

Michigan Craft Beverage Council **FINAL REPORT**

Cover Page

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Project Title

Michigan Grape Extension Programs to Support Vineyard Sustainability and Fruit Quality

Problem Statement and Project Goals

Establishing the best IPM practices in Michigan vineyards has been researched for a number of years and it constantly a moving target. This proposal aimed at developing extension materials and delivery mechanisms that improve upon MSU's outreach efforts in grapes and provide a mechanism for developing sustainability metrics for Michigan's wine grape industry. The purpose of this proposal was to optimize MSU's communication of the best cultural, biological and chemical control strategies in commercial vineyards. We focused on best management practices of vineyards as well conducted surveys to identify grower issues to direct our research and extension programs at MSU.

Results and conclusions

Growers were engaged with our weekly extension content. Bi-weekly vineyard scouting in key vinicultural regions of the state was conducted from May to October in 2019 to determine timing and pest pressure for critical insect and diseases. This scouting information was then incorporated into bi-weekly MSU extension news articles that were circulated through MSUE News and the Grape and Wine newsletter (Fig. 1). MSUE articles have allowed us to communicate with growers the most pressing and current pest issues while simultaneously providing management recommendations. Allowed us to provide new materials to grape producers and educate new growers within the industry about best management practices for disease and insect control. In 2020 with the additions to the MSU Grape Team we have also used grower feedback to improve upon our current delivery methods for weekly grower content.

New electronic extension content was produced. The MSU Grape Team worked to modernize extension materials related to grape pest management, working on the grapes.msu.edu website with Joy Landis. Additionally, we made a template for future fact sheets titled "Michigan Grape Facts" and released 3 new MSU Grape Fact Sheets (Crown Gall, Leafroll Disease, and Botrytis bunch rot, Fig. 2) and digitizing the grape scouting guide so it is available as a searchable PDF online.

The presence of fungicide resistance will influence which products are considered sustainable for cluster rots. In collaboration with MSU's project GREEN our ongoing fungicide resistance work found widespread resistance in powdery mildew and botrytis bunch rot. For powdery mildew we found that, resistance was abundant in both 2018 and 2019. For Botrytis bunch rot, we found that resistance to all 8 main modes of action had increased from 2014 to 2018. Also, that multiple fungicide resistance exists in Michigan vineyards and the frequency increased to ≥ 5 fungicides (Alzohairy et al., 2020, Plant Disease).

Impact

This funding has had an impact on the Grape growing community in Michigan by making them aware of new IPM practices, the widespread nature of fungicide resistance in Michigan, and research related to harvest time insect pests. Additionally, it has given the MSU grape team renewed ability to develop educational resources that will help us educate new Michigan vineyard growers in the future. Using a weekly update format, which is being implemented in 2020 will allow us to track grower engagement with our extension information that we display online. For the MSU Grape Entomology and Pathology programs, this work allowed us to be competitive for external funding and allowed us to leverage a Michigan Specialty Crop Block Grant in 2020 to study fungicide resistance with the Michigan State Horticultural Society. Also, it allowed both programs to secure additional funding from MSU's Project GREEN in 2019.

Work accomplished

Accomplishment	Relevance to Objective and/or Outcome
<p>Coordinated with commercial wine grape growers in the SW and NW of Michigan to set up comparison of vineyards where late-season insect pests are managed using the grower's standard program and another of the same cultivar where new IPM techniques are used. In 2019 IPM techniques include mass trapping for yellowjackets, managing SWD to reduce sour rots, and use of the Enviroweather model for grape berry moth to control the third and fourth generations of this pest. Additionally, we developed an integrated disease management approach with these same growers listed above to try new more sustainable products such as Lifegard (Certis USA) for controlling downy and powdery mildews, and Fracture (FMC Corp.) for controlling sour rot.</p> <p>In 2020 we continued to work with these same grape growers to compare different management techniques for important economic pests, with a focus on reduced-risk options for grape berry moth and sour rot management programs. A new targeted product for controlling GBM currently under investigation in these trials is Verdepryn (Summit Agro USA). We are also testing other targeted products vs. broad spectrum insecticides and comparing different application timings based on the Enviroweather GBM model.</p>	<p>Objective 1. Demonstrate and test reduced risk IPM techniques</p> <p>By setting up comparison blocks with multiple grape growers across different wine grape regions we are able to examine the IPM approaches under different geographical areas and for several wine grape varieties.</p>
<p>Conducted bi-weekly (2019) and weekly (2020) scouting of vineyards that use both conventional management (grower standard) and reduced-risk integrated pest management techniques</p>	<p>Objective 1. Conduct weekly scouting of vineyards to demonstrate and test reduced risk IPM techniques.</p> <p>Scouting has allowed us to compare the effectiveness of the IPM techniques with standard management practices and to make informed management recommendations. Scouting in different areas and different grape cultivars gave us an in-depth look at how regions and varieties differed in pest problems and phenological development throughout</p>

