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Introduction of Integrated Production:
Evaluation of a Powdery Mildew Forecasting System at the Lewis Brown Farm

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INTRODUCTION

One of the goals of the Integrated Production approach is an overall reduction of pesticide use, including the application of fungicides for disease control. Powdery mildew is the most frequently sprayed disease in Oregon vineyards. Losses to powdery mildew vary from year to year, but may be substantial. Because little or no tolerance exists at the winery for fruit affected by powdery mildew, reduced fungicide application without increased disease incidence must be based on a reliable forecasting system. A powdery mildew forecasting system adapted to Oregon conditions would allow growers to time spray applications with greater confidence, and consequently, could result in reduced fungicide applications. The objective of this study was to test the powdery mildew forecasting model developed by Doug Gubler for California vineyards under Oregon conditions.

PROCEDURES

This study was carried out in the Lewis-Brown Farm Trellis Trial vineyard in Corvallis, Oregon. The original trial was planted in 1984. Pinot noir, Chardonnay, Riesling, and Gewurztraminer were trained to five trellis and training systems: upright vertical, cane pruned (Guyot); upright vertical, cordon pruned (Cordon); Scott Henry; cane pruned; Lyre, cane pruned; and Geneva Double Curtain, cane pruned. The two single canopy systems were spaced 1.5m x 2.0 m and the divided canopies were spaced 1.5m x 3.0m. The vines were balance pruned in February 1995.

The current study tested two spray programs: 1) the Standard program had a fixed spray interval of ten days, and 2) the Forecast system, with the spray interval determined using the powdery mildew forecasting model developed by Doug Gubler. Both spray programs were applied over the full range of cultivar and trellis system combinations and replicated five times. Guard rows between complete blocks and between single and divided canopy systems within blocks were left unsprayed to provide inoculum for increased disease pressure.

In the forecasting model system, the spray interval is based on the Disease Risk Index (DRI). When the DRI is 0.3 or less, a long spray interval (14 days for sulfur) can be used; when the DRI is 0.4 to 0.5, an inter-mediate interval (10 days for sulfur) is used; when the DRI is 6.0 or higher, a short interval (7 days for sulfur) is used. The DRI is calculated using temperature as follows: 0.2 units are added each time there are at least six hours during the day with temperatures between 70 and 85 'F (21 and 30 'Q; If there are less than six hours between 70 and 85 'F, or if the maximum temperature is greater than 95 'F (35 'Q in the canopy, then 0.1 is subtracted. On the day of spray application the DRI restarts at 0. In this study,

temperature was recorded using a Hobo temperature logger (Onset Computer Corporation) placed in the canopy. Two temperature loggers were used allowing one to be placed in the canopy at all times for continuous measurement while the other was retrieved for downloading data and calculation of the DRI on a regular basis.

All fungicide applications prior to 12 August were micronized sulfur (Thiolux DF, Sandoz; 21b/50 gal; 90-350 gal/A, applied to runoff with a handgun sprayer, or with an airblast sprayer). Stylet Oil (JMS Flower Farm) was applied to the entire vineyard in August, when it became apparent that the sulfur would not provide adequate powdery mildew control. The spray volume was adjusted between the single and divided canopy systems to approximate an equal volume on a per acre basis.

On 7 July, 18 July, 27 July, 7 August, and 17 August, disease incidence was evaluated on foliage of the two middle vines of each four-vine spray subplot. Fifty randomly selected leaves (twenty-five on each side of the canopy) were visually sampled for presence or absence of mildew lesions, and disease incidence was expressed as the percentage of leaves with mildew lesions. On 7 August, 17 August, and 9 September, disease incidence was evaluated on fruit clusters of the two middle vines of each four-vine spray subplots. All clusters were visually sampled for presence or absence of mildew lesions, and disease incidence was expressed as the percentage of fruit clusters with mildew lesions.

RESULTS AND DISCUSSION

Spray frequency - The Forecast spray program, as implemented, resulted in 10 fungicide applications prior to the shift to Stylet oil on 12 August compared to seven applications for the Standard spray program. Deviations from a spray program using spray intervals determined by the disease forecasting model occurred when unfavorable weather delayed spray application. A spray program implemented strictly with spray intervals determined from the forecasting model would have resulted in 12 spray applications prior to 12 August.

Disease incidence - Disease incidence increased on both foliage and fruit clusters over the course of the evaluation period (Figures 1 and 2). By mid- August the overall mean of disease incidence on foliage was 38%. There was no significant difference in disease incidence between the two spray program treatments. By I September, the overall mean of disease incidence on clusters was 80%. Spray program did not result in significant differences in powdery mildew incidence on fruit clusters.

