Title
Evaluation of fungicide programs for management of Botrytis bunch rot of grapes: 2009 field trial

Authors
Janousek, Christopher N
Bay, Ian S.
Herche, Ryan W
et al.

Publication Date
2009-12-07

Peer reviewed

Evaluation of fungicide programs for management of Botrytis bunch rot of grapes: 2009 field trial

Christopher N. Janousek, Ian S. Bay, Ryan W. Herche, and W. Douglas Gubler

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

University of California Cooperative Extension,
Department of Plant Pathology,
University of California, Davis - December 2009

Published December 2009 at http://escholarship.org/uc/plantpath_ucd.

Abstract

Botrytis bunch rot is an important grapevine disease in California. Twenty eight fungicide programs were evaluated for control of bunch rot in a field experiment in a Chardonnay (clone 4) vineyard in the Carneros region of Napa Valley, California during 2009. Four fungicide applications were made from bloom to harvest with the final application made just prior to heavy rainfall. Disease was rated three weeks following the final application. Disease developed rapidly during the month of October, approaching 60% infected berries in untreated vines. Most fungicide programs failed to give a large (>3 fold) reduction in disease severity, but many partially lowered disease severity. Several products reduced disease to less than 10% severity: fenhexamid (alone and with tetraconazole), fluopyram + tebuconazole and fluopyram + tebuconazole alternated with trifloxystrobin + tebuconazole. Tetraconazole and cyprodinil alone, mineral oil, other soft chemistry products, and boscalid + pyraclostrobin did not effectively control disease.

Introduction

Bunch rot of grapes is caused by *Botrytis cinerea*. The disease can lead to a reduction in the yield and quality of table, raisin, and wine grapes, with high economic losses in some locations or years (Gubler et al. 1987). In California, the southern San Joaquin Valley, Sacramento-San Joaquin delta region, and coastal areas are most vulnerable to bunch rot. *Botrytis* overwinters as sclerotia in mummified berries on the ground or on canes. The disease can first appear as shoot blight or blossom blight following spring rains; flowers also can become infected during bloom but the pathogen becomes latent and disease symptoms may not be evident until later in the season (Flaherty et al. 1992). 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 relative humidity exceeding 90% and temperatures between 15-27°C (Flaherty et al. 1992, Gubler et al. 2008). Along with leaf removal and other cultural controls (Gubler et al. 1987), good spray coverage with a synthetic fungicide is currently the most effective form of disease management.

We examined the efficacy of 28 fungicide treatment programs for control of Botrytis bunch rot in Clone 4 Chardonnay grapes in the Carneros region of Napa County, California in 2009. Materials included synthetic, biological and organic (soft-chemistry) treatments. Four applications were made between May and October 2009. An initially light infection of *Botrytis* grew into a significant epidemic during the final weeks of the trial with the onset of October rains.

Materials and Methods

The trial was conducted using a completely randomized design, with plots consisting of 2 adjacent vines (11 ft row spacing and 5 ft vine spacing). Each treatment (Table 1) consisted of 4 replicates (0.0101 acre total area). Fungicides were applied using a Nifty Fifty 25 gallon stainless steel tank and handgun or applied with Stihl backpack sprayers. Four applications were made during the growing season: 21 May (bloom), 15 June (pre-close, berries pea-sized), 30 July (early veraison) and 1 Oct. Each application was made using 200 gallons/acre of water (2.0 gallons per 4 plots). Other pesticides were applied between bloom and harvest by the commercial vineyard managers for control of powdery mildew and vine mealy bug: dusting sulfur (27 May, 9 June, 19 June, 21 July), Quintec + Sylgard 309 (1 July, 10 July), Applaud 70DF (10 July, 16 July), and Elite 45WP (16 July at 3.8 oz/acre). Leaves were removed on the north side of vines by the commercial growers up to the first shoot node above the uppermost fruit cluster on 26 June.

Disease was assessed on 23 October, three weeks following the last fungicide application. Twenty to thirty clusters were evaluated in each plot for bunch rot symptoms (including visible mycelia or slip skin). Disease severity (percentage of symptomatic berries per cluster) was assessed for each plot by averaging severity estimates for each rated cluster.

Table 1. Experimental treatments. "FP"=formulated product.

