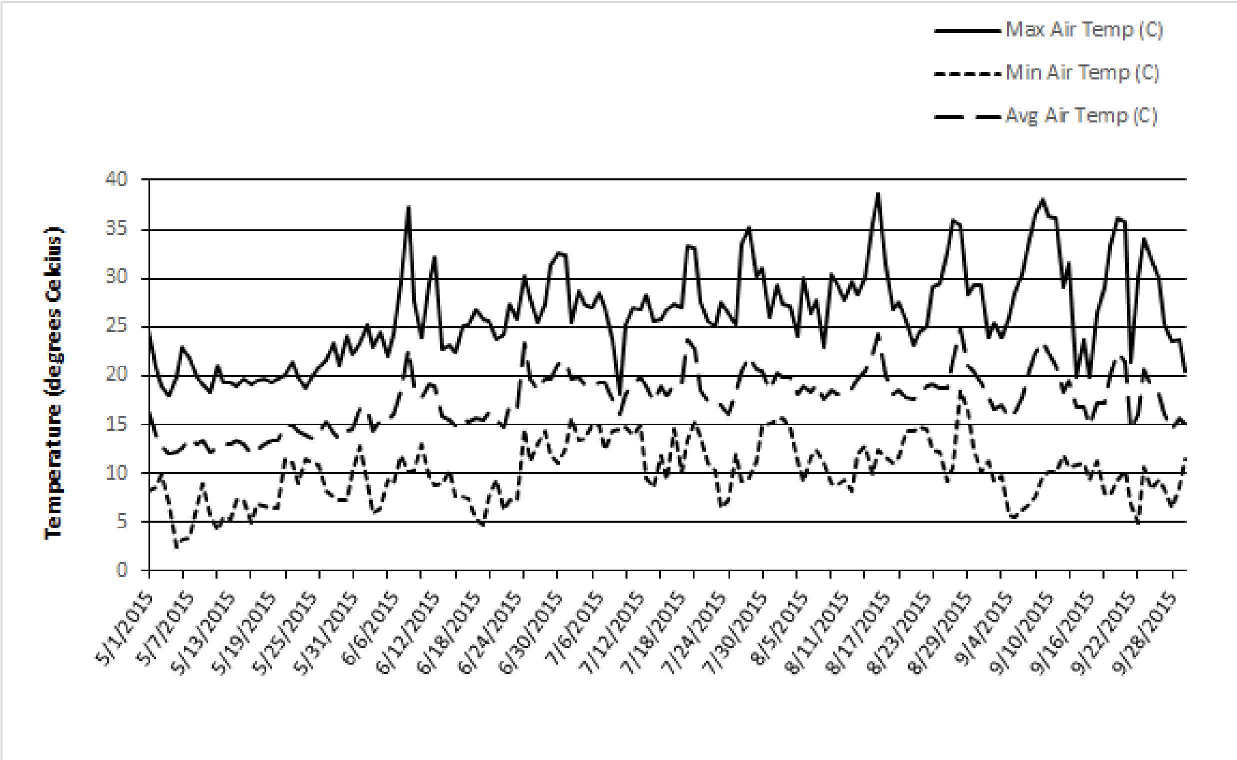


Figure 2: Air temperature history from May 1 to Sep 30, 2015. Data are from a CIMIS station 109 (http://www.cimis.water.ca.gov).



Results

Table 3: Botrytis bunch rot incidence and severity. Product names are followed by rate (per acre). Treatment means followed by the same letter are not significantly different according to Student's t test at α=0.05; alt =alternated with.