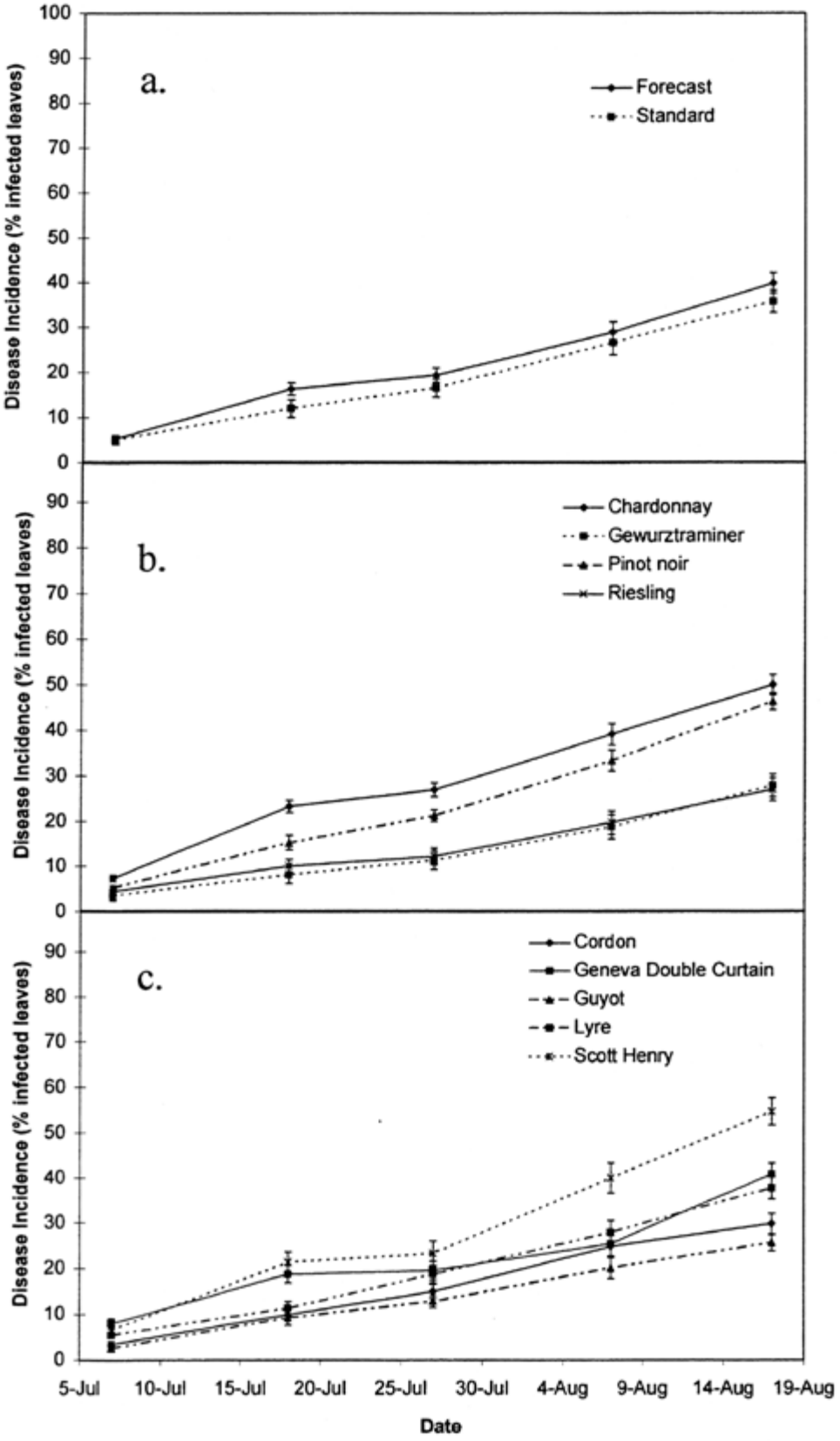

Figure 1. The incidence of foliar powdery mildew in response to: a. spray treatment; b. cultivar; and c. trellis and training system.

