Michigan Grape & Wine Industry Council
2016 Research Report

MICHIGAN VINEYARD IPM EXTENSION PROGRAM

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ABSTRACT

This project demonstrated how reduced-risk pesticides can provide effective insect and disease management when they are integrated into commercial grape production. Reduced-risk and standard broad-spectrum pesticide programs provided similar pest and disease control, and in some cases the reduced risk program out-performed the standard program. Scouting information was collected each week and summarized in biweekly reports that were published in MSU Extension Grape News and are now archived at www.grapes.msu.edu. Results from this and related studies were presented at grape workshops in southwest and northwest Michigan during the growing season, and provided information on current insect, disease and horticultural topics.

GOALS & OBJECTIVES

This project demonstrated IPM techniques to the Michigan grape industry using a combination of demonstration vineyards, electronic scouting updates, formal presentations and hands-on workshops. This included using insect and disease scouting to provide timely information for growers to help them make management decisions. This project also provided training on how to use IPM tactics including cultural controls to show how effective vineyard management can be achieved with reduced chemical inputs. A particular focus of this training was placed on management of insect and disease problems in the period around harvest. The specific objectives of this project were to:

1. **Demonstrate performance of scouting and reduced-risk management in commercial grape vineyards.**
2. **Deliver information on IPM and cultural controls to the Michigan grape industry.**
3. **Deliver training programs on harvest-time pest concerns in 2016.**

PROJECT PERIOD

This project was conducted during 2016, with fieldwork occurring from May to October.

WORK ACCOMPLISHED DURING THE PERIOD

Objective 1. Demonstrate performance of scouting and reduced-risk management in commercial grape vineyards. A pair of demonstration vineyards of the same variety were established at each of two Berrien County and two Van Buren County grape farms in May of 2016. In Berrien County the varieties were Vignoles and Concord and in Van Buren County we used

Chancellor and Niagara vineyard. For each vineyard pair, one received the grower's "standard" program for insect and disease management (Leverage, Sevin, Intrepid, Imidan, Mustang Maxx, Penncozeb, Ridomil, etc.), while the other vineyard received an IPM program that incorporated reduced-risk pesticides (Intrepid, Altacor, Belt, Phostrol, Sovran, Orius, etc.) for controlling key insect pests and diseases. Each of the growers have now incorporated reduced risk insecticides and fungicides into their standard management practices, so these types of compounds were utilized in both programs. To compare the efficacy of the management programs, we scouted each vineyard every week for insect pests (rose chafer, grape leafhopper, potato leafhopper, grape berry moth and Japanese beetle) and diseases (Phomopsis, black rot, powdery mildew, downy mildew, Botrytis, and sour rot) until harvest began in September. During scouting we recorded insect, damage and disease presence on five clusters and five leaves on each of 10 vines on vineyard borders, and the same observations were made on 10 vines in the vineyard interior.

In most cases reduced-risk products consistently performed as well or better than their conventional counterparts. For example, grape berry moth (GBM) control was better in the IPM vineyards where grape berry management relied on Intrepid, Altacor and Belt compared to the grower's standard program where these compounds were used less often. The percentage of clusters with grape berry moth damage was lower in vineyards that received the IPM program than that in Standard vineyards (Figure 1). We have seen similar consistent results through multiple years of this project, and sharing this information at extension meetings and through the MSU Grape Scouting Report have helped to increase the use of Intrepid, Belt and Altacor for grape berry moth management programs in Michigan. In addition to providing superior control of grape berry moth, these compounds provide additional options for insecticide rotations to help manage grape berry moth insecticide resistance. These additional options were especially important in 2016, because we experienced a fourth generation of grape berry moth immediately before harvest.

