Title: EFFICACY OF SULFUR IN REDUCING PHOMOPSIS CANE AND LEAF SPOT OF GRAPES

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Objectives:
1) To determine the efficacy of sulfur in reducing Phomopsis incidence and severity in grapes

2) To determine the ability of sulfur to kill Phomopsis spores

Project duration:
2 years, started in 2003

Procedures
1) To determine the efficacy of sulfur in reducing Phomopsis incidence and severity in grapes

The experiment was conducted in a mature 'Seyval' vineyard at the Clarksville Horticultural Research Station in Clarksville, MI. The vineyard has a history of Phomopsis infection. Vines were left unpruned to increase disease pressure. Treatments were applied to four-vine plots and were replicated four times in a randomized complete block design. Sprays were applied with pump sprayer (lime sulfur) or an R&D Research CO_2 cart-styled sprayer (sulfur) 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. The spray volume was 100 gpa. Sprays were applied at the beginning of budswell (28 April). Disease was assessed on 25 leaves randomly collected from the center two vines of each plot on July 3 and 20 clusters randomly collected on 2 Oct, 2003. 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. All data were entered into Excel spreadsheets and analyzed using the StatGraphics statistical package.

A second experiment was conducted in a commercial 'Niagara' vineyard in Lawton, MI. Vines were spaced at 7 x 9 ft and were cordon-trained on a 2-wire trellis 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 Jun (immediate pre-bloom), 24 Jun (1 st post-bloom), 9 Jul (2nd post-bloom) and 30 Jul (3rd post-bloom). Disease was assessed on 25 clusters randomly collected from the center two vines of each plot on 11 Sep. 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 On 11 Sep, within one week pre-

harvest, total fallen fruit was collected under 4 linear meters of vines per plot. On 23 Sep, within one week after mechanical harvest, total fallen fruit was again collected. All data were entered into Excel spreadsheets and analyzed using the StatGraphics statistical package.

2) To determine the efficacy of sulfur in killing Phomopsis spores

Infected, detached grape canes of cv. 'Seyval' were chosen for this study. The canes supported numerous pycnidia (fruiting bodies) with conidia oozing out of them. Microfine Sulfur was applied to the canes grape canes at the same rate as applied in the field. Canes treated with sterile water served as a control. After one day, the conidia were washed off the canes, placed on water agar in Petri dishes (three replicates per treatment). The plates were incubated at room temperature and examined with a microscope after 6 hours. Germinated and ungerminated spores were counted up to 100 spores per plate. The percentage germination was determined by dividing germinated spores by the total number of spores per field of view. Data were analyzed using the StatGraphics statistical package.

Results and discussion

1) To determine the efficacy of sulfur in reducing Phomopsis incidence and severity in grapes

A single spray of lime sulfur or liquid sulfur on 'Seyval' grapes before bud break significantly reduced Phomopsis on the leaves, rachises and berries. The percent control achieved as measured by disease severity on the leaf petiole was 50% for sulfur and 62% for lime sulfur (Table 1). On the leafblade, control was 54% and 61 %, for sulfur and lime sulfur, respectively. In general, disease levels on the leaves were low, which is typical for Phomopsis, since the lesions are quite small. The percent control as measured by disease severity on the rachis was 64% for sulfur and 73% for lime sulfur (Table 2). On the berries, control was 59% and 73%, for sulfur and lime sulfur, respectively. Berry drop was not assessed because in 'Seyval', since the berries remain attached to the cluster much longer than in 'Niagara.'

A single spray ofMicrofine sulfur on 'Niagara' grapes before bud break significantly reduced Phomopsis severity on the leaves, rachises and berries, and also significantly reduced the number of clusters which had rotten berries. The percent control achieved as measured by disease severity on the leaf petiole was 53% and on the leafblade 29% (Table 3). The percent control as measured by disease severity on the rachis was 38% and on the berries 49% (Table 4). The number of berries on the ground (pre- and post-harvest added together) was reduced by 40% by the single sulfur spray, compared to a 78% reduction as a result of the full-season spray schedule (Table 5). While the level of control was not equivalent to a full-season spray schedule, a single spray of sulfur provided significant control of the disease on all plant parts, including the clusters. The result is also measurable in terms of the amount of fruit lost to berry drop before and after harvest.

2) To determine the efficacy of sulfur in killing Phomopsis spores

Sulfur reduced germination of conidia of Phomopsis viticola that were naturally present on detached infected canes (Figure 1) by 42%. It is assumed that the spores were killed, as sulfur is known to be lethal to fungi. Reduced spore viability may explain in part the efficacy of sulfur in reducing Phomopsis symptoms on grape leaves, rachises, and clusters.

Conclusion

The results of the first year of this study on the use of dormant sprays of sulfur for control of Phomopsis in grapes are promising. While lime sulfur may be somewhat more effective in controlling the disease, sulfur also significantly reduces infection. Considering the low price of sulfur, it appears to be a more cost-effective control method than lime sulfur. The level of control provided by sulfur is obviously not equivalent to a full-season spray schedule. However, a single spray of sulfur can be expected to reduce infection by about half. While it may not be a stand-alone measure, it certainly can be used to aid in control of Phomopsis. This may be especially important in hedged vineyards which contain a lot of overwintering inoculum. In next year's trial we will try liquid sulfur instead of a dry sulfur formulation, since it may be stick better to the canes and potentially provide better control.