GRAPE (*Vitis vinifera* 'Chardonnay')
Powdery Mildew; *Erysiphe necator*

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Organic materials for grape powdery mildew management on Chardonnay, 2024.

Fungicide treatments were arranged in a randomized complete block design in a block of 'Chardonnay' planted in 1985 on a 7x11 ft spacing. Chardonnay vines were trained to a Guyot (vertical shoot position) system and pruned from 3 to 5 Feb 2024. Shoot thinning and sucker removal by hand occurred on 10 May 2024 and continued through the rest of the growing season. Canes were cut above the top wire on 10 Jul and maintained at this height throughout the growing season. Each treatment was replicated on four sets of five vines. Treatments were applied using a hooded boom sprayer at 150 psi at a rate of 42 to 63 gal water/A depending on canopy growth such that 1.49 to 2.23 gal of spray suspension was used per 20 vines. Fungicide treatments were applied on 23 May (BBCH 56), 1 Jun (BBCH 57), 11 Jun (BBCH 60), 18 Jun (BBCH 69), 28 Jun (BBCH 71), 5 Jul (BBCH 75), 11 Jul (BBCH 77), 19 Jul (BBCH 80), 25 Jul (BBCH 80), 1 Aug (BBCH 80), and 9 Aug (veraison beginning, BBCH 82). Leaves were not removed from the fruiting zone this year. Casoron 4-G (150 lb/A; 30 lb/A in herbicide strip) was applied on 26 Mar for general pre-emergent weed management and GlyStar Plus was spot sprayed on 10 Apr for management of perennial weeds. Fertilizer (16-16-16 at 30 lb/A) was applied to vines on 9 Apr. According to the Gubler-Thomas powdery mildew forecasting model, there 8 rain events favorable for ascospore release and infection between bud break and end of bloom: 5 severe infection periods (25 Apr, 1 and 3 May, 2 and 16 Jun), and 3 low infection periods (30 Apr, 6 and 7 May). The powdery mildew risk index rose to high infection risk (0 to $\geq$60) in mid-May for 11 days, dipped back to low risk but went back up to high risk on 9 Jun and generally remained high (above 60) all summer except for a 2 week heat wave in mid Jul where it was at a low risk. Incidence and severity of powdery mildew on leaves was evaluated on 2, 16 and 30 Jul, and 12 Aug while incidence and severity of powdery mildew on fruit was evaluated on 18 Jul and 8 Aug. (Only the last rating date is presented in Tables 1 and 2.) Powdery mildew disease data was collected by arbitrarily examining 50 clusters or leaves from the middle 3 vines of each replicate. Treatments were also evaluated by calculating the area under disease progress curve (AUDPC) which was calculated by multiplying the mean incidence or severity from two observation dates by the number of days between observations $(\Sigma[Y_{i+1} + Y_i)/2][X_{i+1}-X_i]$ where Y_i is incidence or severity of powdery mildew in percent at i*th* observation and X_i is the day of the i*th* observations). Values calculated between each pair of observations are added together to obtain a total AUDPC.

Spring weather conditions were close to long term norms while summer was accented by a few high heat events. Symptoms of powdery mildew were first found on 9 May as a flag shoot in a nearby block and on 13 May as several individual colonies on scattered vines. Highest incidence and severity of powdery mildew on leaves or clusters and highest AUDPC was found on non-treated vines and was significantly higher than the powdery mildew found on fungicide treated vines except for the leaf incidence on on 8 Aug on vines treated only with Microthiol (Tables 1 and 2). Lowest incidence of powdery mildew on leaves and lowest AUDPC was found on vines treated with Cinnerate plus Microthiol and was significantly lower than the incidence or AUDPC found on all other treatments (Table 1). Lowest severity of powdery mildew on leaves and lowest AUDPC was also found on vines treated with Cinnerate plus Microthiol but it was not significantly different than the severity or AUDPC found on vines treated with Cinnerate alone or Howler Evo. Lowest incidence of powdery mildew on clusters and lowest AUDPC was found on vines treated with Cinnerate plus Microthiol and was significantly lower than the incidence or AUDPC found on all other treatments (Table 2). Lowest severity of powdery mildew on clusters and lowest AUDPC was also found on vines treated with Cinnerate plus Microthiol but it was not significantly different than the severity or AUDPC found on vines treated with Cinnerate alone. Both tank mixes with sulfur resulted in leaf powdery mildew incidence and AUDPC values that were significantly lower than on vines treated with just sulfur alone (Table 1). Vine treated with Howler Evo tank mixed with sulfur had cluster severity or AUDPC that was not significantly different than vines treated with sulfur alone (Table 2). No phytotoxicity was observed on vines treated with any fungicide.

Table 1. Incidence and severity of grape powdery mildew on Chardonnay leaves.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Leaves with Powdery Mildew**			
		Incidence (30 Jul)	Incidence AUDPC	Severity (30 Jul)	Severity AUDPC
Non-treated…….……..	None……	100.0 a	3881 a	43.5 a	1148 a
Microthiol Disperss at 2 lb …….	All……..	78.3 b	2804 b	13.3 b	377 b
Cinnerate at 30 fl oz …	All……..	34.8 d	1214 d	2.3 bc	71 c
Cinnerate at 30 fl oz plus Microthiol Disperss at 2 lb …	All……..	22.0 e	747 e	1.0 c	38 c
Howler Evo at 120 oz plus Microthiol Disperss at 2 lb …	All……..	45.5 c	1639 c	2.3 bc	111 c

* Treatments were applied on 23 May (BBCH 56), 1 Jun (BBCH 57), 11 Jun (BBCH 60), 18 Jun (BBCH 69), 28 Jun (BBCH 71), 5 Jul (BBCH 75), 11 Jul (BBCH 77), 19 Jul (BBCH 80), 25 Jul (BBCH 80), 1 Aug (BBCH 80), and 9 Aug (veraison beginning, BBCH 82).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD ($P \leq 0.05$) using Agricultural Research Manager (GDM Solutions, Inc.).

Table 2. Incidence and severity of grape powdery mildew on Chardonnay clusters.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Clusters with Powdery Mildew**			
		Incidence (8 Aug)	Incidence AUDPC	Severity (8 Aug)	Severity AUDPC
Non-treated…….……..	None……	100.0 a	2079 a	84.9 a	1314 a
Microthiol Disperss at 2 lb …….	All……..	92.8 a	1861 b	31.1 b	490 b
Cinnerate at 30 fl oz …	All……..	39.0 c	769 d	5.5 c	72 c
Cinnerate at 30 fl oz plus Microthiol Disperss at 2 lb …	All……..	28.0 d	483 e	1.6 c	21 c
Howler Evo at 120 oz plus Microthiol Disperss at 2 lb …	All……..	80.0 b	1412 c	22.7 b	322 b

* Treatments were applied on 23 May (BBCH 56), 1 Jun (BBCH 57), 11 Jun (BBCH 60), 18 Jun (BBCH 69), 28 Jun (BBCH 71), 5 Jul (BBCH 75), 11 Jul (BBCH 77), 19 Jul (BBCH 80), 25 Jul (BBCH 80), 1 Aug (BBCH 80), and 9 Aug (veraison beginning, BBCH 82).

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