

# Oregon Wine Advisory Board Research Progress Report

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## Evaluation of Grape Powdery Mildew Forecasting Programs Grape (*Vitis vinifera* 'Chardonnay') Powdery Mildew (*Uncinula necator*)

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Three forecasting programs for scheduling fungicide applications were selected for comparison with the standard Oregon phenology based program. The California (Gubler-Thomas, UC-Davis) program used leaf wetness and temperature early in the year to predict ascospore infection periods and only temperature during the summer to predict conidial infection periods. The New York (Gadoury) program was based on rainfall and temperature. The German (Oi Diag) program incorporated relative humidity along with temperature and rainfall. Treatments were arranged in a randomized complete block design in a block of 'Chardonnay' planted in 1985 on a 7 x 10 ft spacing. Vines were trained to a bilateral cordon with spur pruning. Shoot thinning occurred 12-13 May to provide uniform cane density. Each treatment was replicated on 3 sets of 5 vines. Treatments were applied using a handgun sprayer at 300 psi at a rate of 200 gal water/A for applications between 1 May (budbreak) and 13 May (6" growth). Treatments were applied using a hooded boom sprayer at 300 psi at a rate of 200 gal water/A for all applications after 13 May. Approximately 3.5 gal of spray suspension was applied per 15 vines (150 gal water/A) between 1 May and 13 May, 4.5 gal between 21 May and 28 Jul, and 5 gal (200 gal water/A) for the rest of the applications. Treatments were applied as required by the guidelines for each program. However, additional conditions for stopping programs at or just after veraison were incorporated as requested by Oregon growers. The standard program and the water control were applied on 13 May (6" shoots), 21 May (12" shoots), 2 Jun (prebloom, EL growth stage 17), 16 Jun (90% bloom), 1 Jul, 15 Jul (bunch closure), 22 Jul, 5 Aug, and 12 Aug (veraison). No Botrytis control measures, including leaf removal, were applied to test vines. All programs used one of two fungicides, Thiolut DF at 3 lb/100 gal water or Rally at 2 oz/100 gal water for each application. Trap plants of 'Cabernet Sauvignon' were placed next to nontreated vines for 24 hour periods within the same block of grapes from 8 May to 3 Jul. After 24 hours of exposure, plants were transferred to a greenhouse several miles away for incubation under conditions favorable for powdery mildew development.

Record rainfall during the dormant season resulted in a flood, several feet of flowing or standing water, on 1-2 Jan. Urea fertilizer was spread within vine rows on 24 Mar at 100 lb/A. Incidence of powdery mildew on leaves was evaluated on 14 Jul, 21 Jul, 30 Jul, 14 Aug, 22 Aug (veraison), and 4 Sep by randomly examining 50 leaves from the middle 3 vines of each replicate. Incidence of powdery mildew on clusters was evaluated on 21 Jul, 30 Jul, 14 Aug (7.4 Brix), 22 Aug (10.9 Brix), and 4 Sep by randomly examining 50 clusters from the middle 3 vines of each replicate. Severity of powdery mildew on leaves was evaluated on 9 Sep (16.3 Brix) by visually estimating the percentage leaf area infected. Comparisons among treatments for incidence of powdery mildew on leaves and clusters were also evaluated by calculating the area under disease progress curves (AUDPC). AUDPC was calculated by multiplying the mean incidence from two observation dates by the number of days between observations. Values calculated between each pair of observations are added together to obtain a total

AUDPC ( $E[Y_{i+1} + Y_i]/2][X_{i+1} - X_i]$  where  $Y_i$  is incidence of mildew at  $i$ th observation and  $X_i$  is the day of the  $i$ th observations).

