

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

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Evaluation of fungicides for grape powdery mildew management, 2021.

Fungicide treatments were arranged in a randomized complete block design in a block of 'Pinot noir' planted in 1985 on a 7x11 ft spacing. Pinot noir vines were trained to a Guyot (vertical shoot position) system and pruned from 11 to 14 Jan. Shoot thinning by hand occurred on 28 to 29 Apr while sucker removal occurred periodically during the growing season. Canes were cut above the top wire on 6 Jul and maintained at this height throughout the growing season. Each treatment was replicated on 4 sets of 5 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 18 May (BBCH 19), 26 May, 2 Jun (BBCH 55), 8 Jun (BBCH 63), 23 Jun, 8 Jul, 21 Jul (BBCH 79), and 4 Aug (just before veraison). Leaves were removed from the fruiting zone on the east side of all vines on 6 Jul. Movento (6 fl oz/A) was applied on 24 May for erineum mite management. Makaze (64 fl oz/A) plus GoalTender (40 fl oz/A) plus Mission (2.5 fl oz/A) were tank mixed and applied to all rows on 22 Jan, while Makaze (3 fl oz/gal) was applied on 30 Apr and Forfeit 280 (3 fl oz/gal) was applied on 22 Jun for spot management of weeds. Fertilizer (16-16-16; 30 lb/A) was applied 22 Apr but little rain occurred to move it into the soil. According to the Gubler-Thomas powdery mildew forecasting model, there were 7 rain events between bud break and end of bloom that were favorable for ascospore release and infection: 3 severe infection periods (24 May, 11 and 12 Jun), 2 moderate infection periods (24 and 30 Apr) and 2 low infection periods (7 and 19 May). The powdery mildew risk index shot up to high (0 to past 60) for a short period then declined twice around mid-May and again early June before remaining high (above 60) from 19 June until the end of Sep. Incidence and severity of powdery mildew on leaves was evaluated on 1 and 20 July and 11 Aug while incidence and severity of powdery mildew on fruit was evaluated on 7 and 28 July and 10 Aug. 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 ($\sum [Y_{i+1} + Y_i]/2][X_{i+1} - X_i]$ 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 rainfall was well below average and an unusual climate change related heat dome (heat wave) occurred for 3 days in late June with temperatures at or above 100°F. This resulted in the second driest (first was in 1924) and second hottest (first was in 2015) growing season ever recorded. Symptoms of powdery mildew were first found on 17 May as a few individual colonies on scattered vines and flag shoots. Highest incidence of powdery mildew on clusters was found on non-treated vines and was significantly higher than the powdery mildew found on fungicide treated vines (Table 1). Lowest 10 Aug powdery mildew incidence or AUDPC incidence on clusters was found on vines treated with Vivando at bloom (application "D"), however, the incidence found on vines treated with Torino at bloom was not significantly different. Highest 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. Lowest 10 Aug powdery mildew severity or AUDPC severity on clusters was found on vines treated with Vivando at bloom (application "D"), however, the severity found on all other fungicide treated vines was not significantly different.

Highest incidence of powdery mildew on leaves was found on non-treated vines, however, the incidence found on vines treated with Miravis Prime or the high rate of Torino at bloom was not significantly different (Table 2). Lowest 11 Aug powdery mildew incidence on leaves was found on vines treated with Vivando at bloom (application "D"), however, the incidence found on vines treated with Torino at bloom was not significantly different. Lowest powdery mildew AUDPC incidence on leaves was found on vines treated with Miravis Prime at bloom (application "D"), however, the incidence found on vines treated with Vivando or the high rate of Torino at bloom was not significantly different. Highest severity of powdery mildew on leaves was found on non-treated vines and was significantly higher than the powdery mildew

found on fungicide treated vines. Lowest 11 Aug powdery mildew severity or AUDPC severity on leaves was found on vines treated with Vivando at bloom (application “D”), however, the severity found on all other fungicide treated vines was not significantly different.

No phytotoxicity was observed on vines treated with any fungicide.

Figure 1. Gubler-Thomas grape powdery mildew risk index for the 2021 growing season.

