

GRAPE (*Vitis vinifera* ‘Merlot’)
Powdery mildew; *Erysiphe necator*

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Efficacy of DMI (FRAC 3) fungicides for control of powdery mildew in a DMI-tolerant *Erysiphe necator* population, 2020.

Six DMI fungicides were tested for their performance in controlling DMI-tolerant grapevine powdery mildew (PM) on *Vitis vinifera* L. cv. ‘Merlot’ at the University of Georgia Mountain Research and Education Center in Blairsville, GA. The experimental design utilized a randomized complete block with five replications per treatment; single plants were utilized for each replicate unit. Unsprayed buffer rows allowed for increased powdery mildew disease pressure. Treatments were applied with a CO₂ backpack sprayer, and rates were calculated to correspond with a 50 gal per acre total spray volume; applications were made five times (23 May, 11 and 25 Jun, 9 and 23 Jul). Cultural practices mimicked those observed in commercial vineyards. Treatments and active compounds were as follows: 1) Elite 45WP (tebuconazole) 2) Rally 40WSP (myclobutanil) 3) Procure 480SC (triflumizole) 4) Mettle 125 (tetraconazole) 5) Cevya (mefentrifluconazole) 6) Revus Top (difenoconazole + mandipropamid) 7) Aprovia as our positive control (FRAC 7, SDHI) and 8) an untreated control. Fruit clusters (five per plant) were rated for PM incidence (% of clusters infected) and severity (% of cluster covered by powdery mildew) on 8, 16, and 27 Jul using the Powdery Mildew Assessment Tool by the Adelaide Research and Innovation Pty Ltd. On 23 Jul and 5 Aug, 25 leaves were collected from each vine and assessed for powdery mildew incidence (% leaves infected) and severity (% leaf area with powdery mildew). SAS version 9.4 was used for data analysis, and Tukey’s HSD was utilized for treatment means separation using the GLIMMIX procedure.

At this research site, the Y136F mutation in the 14 α -demethylase (CYP51) gene is prevalent in *E. necator*, having been identified extensively in both 2019 and 2020 when isolates were genotyped for resistance-associated alleles. This mutation is associated with DMI tolerance, but not complete DMI resistance, as some DMI fungicides have the ability to overcome it. Some FRAC 3 fungicides may have the ability to perform well even in the presence of this mutation, while others have been reported to have little to no efficacy when this gene is present. In this study, we tested the lowest labeled rate of a variety of DMI fungicides and found that there was a gradient of control. Elite 45WP and Rally 40WSP did not perform much better than the untreated control. Procure 480SC and Mettle 125 provided a higher level of efficacy, but still did not offer an acceptable level of control. Cevya and Revus Top provided excellent efficacy most similar to the positive control (Aprovia). While Revus Top contains two chemicals, the other chemical, mandipropamid (FRAC 40), is not active against true fungi, and this product is therefore representative of difenoconazole’s intrinsic activity against *E. necator* at these rates and/or an ability to overcome the Y136F mutation when present in a population. The same statement can be made for Cevya. Cevya and Revus Top can both be utilized in a spray program and they will provide excellent PM control, even when presented with a DMI-tolerant powdery mildew population. These chemicals should still be used in a rotation with other modes of action to prevent further resistance development.

Treatment and amount/A	Application timing *	Powdery mildew incidence on leaves	Powdery mildew incidence on leaves	Powdery mildew severity on leaves	Powdery mildew severity on leaves
		23 Jul**	5 Aug**	23 Jul**	5 Aug**
Untreated	---	56.4 a	87.3 a	11.8 a	36.4 a
Elite 45WP 4 oz	ABCDEF	25.6 ab	83.6 a	3.4 ab	25.8 ab
Rally 40WSP 3 oz	ABCDEF	18.9 abc	86.7 a	2.0 bc	27.3 ab
Procure 480SC 4 fl oz	ABCDEF	10.3 bcd	86.8 a	1.0 bc	25.9 ab
Mettle 125 3 fl oz	ABCDEF	1.0 cd	54.6 ab	0.1 bc	10.0 bc
Cevya 3 fl oz	ABCDEF	0.7 cd	14.8 bc	0.1 bc	1.9 cd
Revus Top 7 fl oz	ABCDEF	0.7 cd	1.6 c	0.1 bc	0.2 d
Aprovia 10.5 fl oz	ABCDEF	0.0 d	5.2 c	0.0 c	0.8 cd

