

Specialty Crops Program – Annual Report, 2002

Grant Title: Application of Crop Modeling for Sustainable Grape Production

Organization: Rocky Mountain Association of Vintners & Viticulturists (RMAVV)

Technical Advisors: Harold Larsen, Horst Caspari, Rod Sharp

Summary:

First season experience with the available Gubler-Thomas and Kast powdery mildew models found that neither model tracked powdery mildew disease development in the study vineyards with extremely close match. The Kast model was the closest, but it is likely that adjustment of the models may be required to obtain a close fit with actual disease observations through the season. However, the reduction of number of control sprays from six in the grower standard program to only three in the model-driven program demonstrates the potential value of the concept for control of powdery mildew in Colorado vineyards.

Materials and Methods:

One-acre blocks of Chardonnay (the “model” treatment) were set aside at two vineyards in Palisade, Colorado (Vineyard A and Vineyard B). Apart from a single sulfur application at bud break, no further powdery mildew sprays were applied to the model treatment unless requested by the technical advisors. The decisions to spray or not spray were based on (i) the powdery mildew models (Gubler-Thomas and Kast), (ii) accurate, site-specific weather and leaf wetness data, and (iii) field scouting. At each vineyard site, a similar-sized block of Chardonnay served as the control in which powdery mildew was managed according to the growers’ previous practices (the “standard” treatment).

Incidence and severity of powdery mildew infections on shoots and leaves were recorded by a field scout one to three times per week throughout the 2002 season up to and slightly beyond harvest. Funding for the technician/scout was obtained through an EPA grant that was awarded in July 2002. The EPA grant covers personnel costs for the scout; prior existence of the Specialty Crops Grant greatly expedited approval of that EPA grant.

Adcon Telemetry Inc. weather stations were set up at each grower cooperator site and weather data (temperature, humidity, wind speed & direction, rainfall, leaf wetness, solar radiation, etc.) was radio-transmitted back to the base station at the W. Colo. Res. Center at Orchard Mesa site. The weather data was used in the powdery mildew models to calculate a “Risk Index”. The Risk Index provided an assessment of the need for any treatment applications to the model blocks.

The computer model assessments were then compared to the field infection data as gathered by the scout. After reviewing the model output and the field data, the technical advisors forwarded recommendations to the cooperators as to whether to apply mildew control sprays in the model block and what type of spray materials to use. In the standard block, mildew was controlled by way of the grower’s typical spray program. At the end of the season, the inputs and disease ratings were compared for the two treatments.

Results:

Powdery mildew infections were not observed in the study blocks until after July 15, 2002. Infection incidence and severity increased steadily at the end of July in both the standard program blocks and the model program blocks through and beyond harvest (Fig. 1). The timing of this increase corresponded closely with a significant rainfall event in late July at both study sites. Figure 2 shows the precipitation and leaf wetness data for Vineyard B; this data was similar at Vineyard A.