Treatment	Flag Color	FP/Acre	FP/4 replicate plots
Unsprayed control	BD and GD	none	none
Vangard	BS	10 oz	2.9 g
Pristine	G	18.5 oz	5.3 g
Inspire Super (A16001)	GS	20 fl oz	6.0 ml
Luna Privilege (USF2015)	K	5 fl oz	1.5 ml
Luna Experience (USF2017)	K/RD	8 fl oz	2.4 ml
Luna Experience alternated with Adament	KC	8 fl oz alt 4 oz	2.4 ml alt 1.15 g
LEM17 (2X) then Vangard (2X)	KD	16 fl oz then 10 oz	4.8 ml then 2.9 g
LEM17 alt Vangard	KS	24 fl oz alt 10 oz	7.2 ml alt 2.9 g
Vangard (2X) then LEM17 (2X)	OC	10 oz then 16 fl oz	2.9 g then 4.8 ml
Vangard (2X) then LEM17 (2X)	OD	10 oz then 24 fl oz	2.9 g then 7.2 ml
JMS Stylet-oil	OD/GS	2% (v/v)	151 ml
OM2	OKS	2% (v/v)	151 ml
QRD146	OKS/YS	8 oz	2.3 g
QRD146	OS	16 oz	4.6 g
Serenade MAX	OYS	16 oz	4.6 g
Serenade MAX	RC	32 oz	9.2 g
SilverDYNE	RC/YC	0.015% (v/v)	1.14 ml
SilverDYNE	RD	0.03% (v/v)	2.3 ml
Mettle	RKC	5 fl oz	1.5 ml
Elevate	RKD	16 oz	4.6 g
Mettle + Elevate	RKS	2.5 fl oz + 8 oz	0.75 ml + 2.3 g
Mettle + Elevate	YC	3.75 fl oz + 12 oz	1.1 ml + 3.4 g
Mettle + Elevate	YD	5 fl oz + 16 oz	1.5 ml + 4.6 g
GWN-4700	YKC	4 oz	1.15 g
GWN-4700	YKS	5.25 oz	1.5 g
GWN-4700 + Rubigan EC	YRD	5.25 oz + 4 fl oz	1.5 g + 1.2 ml
GWN-4700 + Botran	YS	5.25 oz + 2.75 lb	1.5 g + 12.6 g
GWN-4700 + GWN-4620	YS/KS	5.25 oz + 64 oz	1.5 g + 18.3 ml

Results and discussion

Rain was minimal through most of the growing season, but increased markedly in mid-October (Figure 1). Disease severity reached high levels in many treatments following the October rainfall, reaching 59% in the unsprayed control (Table 2). Many treatments resulted in at least some reduction in disease severity, but only 8 treatment programs reduced severity 3 fold or more. The best treatments included fenhexamid (alone or with tetraconazole), fluopyram, fluopyram + tebuconazole and fluopyram + tebuconazole in rotation with trifloxystrobin + tebuconazole. Soft chemistry materials did not markedly reduce disease.

Figure 1. Precipitation history from 1 May to 25 October 2009 near the trial location. Data are from CIMIS station 109 in Carneros (http://wwwcimis.water.ca.gov/). Dates of fungicide applications are indicated by the arrows.

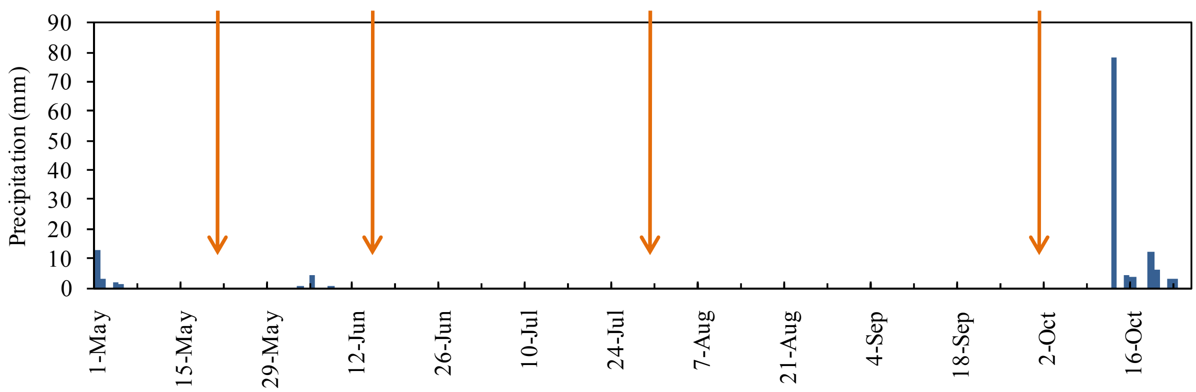

Table 2. Bunch rot severity (means ± 1SE). n = 4 for all treatments, except the unsprayed control (n = 8). Treatments sharing letters are not significantly different according to Fisher's LSD test at α = 0.10.

