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

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Length of grape powdery mildew protection using different rates of Tornio at bloom, 2019.

The objective of this trial was to determine when powdery mildew would increase after a single application of Torino at bloom. Fungicide treatments were arranged in a randomized complete block design in a block of 'Chardonnay' planted in 1985 on a 8x10 ft spacing. Chardonnay vines were pruned on 24 to 25 Jan to a mixture of training systems as they were in transition from a cordon system with spurs to a Guyot system (vertical shoot position). Shoot thinning and sucker removal by hand occurred 14 to 15 May and continued occasionally throughout the growing season. Canes were cut above the top wire on 24 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 148 gal water/A depending on canopy growth such that 2.5 to 4.9 gal of spray suspension was used per 20 vines. Microthiol Disperss (5 lb/A) was applied to all fungicide treatments prior to bloom on 22 May (BBCH 14), 27 May (BBCH 55), 3 Jun (BBCH 57) and 10 Jun (BBCH 59 to 60). Torino was applied at different rates on 15 Jun (BBCH 66). No leaves were removed from the fruiting zone. Makaze (32 fl oz/A) plus Goal 2XL (32 fl oz/A) was applied on 30 Jan and Rely 280 (4 qt/A) was applied on 3 May for management of weeds. No fertilizer or insecticides were applied during the trial. According to the Gubler-Thomas powdery mildew forecasting model, there were 5 rain events between bud break and end of bloom that were favorable for ascospore release and infection: 0 severe infection periods, 3 moderate infection periods (18, 21 and 25 May) and 2 low infection periods (14 and 22 May). The risk index briefly shot up from 0 to past 60 then back down to 0 in mid-May, then back above 60 early June before and during bloom, remained high (above 60) until late June when it dropped below 60 for a week during a cool period, then back above 60 until mid Sep (Figure 1). Incidence of powdery mildew on fruit was evaluated on 26 Jun, 9, 17, and 22 Jul. Severity of powdery mildew on fruit was evaluated on 9, 17, and 22 Jul. Incidence and severity of powdery mildew on leaves was evaluated on Jul 22. 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 the 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 severity of mildew 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.

Rainfall for the growing season (Oct 2018 to Sep 2019) was approximately 5 inches below the 115 yr average but temperatures were at the average of 59.2°F. March precipitation was 3 in below normal while April was 3 in above normal which led to localized flooding from April 9 to 11 in parts of the vineyard prior to bud break. Symptoms of powdery mildew were first found on 13 May as a few individual colonies on scattered vines and flag shoots were observed on 16 May. Powdery mildew on non-treated vines increased rapidly from an average incidence of 26% on 26 Jun to 100% on 9 July (Figure 2). All fungicide treated vines reached 100% incidence on fruit and leaves by 22 Jul since there were no applications past bloom. There was no difference in leaf powdery mildew severity (average 26%) on 22 Jul among fungicide treated vines (data not shown). All fungicide treatments significantly delayed the epidemic when compared to non-treated vines as shown in Figures 2 and 3 and with AUDPCs in Table 1. Vines sprayed with the high rate of Torino had a significant delay in the powdery mildew epidemic than vines sprayed with the lowest rate. This was first detected at the 9 Jul incidence rating and at the 17 Jul severity rating (Figures 2 and 3). Vines sprayed with the high rate of Torino had the lowest incidence AUDPC but it was not significantly different from the AUDPC for vines sprayed with the middle rate of Torino. Vines sprayed with the high rate of Torino had the lowest severity AUDPC but it was not significantly different from the AUDPC for vines sprayed with either the middle rate of Torino or when GWN-10021 was tank mixed with the low rate of Torino. No phytotoxicity was observed on any treated vines. Data suggest that more than a 2 week delay in reapplication could be detrimental to successful powdery mildew management. Reapplication intervals should be no longer than 2 week intervals in western Oregon especially during bloom.

Figure 1. Gubler-Thomas grape powdery mildew risk index for the 2019 growing season.