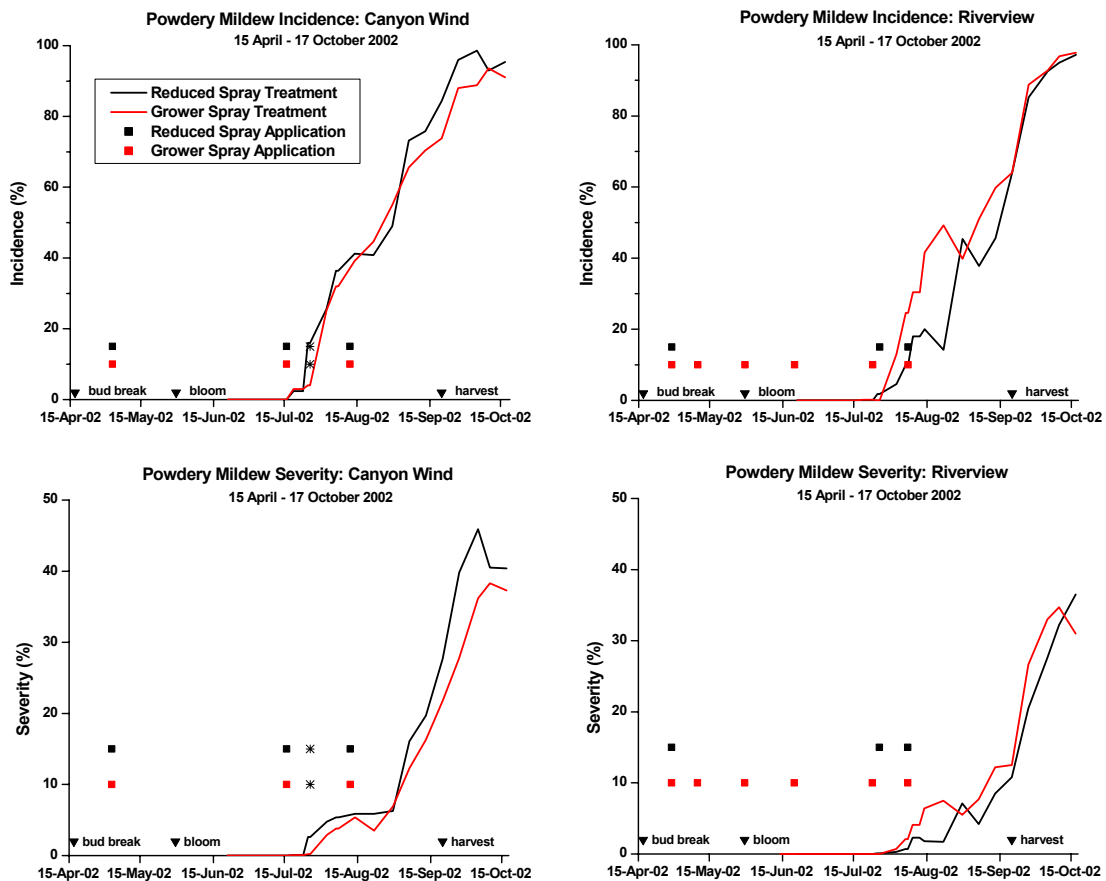


Figure 1. Incidence (top) and severity (bottom) of grape powdery mildew on Chardonnay leaves at two Colorado vineyards in 2002. At each site, the grower's standard spray program was compared to a reduced (model) spray program. Spray applications are indicated by a "■" (grower program) and a "■" (reduced program). An "*" indicates an insecticide application with a material that was also active against powdery mildew. Left: Vineyard A; right: Vineyard B.

The comparative spray programs differed at the two grower cooperator sites. At one site (Vineyard B), the grower applied to the standard block a mildew control program similar to one he used in previous years. This resulted in six protective spray applications in the standard block

compared to three in the model block (Fig. 1). At the other site (Vineyard A), the grower did not apply his standard program as was originally intended. Instead, he decided not to apply any further mildewcide sprays after the first application at bud-break until precipitation events occurred or powdery mildew infections were observed. Thus, the grower used the information gathered by the scout in his standard program. This resulted in the standard and the model program being virtually identical with three sprays each (Fig. 1). It should be noted that the grower applied one insecticide application using Stylet oil at 1.5 % vol/vol. At that rate Stylet oil also has efficacy against powdery mildew.