Treatment	Severity (%)	
JMS Stylet-oil, 2%	77.4 ± 5.5	a
OM2, 2%	72.5 ± 2.8	ab
Mettle, 5 fl oz	63.3 ± 5.4	abc
Unsprayed control	**59.3 ± 7.1**	**bcd**
SilverDYNE, 0.015%	52.0 ± 6.1	cde
Serenade MAX, 32 oz	50.6 ± 8.4	cde
Vangard, 10 oz	48.8 ± 7.7	cdef
Pristine, 18.5 oz	48.7 ± 8.7	cdef
GWN-4700, 4 oz	47.2 ± 12.6	cdef
QRD146, 16 oz	45.3 ± 3.0	def
Inspire Super, 20 fl oz	43.6 ± 16.4	efi
SilverDYNE, 0.03%	43.4 ± 8.9	efg
QRD146, 8 oz	43.2 ± 10.0	efgh
GWN-4700, 5.25 oz + Rubigan, 4 fl oz	39.8 ± 7.3	efgh
GWN-4700, 5.25 oz	39.7 ± 5.8	efgh
Serenade MAX, 16 oz	39.4 ± 7.1	efgh
GWN-4700, 5.25 oz + GWN-4620, 64 oz	31.5 ± 7.8	fghj
Vangard, 10 oz (2X) then LEM17, 16 fl oz (2X)	31.4 ± 6.6	fghj
Vangard, 10 oz (2X) then LEM17, 24 fl oz (2X)	27.2 ± 5.5	ghijk
LEM17, 24 fl oz alt Vangard, 10 oz	26.7 ± 9.3	ghijk
GWN-4700, 5.25 oz + Botran, 2.75 lb	25.7 ± 6.1	hijkl
LEM17, 16 fl oz (2X) then Vangard, 10 oz (2X)	16.8 ± 3.0	jklm
Mettle, 3.75 fl oz + Elevate, 12 oz	14.8 ± 5.1	jklm
Luna Privilege, 5 fl oz	10.6 ± 3.6	klm
Mettle, 2.5 fl oz + Elevate, 8 oz	8.7 ± 1.0	lm
Luna Experience, 8 fl oz	5.9 ± 1.4	m
Luna Experience, 8 fl oz alt Adament, 4 oz	4.0 ± 2.4	m
Elevate, 16 oz	3.9 ± 1.4	m
Mettle, 5 fl oz + Elevate, 16 oz	3.6 ± 1.4	m

Acknowledgements

We thank Towle Merritt for assistance with arranging a site for the trial. Jenny Broome and Jose Úrbez-Torres assisted with disease evaluation in the field. The treatments we described in this report were conducted for experimental purposes only. Crops treated in a similar manner may not be suitable for human or animal consumption.

References

Flaherty, D.L., Christensen, L.P., Lanini, W.T., Marois, I.J., Phillips, P.A., and L.T. Wilson (1992) *Grape Pest Management*, UCDANR Publication 3343, 2nd ed., Regents of the University of California, Davis.

Gubler, W.D., Marois, J.J., Bledsoe, A.M. and Bettiga, L.J. (1987) Control of Botrytis bunch rot of grape with canopy management. Plant Disease 71:599-601.

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

Appendix: Materials

Product	Active ingredient(s) and concentration	Chemical class	Manufacturer
Adament	tebuconazole (25%) + trifloxystrobin (25%)	DMI-triazole + QoI (stobilurin)	Bayer Crop Science
Botran 75WP	dichloran (75%)	substituted benzene	DuPont
Elevate	fenhexamid (50%)	hydroxyanilide	Arysta Life Science
GWN-4620	proprietary	proprietary	Gowan Co.
GWN-4700	proprietary	proprietary	Gowan Co.
Inspire Super (A16001)	difenoconazole (8.4%) + cyprodinil (24%)	DMI-triazole + anilinopyrimidine	Syngenta Crop Protection, Inc.
JMS Stylet-oil	paraffinic oil (97.1%)	oil	JMS Flower Farms, Inc.
LEM17 SC	penthiopyrad (20%)	carboximide	DuPont
Luna Experience (USF 2017)	fluopyram + tebuconazole	pyridinyl ethylbenzamide + DMI-triazole	Bayer Crop Science
Luna Privilege (USF 2015)	fluopyram	pyridinyl ethylbenzamide	Bayer Crop Science
Mettle 125ME	tetraconazole (11.6%)	DMI-triazole	Isagro, USA
OM2	paraffinic oil (JMS Stylet-oil) + OE-444 (oil-based adjuvant)	oil	OE444: DuGassa/Goldschmidt
Pristine	pyraclostrobin (12.8%) + boscalid (25.2%)	QoI + carboximide	BASF
QRD146	*Bacillus subtilis*	biological	AgraQuest, Inc.
Rubigan	fenarimol (12%)	DMI-pyrimidine	Gowan Co.
Serenade MAX	*Bacillus subtilis* QST713	biological	AgraQuest, Inc.
SilverDYNE	silver colloid (3.6%)	other	World Health Alliance International, Inc.
Vangard 75WG	cyprodinil (75%)	anilinopyrimidine	Syngenta Crop Protection, Inc.

Appendix references: (1) Adaskaveg, J, Gubler, D., Michailides, T. and Holtz, B. 2008. Efficacy and timing of fungicides, bactericides, and biological for deciduous tree fruit, nut, strawberry, and vine crops. UC Davis: Department of Plant Pathology. http://escholarship.org/uc/item/24r9p3j1. (2) Product labels, pers. communication, and other sources.