*Treatment dates: A = 27 Apr (pre-bloom), B = 11 May (bloom 1), C = 26 May (bloom 2), D = 8 Jun (post-bloom), E = 22 Jun (bunch closure), and F = 6 Jul (first cover)

**Powdery mildew incidence (% infected leaves) and severity (% of leaf covered by powdery mildew) were calculated from 25 leaves per treated plant. Means following the same letter are not significantly different from one another when using Tukey’s HSD ($P \leq 0.05$). All data was arcsine square root transformed before analysis. Back-transformed means are shown.

Treatment and amount/A	Application timing *	Powdery mildew	Powdery mildew	Powdery mildew
		<u>incidence on fruit</u>	<u>incidence on fruit</u>	<u>incidence on fruit</u>
		8 Jul**	16 Jul**	27 Jul**
Untreated	---	95.2 a	99.1 a	96.9 ab
Elite 45WP 4 oz	ABCDEF	95.2 a	100.0 a	96.9 ab
Rally 40WSP 3 oz	ABCDEF	77.0 ab	96.9 a	98.1 a
Procure 480SC 4 fl oz	ABCDEF	56.4 abc	73.2 ab	90.0 ab
Mettle 125 3 fl oz	ABCDEF	52.0 abc	62.0 abc	69.6 abc
Cevya 3 fl oz	ABCDEF	23.0 bc	38.8 bc	38.8 bc
Revus Top 7 fl oz	ABCDEF	1.9 c	7.1 c	52.8 abc
Aprovia 10.5 fl oz	ABCDEF	5.2 c	7.5 c	22.3 c

*Treatment dates: A = 27 Apr (pre-bloom), B = 11 May (bloom 1), C = 26 May (bloom 2), D = 8 Jun (post-bloom), E = 22 Jun (bunch closure), and F = 6 Jul (first cover)

**Powdery mildew incidence (% infected clusters) was calculated from 5 clusters per treated plant. Means following the same letter are not significantly different from one another when using Tukey's HSD ($P \leq 0.05$). All data was arcsine square root transformed before analysis. Back-transformed means are shown.

Treatment and amount/A	Application timing *	Powdery mildew	Powdery mildew	Powdery mildew
		<u>severity on fruit</u>	<u>severity on fruit</u>	<u>severity on fruit</u>
		8 Jul**	16 Jul**	27 Jul**
Untreated	---	20.6 a	40.0 a	48.0 a
Elite 45WP 4 oz	ABCDEF	7.6 ab	16.1 ab	32.2 ab
Rally 40WSP 3 oz	ABCDEF	3.6 bc	10.4 bc	24.6 abc
Procure 480SC 4 fl oz	ABCDEF	2.6 bc	5.7 bc	11.7 bcd
Mettle 125 3 fl oz	ABCDEF	1.8 bc	3.7 bc	7.5 bcd
Cevya 3 fl oz	ABCDEF	1.1 bc	2.1 bc	2.1 d
Revus Top 7 fl oz	ABCDEF	0.1 c	0.3 c	3.4 cd
Aprovia 10.5 fl oz	ABCDEF	0.2 c	0.5 c	1.0 d

*Treatment dates: A = 27 Apr (pre-bloom), B = 11 May (bloom 1), C = 26 May (bloom 2), D = 8 Jun (post-bloom), E = 22 Jun (bunch closure), and F = 6 Jul (first cover)

**Powdery mildew severity (% of cluster covered by powdery mildew) was calculated from 5 clusters per treated plant. Means following the same letter are not significantly different from one another when using Tukey's HSD ($P \leq 0.05$). All data was arcsine square root transformed before analysis. Back-transformed means are shown.