Title: PHOMOPSIS IN NIAGARA GRAPES: FUNGICIDE TIMING AND EFFECTS ON YIELD

Principal investigator: Dr. Annemiek Schilder
Department of Plant Pathology
104 Center for Integrated Plant Systems
Michigan State University
East Lansing, MI 48824
Tel.517-355-0483
Fax. 517-353-5598
Email: schilder@msu.edu

Objectives:

1) To determine the effects of timing of fungicide applications on Phomopsis incidence and severity in Niagara

2) To determine the relationship between rachis and fruit infection severity and yield loss

No fungicide residue analysis was done, as mancozeb was not applied after bloom in any of the treatments.

Project duration:
2 years, started in 2003

Procedures
1) To determine the effects of timing of fungicide applications on Phomopsis incidence and severity in Niagara

The experiments were conducted in two mature, commercial 'Niagara' vineyards, one in Lawton (Van Buren County), the other in Scottdale (Berrien County), Ml In the Lawton vineyard, vines were spaced at 7 x 9 ft and were cordon-trained and mechanically pruned. Treatments were applied to four-vine plots and were replicated four times in a randomized complete block design. Sprays were applied with an R&D Research CO_2 cart-styled sprayer equipped with six bottles (0.8 gal each), a twin gauge Norgren pressure regulator set at 55 psi, and a single XR TeeJet 8002VS nozzle on a 5-ft spray boom. Initially, spray volume was 30 gpa then increased to 50 gpa beginning 24 Jun and 75 gpa beginning 9 Jul. Spray dates and approximate phenological stages were as follows: 25 April (budswell), 8 May (2-3 in. shoot), 21 May (8-10 in. shoot), 2 Jun (12-16 in. shoot), 10 fun (immediate pre-bloom), 24 Jun (1 st post-bloom), 9 ful (2nd post-bloom) and 30 ful (3rd post-bloom).

In the Scottdale vineyard, vines were spaced at 8 x 9 ft and were cordon-trained on a 2-wire trellis and hand-pruned. Treatments were applied to 4-vine plots and were replicated 4 times in a randomized complete block design. Sprays were applied, as above. Initially, spray volume was 30 gpa then increased to 50 gpa beginning 23 fun and 75 gpa beginning 9 Jul. Spray dates and approximate phenological stages were as follows: 1 = 8 May (2-3 in. shoot), 2 = 21 May (8-10 in. shoot), 3 = 2 Jun (12-16 in. shoot), 4 = 11 Jun (immediate pre-bloom), 5 = 23 Jun (1st post-bloom), and 6 = 9 Jul (2nd post bloom). Rainfall totals between sprays were, 2.08,0.53,0.29,0.04,2.45 and 2.03 in. respectively.

In both vineyards, disease was assessed on 25 clusters randomly collected from the center two vines of each plot. Incidence denotes the percentage of clusters with visible disease on the rachis or berries. Severity denotes the percentage of the rachis area or percentage of berries within a cluster affected averaged over all fruit clusters. In Lawton, disease measurements were done on 11 Sep, just before harvest. Also, total fallen fruit was collected under 12 linear feet of vines per plot. On 23 Sep, one week after mechanical harvest, total fallen fruit was again collected. In Scottdale, disease was assessed on 13 and 22 Sep. The reason for this is that the harvest date kept changing as the fruit was very unripe. On 15 Sep, within two weeks pre-harvest, total fallen fruit was collected under 4 linear meters of vines per plot. On 6 Oct, within two weeks post-harvest, total fallen fruit was again collected. The number of clusters per vine was calculated by counting and averaging the clusters on 10 vines. Average weight per cluster was determined on a subsample of 20 clusters. All data were entered into Excel spreadsheets and analyzed using the StatGraphics statistical package.

2) To determine the relationship between rachis and fruit infection severity and yield loss

Rachis and fruit infection data were regressed against each other and against the number of berries on the ground to determine which was best correlated to yield loss. This was done in the Excel computer program

Results and discussion

1) To determine the effects of timing of fungicide applications on Phomopsis incidence and severity in Niagara

In the Lawton vineyard, differences in disease severity on the fruit clusters occurred as a result of the different fungicide treatments (Table 3). The program with EBDC sprays before bloom and strobilurin (Abound) sprays after bloom tended to be more effective than a similar program with Ziram. While the difference may not be statistically significant, this observation has been consistent over several years and was also seen in Scottdale. A single spray of Topsin M or Sulfur reduced disease severity on the rachis and berries. Sulfur appeared slightly better than Topsin M. The most important spray timings appeared to be 2, 3, 4, and 5. In general, the differences in fruit drop reflected those in disease severity (Tabl~ 4). More berries were on the ground after harvest than before harvest. The average number of clusters per vine was 157. Average weight per cluster in best plot was 108 g (2.9 g/berry) and in the untreated control 97 g (2.8 g/berry). Estimated yield for the plot was 11.9 tons/acre. The estimated pre-harvest yield loss in the witreated plot was 1104 Ib/acre (0.55 tons/acre) and the post-harvest yield loss was 1505 Ib/acre (0.752 tons/acre). Some of the berry drop may be due to other causes.

In Scottsdale, differences in disease severity on the fruit clusters occurred as a result of the different fungicide treatments (Table 3). The program with EBDC sprays before bloom and strobilurin (Abound or Flint) sprays after bloom tended to be more effective than a similar program with Ziram instead of a strobilurin application. While the difference may not be statistically significant, this observation has been consistent over several years. The addition of sulfur to Dithane sprays did not appear to improve control of the disease. The most important spray timings appeared to be 2, 3, 4, and 5. Addition of a spray at time 1 or time 6 did not significantly improve control. Flint was somewhat more effective than Abound in a similar spray program. In general, the differences in fruit drop reflected those in disease severity (Table 4). There was a lot more fruit on the ground post-harvest, but the differences were not significant. The average number of clusters per vine was 204. Average weight per cluster in best plot was 107 9 (3.2 g/berry) and in the untreated control 97 9 (3.1 g/berry). Calculated total yield was 15.5 tons/acre. Most losses are due to fruit drop. The estimated pre-harvest yield loss in the untreated plot was 212 lb/acre (0.1

tons/acre) and the post-harvest yield loss was 716 lb/acre (0.36 tons/acre). Some of the berry drop may be due to other causes, as may be concluded from the fact that after harvest, the difference between plots was non-significant.

2) To determine the relationship between rachis and fruit infection severity and yield loss

Rachis and fruit infection data were very well correlated with number of berries on the ground pre-harvest at the Lawton plot (Figs. 1-4). The best correlation was actually with the percentage of clusters that had infected berries, followed by the percentage of infected berries per clusters, and the percentage of the rachis area infected. The poorest correlation was with the percentage of clusters that had rachis infection. This suggests that yield loss may be due to any of the first three factors, though last year the best correlation was with percentage of the rachis area infected. These factors are very highly correlated amongst each other, indicating that rachis infection may lead to berry infection or that both were infected at the same time. However, field observations indicate that most berry infections result from infections of the rachis and berry stems. Few are actually due to direct infections of the berry.

Conclusions

The results of this study show that spray programs are useful in controlling Phomopsis disease symptoms as well as yield losses. The best programs include strobilurin sprays after bloom. The most important times for control are from about 8-10 in shoot growth until the first post-bloom spray. A dormant application of sulfur can be used to aid in disease control. Disease symptoms are well correlated with yield losses, so 'what you see is what you get'. Most of the yield loss actually occurs after harvest, due to the force exerted by mechanical harvesters. However, pre-harvest fruit drop is better correlated with disease symptoms incidence and severity.