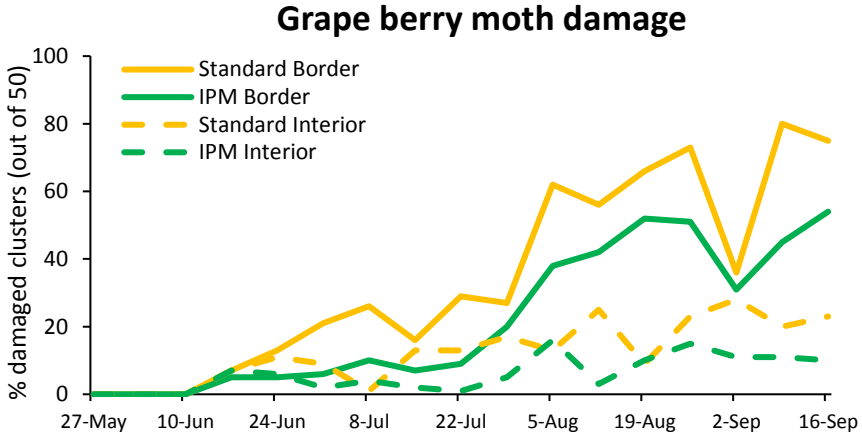

Figure 1. Comparison of grape berry moth control in IPM (reduced-risk) and Standard programs at four farms in southwest Michigan.

Very low abundance of other important grape insect pests such as leafhoppers and Japanese beetles were found in all vineyards, and numbers were similar between IPM and standard programs. However, in the vineyards in this study and in many others across southwest Michigan, there was an increase of late-season pests such as spotted wing *Drosophila*, vinegar flies, bees, wasps and

ants. This may be more important as fast acting short PHI insecticides are needed to prevent losses from late-season pests such spotted winged drosophila and other vinegar flies.

The Standard and IPM fungicide programs both kept diseases at low levels in all vineyards for much of 2016. The extended dry period that occurred in southwest Michigan from June to early August likely helped to keep disease symptoms low and reduced the number of mid-season fungicide applications that growers used. However, the hot, dry conditions in the middle of the growing season delayed the onset of harvest, and rainy conditions during ripening led to higher than expected late-season incidence of downy mildew in juice grapes and Botrytis and sour rot in wine grapes.

Overall very little disease pressure was observed in the juice grape vineyards. Through most of the season only 1 to 6% of observed clusters had black rot symptoms and incidence was very similar in IPM and Standard vineyards. An increase in black rot infection was observed before harvest in these vineyards and suggests that early season fungicide applications in these vineyards were negatively affected by the wet conditions that occurred during the period that clusters were susceptible to black rot. Phomopsis was the most common disease affecting leaves early in the year. In the middle of the season dry conditions help slow development of diseases, and few new

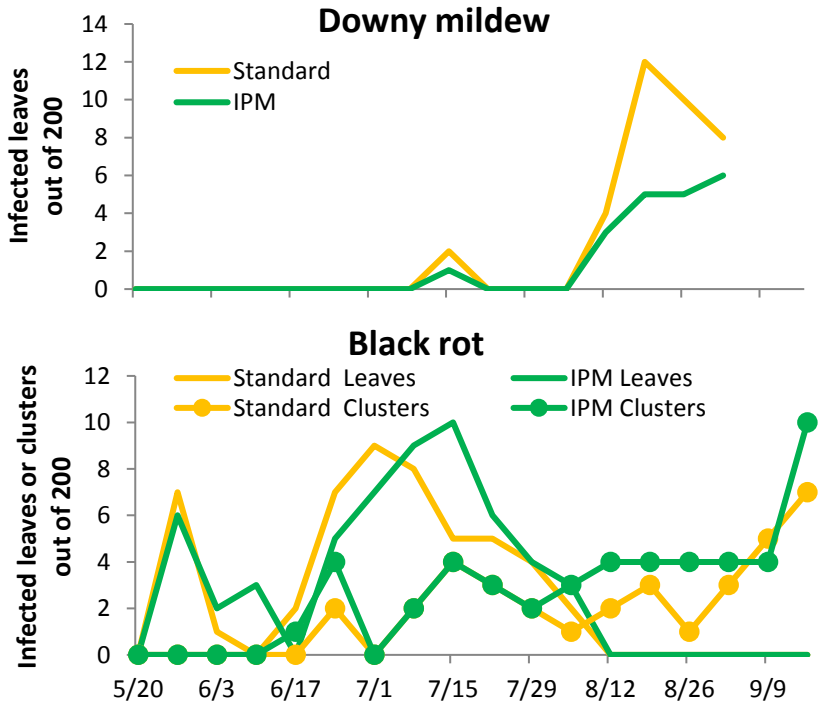

Figure 2. Disease incidence in juice grape vineyards receiving either an IPM or Standard program. (Top) Late-season downy mildew infections on leaves in two juice grape vineyards in southwest Michigan in 2016. (Bottom) Black rot symptoms on leaves and clusters at the same vineyards. In general, the efficacy of the two programs was very similar.