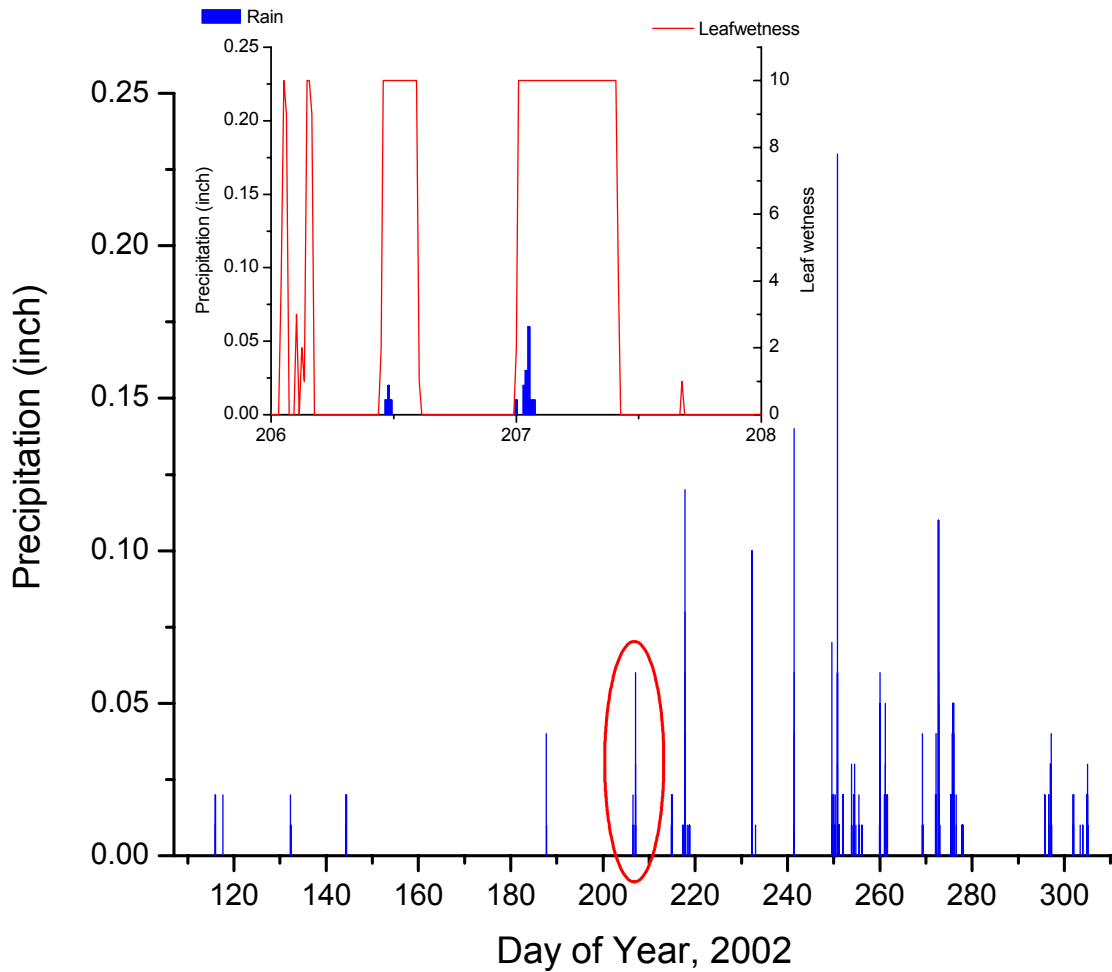


Figure 2. Precipitation at Vineyard B near Grand Junction, CO during 2002. Insert: Close-up of the precipitation and leaf wetness data for July 25 and 26 (DOY 206 and 207).

Conclusions and Discussion:

The first season data demonstrate the potential benefit of using computer models driven by remotely gathered weather data and validated by scout observations. At the Vineyard B cooperater site, the model program used ½ of the number of spray applications used by the standard program.

The standard program used at Vineyard B is very representative of the type of program used within the industry prior to the start of the study. In fact, Vineyard A used a spray program very similar to that of Vineyard B prior to the start of our study. However, due to the change in the standard program used at Vineyard A, the number and timing of the control sprays did not differ from the model treatment and so do not reflect a very accurate comparison.

It is worth noting that the model program at Vineyard B had a slight offset from the standard program spray in late July. In the standard program, a spray was applied on July 23 because the efficacy of the previous spray (applied on June 20) had ceased. In the model program, the same fungicide spray was applied on July 26 in response to significant rainfall and extended leaf wetness periods on July 25, 26. Following those applications, a major difference was noted in incidence and severity levels for several observations thereafter (Fig. 2). This reduction in incidence and severity of infections is very likely due to the difference in timing.

There was obviously no difference in the costs for the control programs at Vineyard A. However, at Vineyard B the approximate costs (materials only) for the grower treatment was \$98 per acre versus \$46 per acre for the model program. The actual cost savings are likely to be higher when one considers the additional costs of labor and equipment.

It was noted that the Gubler-Thomas model incorporated within the computer software called for protective sprays many additional times early in the season. Conversely, the Kast model from Germany was more conservative in its assessment of infection periods, and did a better job during the early season when the Gubler-Thomas model was calling for infection periods driven primarily by temperature data (no significant rainfall during that period). It appears that additional experience with these models is needed, and best results may require adjustment of the models to better track Colorado conditions.

The objectives of phase I of the study were achieved. Phase II will expand the number of vineyards within the study by two additional vineyards, with addition of two more telemetry weather stations that will be tied in with the existing computer server. An additional season of data will provide further indication on whether (and how) the models may need adjustment for Colorado's conditions.

Outreach:

Producers were informed of the project plans at the Spring meeting of the Rocky Mountain Association of Vintners and Viticulturists (RMAVV) held April 20, 2002. A progress report was given at the Summer RMAVV meeting held July 27, 2002. The season-long results were shared with producers at the Fall RMAVV meeting held Nov. 9, 2002.

Drs. Larsen and Caspari met formally with the grower cooperators on June 4, 2002 to review the powdery mildew models and the control strategy in the model program. The technical advisors also had numerous informal meetings with the grower cooperators throughout the season.

2002 Budget Sheet:

Budget Category	Description	Funds Received from SCP (\$)	Matching Funds (\$)
Personnel			
Rental Value of Equipment			
Materials and Supplies			
Equipment Purchases		2,866.03	8,598.07
Outreach Expenses		663.44	663.44 508.69 ¹
Travel Expenses			
Miscellaneous			
Total		3,529.47 ¹	9,770.2

¹ An additional \$508.69 has been invoiced to SCP for Outreach Expenses, but no funds had been received at the time of this report.

Signed: _____
President, Rocky Mountain Ass'n. Vintners & Viticulturists

Date: _____