

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

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Organic materials for grape powdery mildew management on Chardonnay, 2022.

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 bilateral cordon with spur pruning and pruned from 14 to 17 Feb. Sucker removal occurred periodically during the growing season. Canes were cut above the top wire on 15 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 80 to 128 gal water/A depending on canopy growth such that 2.8 to 4.5 gal of spray suspension was used per 20 vines. Fungicide treatments were applied on 1 Jun (BBCH 14), 8 Jun (BBCH 15), 15 Jun (BBCH 17), 22 Jun (BBCH 55), 28 Jun (start of bloom, BBCH 63), 6 Jul (BBCH 67), 13 Jul (BBCH 71), 21 Jul (BBCH 73), 28 Jul (BBCH 75), 4 Aug (BBCH 77), 11 Aug (BBCH 79), 18 Aug (BBCH 79), and 24 Aug (just before veraison, BBCH 81). Leaves were removed from the fruiting zone on the east side of all vines on 20 Jul. Movento (12 fl oz/A) was applied on 26 May for erineum mite management. Makaze (32 fl oz/A) plus GoalTender (32 fl oz/A) were tank mixed and applied to all rows on 21 Jan for weed control, while Forfeit 280 (3 fl oz/gal) was applied on 29 Jun for spot management of weeds. Fertilizer (16-16-16 at 30 lb/A) was applied 25 Apr. According to the Gubler-Thomas powdery mildew forecasting model, there were 15 rain events between bud break and end of bloom that were favorable for ascospore release and infection: 7 severe infection periods (21 and 27 Apr, 5 and 13 May, 3, 9 and 10 Jun), 7 moderate infection periods (20 Apr, 7, 12 and 28 May, 6, 14 and 17 Jun) and 1 low infection periods (2 May). The powdery mildew risk index shot up to high (0 to past 60) on 24 Jun and remained high (above 60) all summer except between 30 Jul to 8 Aug and 26 Aug to 8 Sep when it fluctuated between low, medium and high risk. Incidence and severity of powdery mildew on leaves was evaluated on 20 and 27 Jul, 3, 16 and 30 Aug while incidence and severity of powdery mildew on fruit was evaluated on 2, 12 and 19 Aug. Powdery mildew disease data were collected by arbitrarily examining 50 leaves or 44 clusters (31 to 50) from the middle three 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 ($\sum [Y_{i+1} + Y_i]/2][X_{i+1}-X_i]$ where Y_i is incidence or severity of 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 very wet resulting in the second wettest spring on record. A frost event on 14 Apr hit bud breaking Chardonnay hard all over western Oregon resulting in delayed vine development and injured or killed primary buds. Symptoms of powdery mildew were first found on 23 May as a few individual colonies on scattered vines in a nearby grape planting and in this block on 31 May. Flag shoots were also observed in this block on 31 May. Highest incidence and severity of powdery mildew on clusters was found on non-treated vines and was significantly higher than the powdery mildew found on fungicide treated vines. There was no significant difference in the incidence of powdery mildew on clusters among fungicide treated vines. Although Actigard treated vines had the lowest severity on leaves, powdery mildew was not significantly different on vines treated with Serenade or Stargus, except sulfur alone. Although the highest incidence of powdery mildew on leaves on 3 Aug was on non-treated vines, the incidence on vines treated with sulfur alone or Stargus was not significantly different. Highest AUDPC incidence of powdery mildew on leaves was on non-treated vines which was significantly different from all other treatments. Highest severity of powdery mildew on leaves was on non-treated vines which was significantly different from all other treatments. Lowest severity of powdery mildew on leaves was on vines treated with Serenade plus Sulfur but it was not significantly different than the powdery mildew found on Actigard plus sulfur or Stargus plus sulfur treated vines. No phytotoxicity was observed on vines treated with any fungicide.

Table 1. 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 (2 Aug)	Incidence AUDPC	Severity (19 Aug)	Severity AUDPC
Non-treated.....	None.....	98.9 a	1695 a	99.6 a	1253 a
Microthiol Disperss at 2 lb	All.....	86.9 b	1630 b	81.9 b	706 b
Actigard at 1 oz plus					
Microthiol Disperss at 2 lb ...	All.....	85.9 b	1578 b	67.3 c	517 b
Serenade ASO at 4 qt plus					
Microthiol Disperss at 2 lb ...	All.....	88.1 b	1606 b	67.8 c	594 b
Stargus at 2 qt plus					
Microthiol Disperss at 2 lb ...	All.....	85.3 b	1596 b	73.2 bc	614 b

* Pesticides were applied on A = 1 Jun (BBCH 14), B = 8 Jun (BBCH 15), C = 15 Jun (BBCH 17), D = 22 Jun (BBCH 55), E = 28 Jun (start of bloom, BBCH 63), F = 6 Jul (BBCH 67), G = 13 Jul (BBCH 71), H = 21 Jul (BBCH 73), I = 28 Jul (BBCH 75), J = 4 Aug (BBCH 77), K = 11 Aug (BBCH 79), L = 18 Aug (BBCH 79), M = 24 Aug (just before veraison, BBCH 81).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD ($P=0.05$).

Table 2. 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 (3 Aug)	Incidence AUDPC	Severity (30 Aug)	Severity AUDPC
Non-treated.....	None.....	100 a	4083 a	100 a	3127 a
Microthiol Disperss at 2 lb	All.....	98.5 a	3975 b	77.1 b	1842 b
Actigard at 1 oz plus					
Microthiol Disperss at 2 lb ...	All.....	93.0 b	3848 c	70.3 c	1581 c
Serenade ASO at 4 qt plus					
Microthiol Disperss at 2 lb ...	All.....	94.5 b	3875 bc	69.5 c	1570 c
Stargus at 2 qt plus					
Microthiol Disperss at 2 lb ...	All.....	96.5 ab	3913 bc	70.7 c	1615 c

* Pesticides were applied on A = 1 Jun (BBCH 14), B = 8 Jun (BBCH 15), C = 15 Jun (BBCH 17), D = 22 Jun (BBCH 55), E = 28 Jun (start of bloom, BBCH 63), F = 6 Jul (BBCH 67), G = 13 Jul (BBCH 71), H = 21 Jul (BBCH 73), I = 28 Jul (BBCH 75), J = 4 Aug (BBCH 77), K = 11 Aug (BBCH 79), L = 18 Aug (BBCH 79), M = 24 Aug (just before veraison, BBCH 81).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD ($P=0.05$).