According to the unpublished California powdery mildew forecasting model, there were 9 rain events between budbreak (28 Apr) and end of bloom (28 Jun) that were favorable for ascospore release and infection; 7 severe (high) infection periods (28 Apr, 22 May, 27 May, 31 May, 3 Jun, 11 Jun, and 22 Jun); 2 moderate infection periods (24 May and 28 Jun). The cumulative risk index reached 60 (indicating the need for short spray intervals) on 10 May and generally remained at or above 60 until 17 Sep, except for a short rainy period from 24 May to 29 May. The German program calculated the first fungicide application for 4 May. Mean Index values rose above 40 (indicating the need for short spray intervals) on 11 May. Long spray intervals were indicated three separate times during the summer, but went back to short intervals soon after, until mid Sep when longer intervals prevailed. Conditions for the New York program to indicate fungicide applications were met throughout the spring season.

Treatment and Rate/100 gal	Powdery Mildew on Leaves (%) <sup>1</sup>			Powdery Mildew on Clusters (%) <sup>1</sup>	
	Incidence 14 Aug	Severity 9 Sep <sup>2</sup>	AUDPC	Incidence 22 Aug	AUDPC
Water Control .....	97.3 a	---	29.2 a	100.0 a	27.4 a
<u>Standard Program<sup>3</sup></u>					
Thiolux 80 DF 3 lb (5 applications)					
Rally 40 WP 2 oz (4 applications) .	12.7 bc	0.5	2.9 b	34.0 b	6.4 b
....					
<u>California Program<sup>4</sup></u>					
Thiolux 80 DF 3 lb (4 applications)					
Rally 40 WP 2 oz (5 applications) .	4.7 c	0.5	0.9 b	34.0 b	6.3 b
....					
<u>German Program<sup>5</sup></u>					
Thiolux DF 3 lb (5 applications)					
Rally 40 WP 2 oz (5 applications) .	2.7 c	0.2	1.0 b	20.0 b	3.0 b
....					
<u>New York Program<sup>6</sup></u>					
Rally 40 WP 2 oz (3 application)					
Thiolux 80 DF 3 lb (5 applications)	22.7 b	6.1	4.9 b	31.3 b	6.5 b

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

2 Evaluations for incidence of powdery mildew for leaves and clusters for the water control were not made after 26 Aug due to eradicated measures taken to control high levels of disease development.

3 For the standard program, Thiolux DF was applied on 13 May, 21 May, 1 Jul, 15 Jul, 5 Aug. Rally was applied on 2 Jun, 16 Jun, 22 Jul, and 12 Aug. Water was also applied on each of these dates for the water control treatment.

4 For the California program, Thiolux DF was applied on 1 May, 21 May, 16 Jul, and 9 Aug. Rally was applied on 5 Jun, 19 Jun, 2 Jul, 25 Jul, and 19 Aug.

5 For the German program, Thiolux DF was applied on 5 May, 13 May, 21 May, 21 Jul, and 11 Aug. Rally was applied on 5 Jun, 23 Jun, 7 Jul, 28 Jul, and 19 Aug.

6 For the New York program, Thiolux DF was applied on 1 May, 21 May, and 5 Jun. Rally was applied on 26 Jun, 11 Jul, 25 Jul, 9 Aug, 22 Aug.

Powdery mildew was first observed in an adjacent block on 9 Jun and within this block of vines on 27 Jun. Only trap plants exposed on or after 5 Jun developed symptoms of powdery mildew. From 5 to 13 Jun, a total of 12 out of 28 trap plants developed symptoms of powdery mildew. Total number of fungicide applications was 9, 9, 10, and 8 for the Standard, California, German and New York programs, respectively. All programs resulted in vines with significantly less leaf and cluster powdery mildew than water treated vines. Vines treated according to the New York program had significantly more leaves with powdery mildew on 14 Aug than vines treated according to the California or German programs, but not significantly more than vines treated according to the standard program. The percentage of leaf surface covered on 9 Sep and the AUDPC, however, for vines treated according to the

New York program were not significantly different from vines treated according to the other programs. There were no significant differences in cluster powdery mildew detected between vines treated according to the various programs. Although the standard program was supposed to be sprayed with Rally on 1 Jul, it did not appear to have a major impact on the overall disease control obtained.