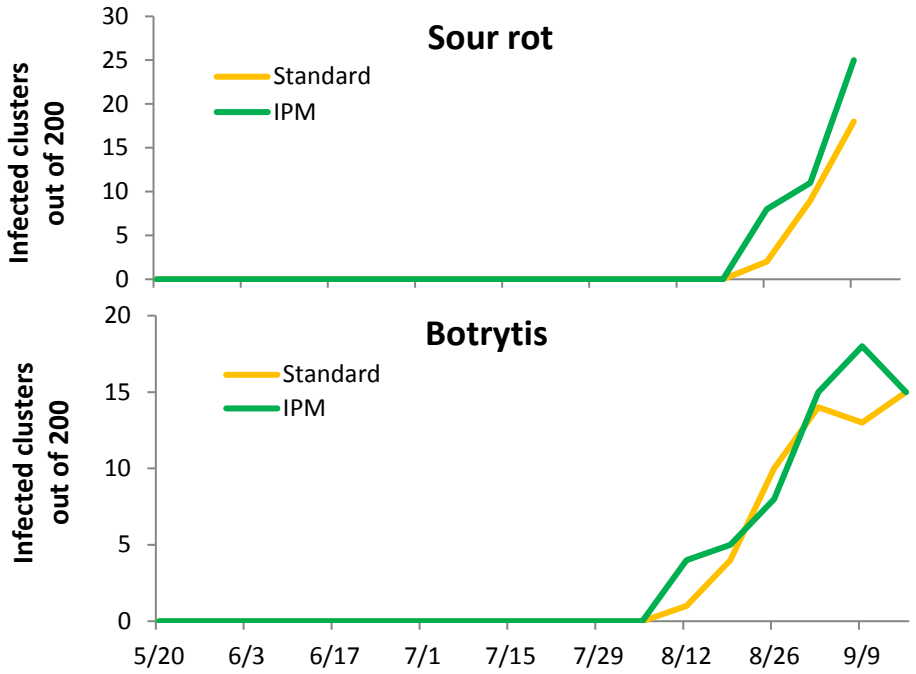

Figure 3. Late-season disease incidence in wine grape vineyards receiving either an IPM or Standard program in southwest Michigan in 2016. (Top) Sour rot. (Bottom) Botrytis. As in juice grapes, the efficacy of the two programs was very similar.

infections were observed. Starting in early August, several storm systems brought considerable rainfall to southwest Michigan and a large increase in the incidence of downy mildew lesions were observed in juice grape vineyards (Figure 2). Despite the appearance of leaf lesions, these diseases were considered to be well managed as the infections did not move onto the clusters, and did not lead to defoliation.

Phomopsis and black rot lesions were visible on leaves of both of these varieties early in the season, but there was little evidence that these diseases colonized clusters, again showing that the IPM and Standard programs both provided equivalent control in these vineyards. Although some downy mildew lesions increased on leaves in these wine grape vineyards, the infections did not move onto the clusters, and did not lead to defoliation. Powdery mildew was not a problem in any of the vineyards we scouted in 2016.

The key disease issues in the wine grape vineyards that we scouted were Botrytis and sour rot (Figure 3), and the IPM and Standard programs both provided similar control of these pathogens. Although the data are not shown by variety, the incidence of sour rot was much higher in the Vignoles vineyards than in the Chancellor vineyards, whereas there was a higher incidence of Botrytis in Chancellor than in Vignoles. In case of either disease, incidence increased rapidly before harvest, and this is likely due to heavy rainfall associated with multiple storms that affected southwest Michigan in August and September.

Objective 2. Deliver information on IPM and cultural controls to the Michigan grape industry.