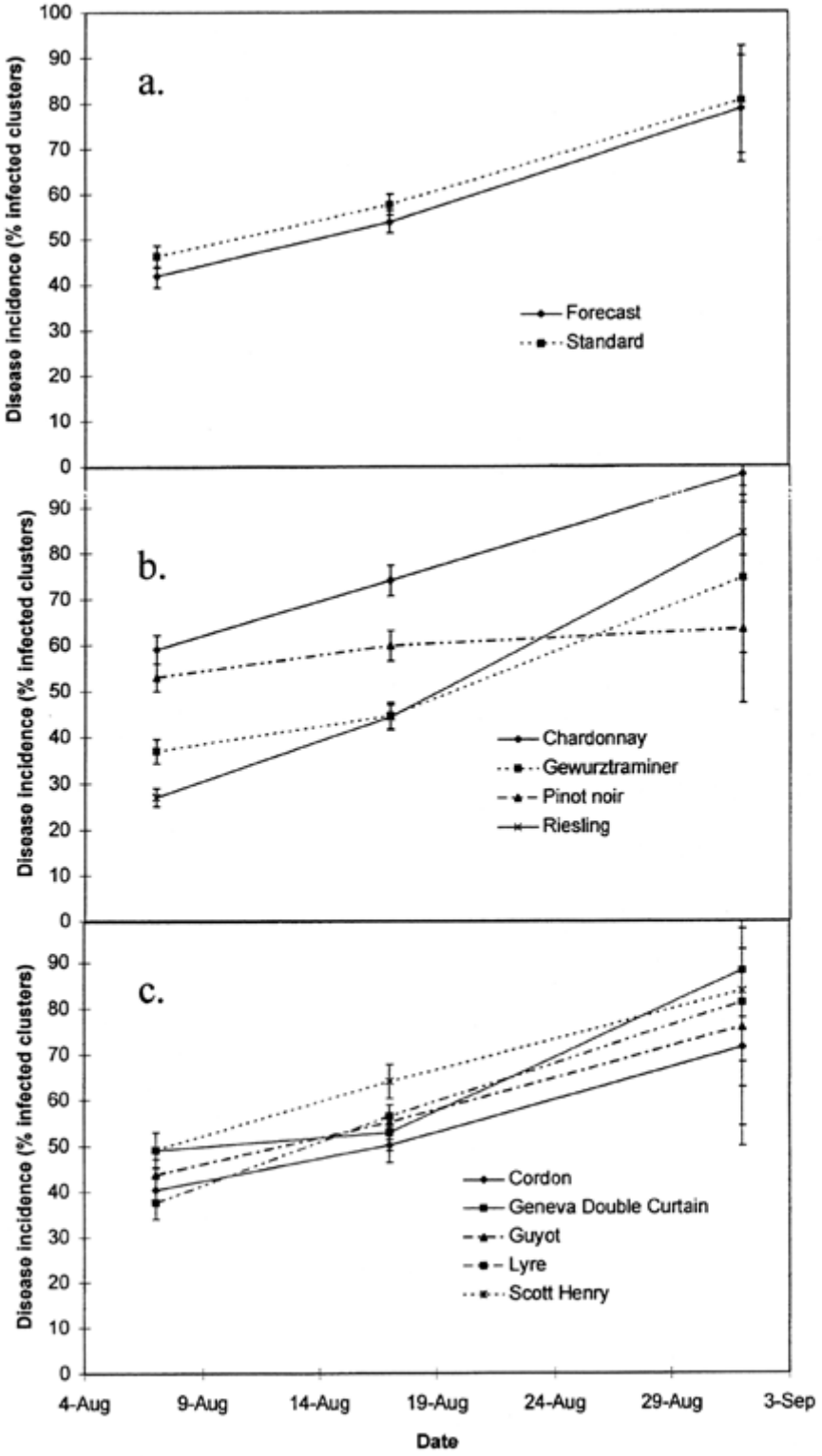

Figure 2. The incidence of fruit cluster powdery mildew in response to: a. spray treatment; b. cultivar; and c. trellis and training system.

Differences were apparent, however, in disease incidence on both foliage and fruit among the different cultivars. Chardonnay and Pinot noir had the highest foliage powdery mildew incidence, respectively,

over the course of the evaluation period. Disease incidence on fruit clusters mirrored that of foliage except in Pinot noir where it appears to have leveled off at about 60% after 17 August. It is more likely that disease incidence on Pinot noir fruit clusters continued to increase but was undetected after veraison. The differences in powdery mildew incidence among cultivars observed here are in general agreement with other work.

Foliar powdery mildew incidence tended to be lowest for the two single canopy systems, followed by the Lyre and Geneva Double Curtain, and was highest in the Scott Henry system.

The two single canopy systems tended to have lower cluster disease incidence than the divided systems, but the variation was high in all five trellis and training systems. The differences observed here, particularly the high foliar disease incidence in the Scott Henry system, may be due to inadequate adjustment of spray equipment for the different systems rather than differences in susceptibility inherent among the trellis and training systems.

CONCLUSIONS

The Forecast approach to determining spray interval resulted in overall increased fungicide use. Under conditions of high disease risk, the potential exists for a predictive model to indicate greater spray frequency than a program based on a fixed spray interval. Improved timing of fungicide applications, however, should result in better mildew control. Conversely, under conditions of low disease risk, a spray program using a predictive model could result in reduced spray frequency with no reduction in disease control. In this study, with extremely high disease pressure and a sulfur based program, neither the Standard spray program nor the Forecast spray program provided a commercially acceptable level of disease control. It would be useful to test the powdery mildew forecasting model developed by Doug Gubler, as well as other powdery mildew forecasting systems, under disease pressure conditions more typical of Oregon vineyards.

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