Treatment	Severity (%)		Incidence (%)	
Kenja, 20 fl oz	0.03	cd	2.67	c
Pristine, 23 oz + Syl-Coat, 8 fl oz	0.07	cd	4.00	c
(Vangard, 10 oz then Fracture, 24.4 oz then Elevate, 16 oz) + Dyneamic, 0.25 % (v/v)	0.11	d	4.56	c
(Luna Experience, 8.6 fl oz then Elevate, 16 oz then Luna Tranquility, 16 fl oz) + Syl-Coat, 6.4 fl oz	0.18	d	7.38	bc
GOP-Bran, 28 oz + GOP-1 Oil, 128 fl oz	0.28	cd	7.38	bc
(Fracture, 24.4 fl oz then Vangard, 10 oz then Elevate, 16 oz) + Dyneamic, 0.25 % (v/v)	0.21	cd	8.66	abc
(Luna Experience, 8.6 fl oz then Serenade Optimum, 16 oz then Luna Tranquility, 16 fl oz) + Syl-Coat, 6.4 fl oz	0.17	cd	9.33	abc
(Vangard, 10 oz (2x) then Elevate, 16 oz) + Dyneamic, 0.25 % (v/v)	0.23	cd	9.33	abc
(Vangard, 10 oz then Fracture, 18.3 fl oz then Elevate, 16 oz) + Dyneamic, 0.25 % (v/v)	0.28	cd	9.38	bc
AG Copp 75, 60g/100L + Microthiol Disperss, 5 lb + HML32, 1.25L/100L	0.38	cd	10.38	abc
Elevate (standard), 16 oz	0.70	cd	10.67	abc
Kenja, 22 fl oz	0.43	cd	13.56	abc
K-PHITE 7LP, 3 qt + Latron, 6 fl oz	4.68	a	14.31	abc
Luna Tranquility, 16 fl oz + Syl-Coat, 6.4 fl oz	0.66	cd	14.56	abc
(Elevate, 16 oz then Fracture, 24.4 fl oz then Vangard, 10 oz) + Dyneamic, 0.25 % (v/v)	2.45	abcd	15.38	abc
K-PHITE 7LP, 3 qt + Tactic, 6 fl oz	1.45	bcd	17.38	abc
(Luna Experience 8.6 fl oz then Serenade Optimum, 8 oz + Scala, 9 fl oz then Luna Tranquility, 16 fl oz) + Syl-Coat, 6.4 fl oz	2.55	abc	22.38	ab
Timorex Gold (veraison app), 2L/Ha	3.66	ab	23.24	ab
Untreated	1.35	bcd	26.38	a

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References

Bulit, J., & Dubos, B. (1988). Botrytis bunch rot and blight. *Compendium of grape diseases*, 13-15.

Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., & Wilson, L. T. (1992). *Grape pest management* (No. Ed. 2). University of California.

Gubler, W.D., Smith, R.J., Varela, L.G., Vasquez, S., Stapleton, J.J., & Purcell, A.H. (2008) UC IPM Pest Management Guidelines: Grape, UC ANR Publication 3348, Diseases, available at: http://www.ipm.ucdavis.edu/PMG/r302100111.html.

Steel, C. C., Greer, L. A., Savocchia, S., & Samuelian, S. K. (2015). Effect of temperature on *Botrytis cinerea*, Colletotrichum acutatum and Greeneria uvicola mixed fungal infection of Vitis vinifera grape berries. *VITIS-Journal of Grapevine Research*, *50*(2), 69.

Appendix: Materials

Product	Active Ingredient(s) and Concentration	Chemical Class (after Adaskaveg et al. 2008)	Manufacturer or Distributor
AG Copp 75	cuprous oxide (75% copper)	inorganic (M1)	American Chemet Corporation
Dyne-amic	polyalkyleneoxide modified polydimethylsiloxane, nonionic emulsifiers, methyl ester of C16-C-18 fatty acids (99%)	adjuvant	Helena Chemical Co.
Elevate 50 WDG	fenhexamid (50%)	hydroxyanilide (17)	Arysta Life Science
GOP-1 Bran	proprietary	proprietary	N/A
GOP-1 Oil	proprietary	proprietary	N/A
HML32	proprietary	proprietary	N/A
Kenja 400SC	proprietary	proprietary	N/A
K-Phite 7LP	potassium phosphate (56%)	phosphonates	Plant Food Systems, Inc.
Latron B-1956	modified phthalic glycerol alkyd resin (77.0%)	adjuvant	Dow AgroSciences LLP
Luna Experience	fluopyram (17.54%) tebuconazole (17.54%)	SDHI (7)/ DMI-triazole (3)	Bayer CropScience
Luna Tranquility	fluopyram (11.3%) pyrimethanil (33.8%)	SDHI (7)/ AP (9)	Bayer CropScience
Microthiol Disperss	sulfur (80%)	inorganic (M2)	United Phosphorous
Pristine	pyraclostrobin (12.8%) boscalid (25.2%)	SDHI (7)/QoI(11)	BASF

Regalia	extract of *Reynoutria sachalinensis* (5%)	natural product	Marrone Bio Innovations
Serenade Optimum	QST 713 strain of *Bacillus subtilis* (26.2%)	biological	Bayer CropScience
Syl-Coat	polyether-polymethylsiloxane-copolymer and polyether (100%)	adjuvant	Wilbur-ellis
Scala	pyrimethanil (54.6%)	AP (9)	Bayer CropScience
Tactic	synthetic latex, 1,2-propanediol, Alcohol ethoxylate, silicone polyether copolymer (63.4%)	adjuvant	Loveland Products
Timorex Gold	oil derived from the tea tree, *Melaleuca alterniflora* (23.8%)	oil	Biomor Israel Ltd.
Vangard WG	cyprodinil (75%)	AP (9)	Syngenta Crop Protection

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 fungicide trials 2013, available at http://plantpathology.ucdavis.edu/Cooperative_Extension/Gubler/2013_Fruit_Crop_Fungicide_Trials/ (3) product-specific MSDS and/or labels.