The data from weekly scouting in the demonstration vineyards used in Objective 1 were compiled into Vineyard IPM Scouting Updates that were distributed through MSU Extension Grape News. These bi-weekly updates provided growers with detailed information on current insect and disease pressure in vineyards in southwest Michigan, and a similar report was written by Dr. Duke Elsner to cover vineyards in the northwest. Growers were able to use this information to determine when and which pesticides to apply and to know what to scout for in their own vineyards. In addition to current scouting information, the reports contained timely feature articles on a wide range of topics including disease and insect control and various aspects of viticulture. A total of 10 issues of the Vineyard IPM Scouting Update were produced in 2016 from May to September, and these are now archived on grapes.msu.edu. The Vineyard IPM Scouting Update along with pertinent events and articles with recommendations was sent out to MSUE's Grape & Wine Industry Constant Contact list. The number of people subscribing to receive the weekly emails has grown from **1,133** in December 2015 to **1,875** in November 2016.

On Feb. 17, 2016, www.grapes.msu.edu was migrated over to the MSU Extension website boosting its increase in traffic to grape-related content. This move does not change the web address but as part of the powerful MSU Extension website -- which will have more than 4 million users this year -- the grape information is more frequently found by search engine algorithms. Grape navigational pages (e.g., "Viticulture," "Education,") had 58,000 pageviews.

During 2016, articles containing the word "grapes" at the MSU Extension website received 30,500+ pageviews of which 26,700+ were unique pageviews. Average time spent was 3.75 minutes per page. Articles containing the word "vineyard" received 8,800+ pageviews of which 8,000+ were unique pageviews. The following are some of the most frequently viewed grape-related articles:

1. Hornworm caterpillars: The big cats of the vineyard by Duke Elsner http://msue.anr.msu.edu/news/hornworm_caterpillars_the_big_cats_of_the_vineyard (5,430)
2. Protecting young grape clusters from powdery and downy mildew by Annemiek Schilder http://msue.anr.msu.edu/news/protecting_young_grape_clusters_from_powdery_and_downy_mildew (2,508)
3. Late-season fungicide sprays in grapes and potential effects on fermentation by Annemiek Schilder http://msue.anr.msu.edu/news/late_season_fungicide_sprays_in_grapes_and_potential_effects_on_fermentatio (2,037)
4. Banning black rot and Phomopsis from young grape clusters by Annemiek Schilder http://msue.anr.msu.edu/news/banning_black_rot_and_phomopsis_from_young_grape_clusters (1,985)
5. Preparing for rose chafer management in vineyards by Rufus Isaacs http://msue.anr.msu.edu/news/preparing_for_rose_chafer_management_in_vineyards (890)
6. How to tie grapevines by Tom Zabadal http://msue.anr.msu.edu/news/how_to_tie_grapevines (868)

Another outstanding source of traffic for www.grapes.msu.edu is Tom Zabadal's collection of videos on pruning and tying vines (all listed under Viticulture) that have now have been viewed over 277,000 times. This is an increase of 27,000 over last year.

Objective 3. Deliver training programs on harvest-time pest concerns in 2016. Our harvest time pest and disease updates and control recommendations were included in the last three Vineyard IPM Scouting Updates. Reports of vinegar flies, wasps, ants, bees, brown marmorated stink bugs, downy mildew, Botrytis and sour rots were common in southwest Michigan vineyards. It is likely the frequent and heavy rain storms that occurred in August and September increased the incidence of these late-season challenges. In addition, excess precipitation caused many berries to split, and allowed late season proliferation of fruit flies, sour rots and Botrytis in clusters in some vineyards. Large late season increases in spotted wing drosophila (SWD) in traps and early cluster infestations by this pest suggests SWD may have opened the skins of berries and allowed vinegar flies to infest those berries. Brown marmorated stink bugs (BMSB) were also found in Michigan vineyards for the first time this year, but they were not seen feeding on clusters. It is possible that berry injury caused by BMSB feeding could also allow an increase in fruit fly infestations. A pre-harvest IPM meeting scheduled for August was not held due to low grower interest in attending. In future years, earlier promotion efforts will be used for IPM education events that occur in late summer. The grape program at Great Lakes Fruit and Vegetable Expo in December 2016 has been changed to a pre-harvest focus to help meet this commitment.

