SOUTHERN REGION SMALL FRUIT CONSORTIUM RESEARCH PROJECT

2003-2004 Final Report

Validating Grape Disease Forecast Models for the Southern U.S.

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Objectives: To evaluate commercial forecast models for black rot and grape berry moth and to determine their potential as aids in managing these pests in the southern U.S.

Justification: Black rot is the most important grape disease in the southern U.S. Satisfactory control of black rot can require up to 12 fungicide applications per year. Prospects for reducing the number of fungicide applications were enhanced with the 1977 development of the Spotts model, a practical model for predicting black rot infection periods. The emergence of DMI fungicides with post-infection activity has allowed the use of the Spotts model in a curative manner shortly after black rot infection periods. The Spotts model is sometimes suggested for use in scheduling sprays by southern grape growers. However, there is a need to validate the accuracy of the forecasts under southern conditions.

The weather monitoring equipment used for determining disease infection periods can also be used to drive predictive models for insects such as grape berry moth. Temperature data can be used to time control tactics. Multiple uses of the weather monitoring equipment should maximize the potential for return on the cost of the equipment by improving pest control while reducing pesticide usage.

Methodologies: Development of black rot and grape berry moth was monitored in grape plantings and compared to model predictions driven by weather data. In addition, the utility of the Spotts model in black rot control was evaluated with a spray program dictated by the model.

In early April, 2004, weather stations for the black rot trials were placed in grape vineyards at Franklin and Brentwood, about 12 miles apart in central Tennessee. WatchDog weather stations (Spectrum Technologies, Inc., Plainfield, IL) were used to measure and record environmental data. The data were downloaded to a computer every 7 to 14 days. The software (SpecWare 6.0, Spectrum Technologies) provides a daily rating of risk for infection by the black rot fungus. The infection risk rating is based on the Spotts model and is determined by the temperature while leaves are wet and the length of time that leaves are wet. A daily risk rating of 1.00 or greater indicates a high probability of an infection period.

The fungicide spray program trial compared a Spotts model-driven program ("curative") using the DMI fungicide Nova with the currently-recommended calendar-based program ("calendar") using the protectant fungicides Dithane DF or Captan. Nova was applied after each daily risk rating of at least 1.00, with the exception of those that occurred within 10 days of the previous application. The calendar program fungicides were applied every two weeks.

Grape berry moth data was obtained in 2003 and 2004 from sites about 10 miles apart at Nashville and Nolensville, in central Tennessee. The Nashville site involved wild grapes, while the Nolensville site was a commercial winegrape vineyard. The grape berry moth model uses temperature data calculated as degree days with a 50° F base. Temperature data at the Nashville

site was obtained from a WatchDog weather station, while National Weather Service data was used for the Nolensville site. Moth activity was monitored with pheromone traps using Trece lures. A Multipher 1 canister trap was used at Nashville, and a Trece Pherocon 1C trap with straw spacers was used at Nolensville.

Results: The two black rot locations generally had similar results. Black rot was first observed on non-sprayed vines at Franklin on May 8 (prebloom). The incubation period for leaf infections by the black rot fungus is 7-14 days, typically 8-10 days during the spring. Thus, the first infections probably occurred when infection risk ratings of 1.00 and 1.02 occurred on Apr 30 and May 1, respectively. While this observation could be considered a success, it should be noted that infection risk ratings of 1.27 and 1.20 on Apr 21 and 22, respectively, failed to result in infections. This lack of infection could be explained by a malfunction of the monitoring equipment, an execution problem with the software program, or by a lack of inoculum in place on the leaves. However, the site had a high overwintering inoculum level, and ascospores typically are discharged any time after bud break (April 1, in this case) with minute amounts of rainfall.

The curative spray program required only two fungicide applications between Apr 1 and mid-Jun (bunch closure), compared to the calendar program's five applications during this time. Black rot control was equal, with approximately 1% of leaf area and 1% of berries affected in each program. Black rot pressure was very high, with 90% defoliation and 95% loss of fruit in the untreated check.

In 2003, grape berry moth activity at Nashville was too low to be meaningful. The Nolensville trap was installed on Jul 3 and produced data adequate to detect flight activity that seemed to peak in mid-Jul and mid-Sep. In 2004, the Nashville trap, installed on Mar 4, detected the emergence of the male moths in early Apr and continued until May 10. The Nolensville trap, installed on Apr 3, detected very few moths at any time. The low numbers of moths trapped during this project made it difficult to discern peak moth activity, used to time insecticide sprays (8 days later). Although the Nolensville counts were low, moths caught in early Jul corresponded with model predictions for third generation emergence.

Conclusions: Clearly, there is much room for reductions in fungicide use for black rot control. Whether the method used in this study is the most advantageous is questionable. Wet ground can create difficulties in making curative fungicide applications. Weather monitoring equipment is somewhat expensive for small operators and is subject to malfunction. Incorporation of the Spotts model into a software program introduces some subjectivity, thus a possibility of differences in model performance among brands of software.

The potential for using these IPM methods to manage grape berry moth was difficult to assess because of the low numbers of moths trapped. Difficulty in identifying moths was encountered, as the traps contained many tortricid moths that could cause confusion for anyone trying to identify them only with a hand lens.

Impact Statement: The authors do not presently recommend these techniques. Certain growers may be able to use them with success, but it is suggested that such growers thoroughly familiarize themselves with the equipment and the techniques by using them for at least one year before fully implementing them. Plans are to continue evaluating these and other methods of timing grape pesticide sprays.