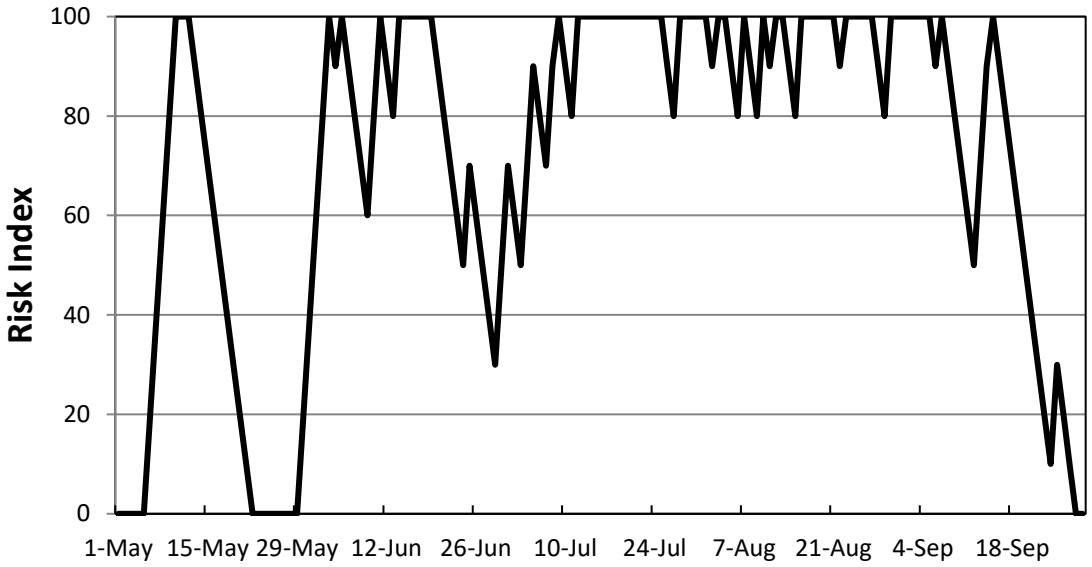

Table 1. Incidence and severity of grape powdery mildew on clusters treated with Torino at bloom.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Clusters with Powdery Mildew**			
		Incidence (9 July)	Incidence AUDPC	Severity (17 July)	Severity AUDPC
Non-treated…….……..	None……	100 a	21.2 a	100 a	13.0 a
Microthiol Disperss at 5 lb then Torino SC at 3. 4 fl oz plus Stylet-Oil at 0.5 gal/100 gal …	A, B, C, D E…….	97 a	19.2 ab	69.7 ab	8.1 b
Microthiol Disperss at 5 lb then Torino SC at 5.1 fl oz plus Stylet-Oil at 0.5 gal/100 gal …	A, B, C, D E…….	82.5 ab	17.7 bc	43.7 bc	5.9 bc
Microthiol Disperss at 5 lb then Torino SC at 6.8 fl oz plus Stylet-Oil at 0.5 gal/100 gal …	A, B, C, D E…….	68 b	16.0 c	19.9 c	2.7 c
Microthiol Disperss at 5 lb then Torino SC at 3.4 fl oz plus GWN-10021 at 32 fl oz/100 gal	A, B, C, D E…….	98 a	19.3 ab	46.4 bc	5.5 bc

* Fungicides were applied on A = 22 May (BBCH 14), B = 27 May (BBCH 55), C = 3 Jun (BBCH 57), D = 10 Jun (BBCH 59 to 60) and E = 15 Jun (BBCH 66).

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

Figure 2. Incidence of powdery mildew on clusters treated with various rates of Torino at bloom. Arrow indicates time when the one application of Torino occurred (15 Jun).

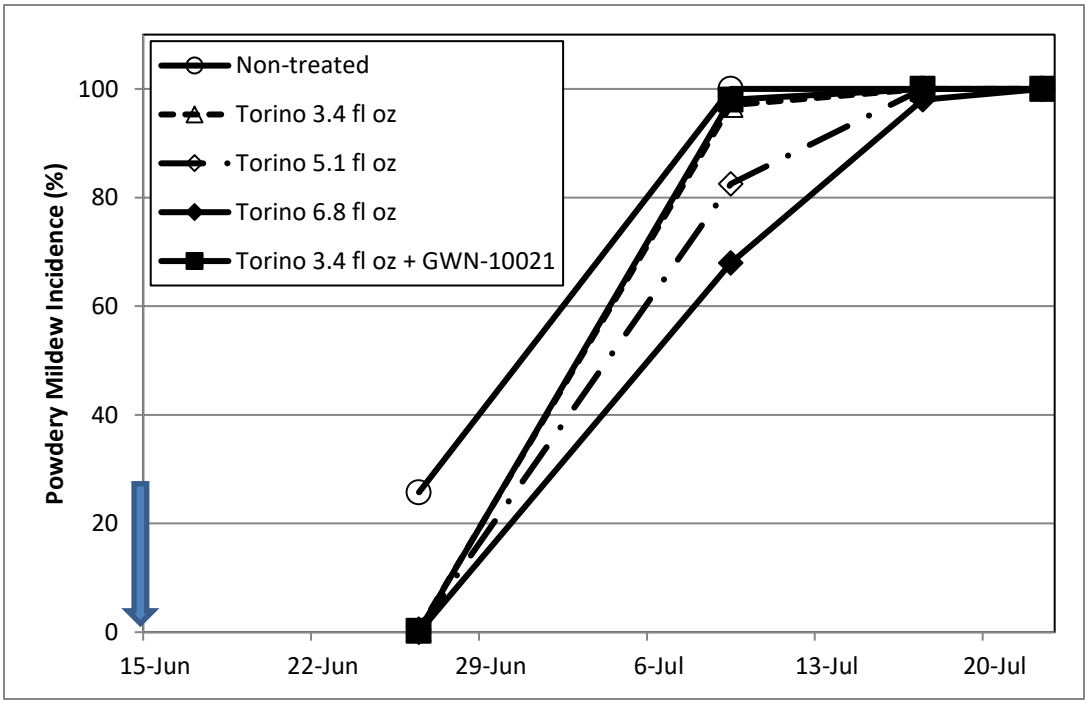

Figure 3. Severity of powdery mildew on clusters treated with various rates of Torino at bloom. Arrow indicates time when the one application of Torino occurred (15 Jun).