Meetings in northwest Michigan in 2016 included a spring "Kick-Off" at the Northwest Michigan Horticulture Research Center on April 8 and "First Friday" field meetings on May 6, June 3, July 1 and August 5. The Kick-Off meeting included talks on vineyard sprayer technology and calibration by John Stone, grape disease biology and management by Annemiek Schilder and featured a comparative tasting of commercial wines made from several lesser-known *Vitis vinifera* cultivars currently being grown in Michigan. Mark Ledebuhr from Application Insight presented on sprayer rate controllers, drift management, and visualizing deposition patterns at the May meeting. Annemiek Schilder returned for the June meeting, discussing disease scouting, weather influences and fungicide selection. Rufus Isaacs presented on natural enemies, new insecticide options, and perimeter spray programs in July. The August meeting brought back Annemiek Schilder to present results from field trials using compost tea applications for disease management.

In southwest Michigan three grower meetings were held in 2016. The Season Kick-off meeting at SWMREC on April 4th included presentations on Horticultural practices for prevention and treatment of cold injury, and new information regarding insect management in grape (61 attendees). On May 25th, the Pre-Bloom IPM meeting had lectures by both faculty specialists in grape pest management, included good discussion on IPM practices (Annemiek Schilder and Rufus Isaacs) and was attended mostly by juice grape growers (31 attendees). Then on June 3 we held a special field meeting for wine grape growers on diagnosing, preventing, and treating the grape mealybug and grape leafroll virus (17 attendees).

COMMUNICATIONS ACTIVITIES, ACCOMPLISHMENTS, AND IMPACTS

Results from this project have been shared during summer and winter grower meetings, including the SWMREC Viticulture Days, Great Lakes Expo, Southwest Hort Days, and the Northwest Orchard and Vineyard Show. The information from this project's vineyard scouting was also presented in the Grape eNews newsletters that were distributed via email through the growing season.

RESULTS & CONCLUSIONS

This project has supported the delivery of relevant and timely information to the grape industry regarding vineyard management. It has also supported the gathering of weekly scouting information used to present timely updates and recommendations in the Grape eNews distributed through MSU Extension. The scouting information has also been taken at vineyards where reduced-risk insect and disease management programs have been used, and this has allowed demonstration of their efficacy under commercial conditions, resulting in improved pest control and reduced dependence on broad-spectrum pesticides. Through the support of this project, we were also able to inform the industry about the increasing incidence of grapevine mealybug and the spread of grapevine leaf roll virus. During 2016 we also organized and delivered multiple workshops covering insect and disease control and horticultural techniques for renovating vineyards.

Growers have been able to see the performance of new pest management programs at the whole vineyard scale and these commercial sites have provided venues through the growing season for discussion of relevant issues in the plant pathology, entomology, and horticulture. Our ongoing extension program has helped improve vineyard management in Michigan and we have had highly positive feedback from growers on the information being provided. Feedback from growers at post-harvest meetings indicate the following outcomes: increasing adoption of certain reduced-risk products such as Intrepid, Altacor, Vivando and Prophyt; incorporating tactics like dormant season fungicides into spray programs; increased use of scouting to determine if sprays are necessary and use of the grape berry moth degree model to time sprays.

BUDGET NARRATIVE

This project was conducted in accordance with the approved budget, as outlined in the original grant agreement and funds were used to accomplish the objectives of the proposal. Our grower cooperators made in-kind contributions of labor, materials and equipment costs to manage their vineyards to the specifications of the IPM and Standard programs. This is estimated to be between $1,500 and $2,500 per acre, and we used approximately 30 acres for this project. Some pesticides were provided to the Isaacs lab by agrichemical companies for use in this research/demonstration project. We estimate this to be an additional $3,500 of in-kind contribution.

ACKNOWLEDGEMENTS

Many thanks to the growers, Jeff Lemon, Jim Shafer and Ed Oxley, for their cooperation with this study, and for providing access to their vineyards. We also thank Holly Drankhan, Josh Paavola, Guy Procopio and Chris Worst, and for their work scouting vineyards, checking traps and assessing fruit for this project. Bayer CropScience, Dow AgroSciences, DuPont Crop Protection and Gowan provided pesticides for use in this project.