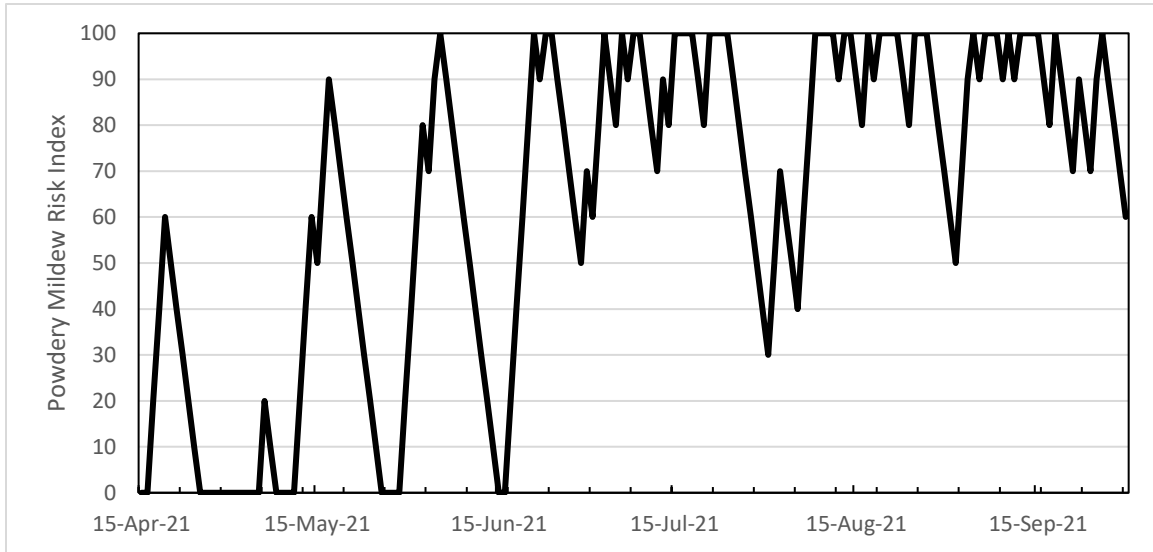


Table 1. Incidence and severity of grape powdery mildew on Pinot noir clusters.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Clusters with Powdery Mildew**			
		Incidence (10 Aug)	Incidence AUDPC	Severity (10 Aug)	Severity AUDPC
Non-treated.....	None.....	100 a	3263 a	97.6 a	2471 a
Miravis Prime at 13.4 fl oz plus Induce at 1 pt/100 gal <i>alternate</i>	A, D, F, H				
Inspire Super at 20 fl oz plus Induce at 1 pt/100 gal	C, E, G.....	88.0 b	600 b	3.1 b	42 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Torino at 3.4 fl oz plus Microthiol Disperss at 6 lb plus JMS Oil at 2 pt/100 gal <i>then</i>	C				
Vivando at 10 fl oz plus "C" <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	F				
Quintec at 4 fl oz plus "C" <i>then</i>	G				
Magister SC at 32 fl oz plus "C" .	H.....	79.5 c	517 c	1.8 b	13 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Mettle at 5 fl oz plus "C" <i>then</i>	C				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Quintec at 4 fl oz plus "C" <i>then</i>	F				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	G				
Magister SC at 32 fl oz plus "C"	H.....	83.5 bc	543 c	2.1 b	16 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Mettle at 5 fl oz plus "C" <i>then</i>	C				
Torino at 6.8 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Quintec at 4 fl oz plus "C" <i>then</i>	F				
Torino at 6.8 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	G				
Magister SC at 32 fl oz plus "C"	H.....	84.0 bc	560 bc	2.5 b	26 b

* Pesticides were applied on A = 18 May (BBCH 19), B = 26 May (BBCH 53), C = 2 Jun (BBCH 55), D = 8 Jun (BBCH 63), E = 23 Jun (BBCH 71), F = 8 Jul (BBCH 76), G = 21 Jul (BBCH 79), and H = 4 Aug (BBCH 81, start of Veraison).

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

"C" = Cohere at 1 pt/100 gal

Table 2. Incidence and severity of grape powdery mildew on Pinot noir leaves.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Leaves with Powdery Mildew**			
		Incidence (11 Aug)	Incidence AUDPC	Severity (11 Aug)	Severity AUDPC
Non-treated.....	None.....	100 a	3945 a	100 a	2593 a
Miravis Prime at 13.4 fl oz plus Induce at 1 pt/100 gal <i>alternate</i>	A, D, F, H				
Inspire Super at 20 fl oz plus Induce at 1 pt/100 gal	C, E, G.....	98.0 ab	1267 c	16.7 b	193 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Torino at 3.4 fl oz plus Microthiol Disperss at 6 lb plus JMS Oil at 2 pt/100 gal <i>then</i>	C				
Vivando at 10 fl oz plus "C" <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	F				
Quintec at 4 fl oz plus "C" <i>then</i>	G				
Magister SC at 32 fl oz plus "C" .	H.....	95.0 c	1308 bc	12.8 b	154 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Mettle at 5 fl oz plus "C" <i>then</i>	C				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Quintec at 4 fl oz plus "C" <i>then</i>	F				
Torino at 3.4 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	G				
Magister SC at 32 fl oz plus "C"	H.....	96.0 bc	1441 b	16.2 b	198 b
Microthiol Disperss at 6 lb plus Cohere at 1 pt/100 gal <i>then</i>	A, B				
Mettle at 5 fl oz plus "C" <i>then</i>	C				
Torino at 6.8 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	D				
Merivon at 5.5 fl oz plus "C" <i>then</i>	E				
Quintec at 4 fl oz plus "C" <i>then</i>	F				
Torino at 6.8 fl oz plus JMS Oil at 2 pt/100 gal <i>then</i>	G				
Magister SC at 32 fl oz plus "C"	H.....	97.5 abc	1310 bc	15.7 b	185 b

* Pesticides were applied on A = 18 May (BBCH 19), B = 26 May (BBCH 53), C = 2 Jun (BBCH 55), D = 8 Jun (BBCH 63), E = 23 Jun (BBCH 71), F = 8 Jul (BBCH 76), G = 21 Jul (BBCH 79), and H = 4 Aug (BBCH 81, start of Veraison).

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

"C" = Cohere at 1 pt/100 gal