	the season and we were able to report accurate and specific information to the respective grape growers.
<p>Multiple extension presentations have been geared towards new and “softer fungicide products”. These talks were primarily held during the early spring and prebloom time periods and were well attended with between 20-30 grape growers. Finally, IPM strategies of reducing fungicide resistance have been discussed in multiple extension talks throughout the state during 2019.</p> <p>In 2020 many webinars were held to inform growers of our findings and different IPM management strategies. This includes the Virtual Viticulture Days held in July, as well as pre-bloom and pre-harvest meetings, and special topics meeting, such as the SWD webinar on Drosophila and sour rot control during the late season.</p>	<p>Objective 1. Conduct weekly scouting of vineyards to demonstrate and test reduced risk IPM techniques.</p> <p>Conducted extension talks on reduced risk products and reducing fungicide resistance by communicating to growers on pesticide timing and product choices.</p>
<p>In total from 2019 to 2020, 23 extension articles were published that allowed growers to be aware of what pests might be in their vineyard.</p> <ol style="list-style-type: none"> 1. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. July 29, 2020. Michigan grape scouting report – July 29, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-july-29-2020 2. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. July 22, 2020. Michigan grape scouting report – July 22, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-july-22-2020 3. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. July 15, 2020. Michigan grape scouting report – July 15, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-july-15-2020 4. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. July 8, 2020. Michigan grape scouting report – July 8, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-july-8-2020 5. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. July 1, 2020. Michigan grape scouting report – July 1, 	<p>Objective 2. Report weekly scouting results and pest alerts through MSU Grape online news.</p> <p>MSUE articles have allowed us to communicate with growers the most pressing and current pest issues while simultaneously providing management recommendations. Allowed us to provide new materials to grape producers and educate new growers within the industry about best management practices for disease and insect control.</p>

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6. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. June 24, 2020. Michigan grape scouting report – June 24, 2020. <https://www.canr.msu.edu/news/michigan-grape-scouting-report-june-24-2020>
 7. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. June 17, 2020. Michigan grape scouting report – June 17, 2020. <https://www.canr.msu.edu/news/michigan-grape-scouting-report-june-17-2020>
 8. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. June 10, 2020. Michigan grape scouting report – June 10, 2020. <https://www.canr.msu.edu/news/michigan-grape-scouting-report-june-10-2020>
 9. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. June 3, 2020. Michigan grape scouting report – June 3, 2020. <https://www.canr.msu.edu/news/michigan-grape-scouting-report-june-3-2020>
 10. Reinke, M., East, K., Isaacs, R., Miles, T., Perkins, J., Sabbatini, P., Trammel, M., Chaudhari, S. May 27, 2020. MSU Extension's grape scouting reports for 2020. <https://www.canr.msu.edu/news/msu-extensions-vineyard-pest-scouting-reports>
 11. Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. May 27, 2020. Michigan grape scouting report. <https://www.canr.msu.edu/news/grape-scouting-report-may-27-2020>
 12. Todaro, T., Miles, T., Albert, J., Isaacs, R., Trammel, M., Longstroth, M., Reinke, M. October 9, 2019. MSU vineyard IPM scouting report – Oct. 9, 2019. <https://www.canr.msu.edu/news/msu-vineyard-ipm-scouting-report-oct-9-2019>
 13. Perkins, J., Miles, T., Isaacs, R., Todaro, T., Trammel, M., Longstroth, M., Reinke, M. September 25, 2019. MSU vineyard IPM scouting report – Sept. 25, 2019. <https://www.canr.msu.edu/news/msu-vineyard-ipm-scouting-report-sept-25-2019>
 14. Perkins, J., Miles, T., Isaacs, R., Todaro, T., Trammel, M., Longstroth, M., Reinke, M.

September 11, 2019. MSU vineyard IPM scouting report – Sept. 11, 2019.

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15. Perkins, J., Miles, T., Isaacs, R., Todaro, T., Trammel, M., Longstroth, M., Reinke, M. August 28, 2019. MSU vineyard IPM scouting report – Aug. 28, 2019.

<https://www.canr.msu.edu/news/msu-vineyard-ipm-scouting-report-aug-28-2019>

16. Perkins, J., Miles, T., Isaacs, R., Todaro, T., Trammel, M., Longstroth, M., Reinke, M. August 14, 2019. MSU vineyard IPM scouting report – Aug. 14, 2019.

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20. Isaacs, R. Albert, J., Todaro, T., and Miles, T. June 19, 2019. MSU vineyard IPM scouting report – June 19, 2019.

<https://www.canr.msu.edu/news/msu-vineyard-ipm-scouting-report-june-19-2019>

21. Isaacs, R., Albert, J., Landis, J., Miles, T., Todaro, T. June 11, 2019. MSU Extension's vineyard pest scouting reports for 2019.

<https://www.canr.msu.edu/news/msu-extension-s-vineyard-pest-scouting-reports-for-2019>

22. Miles, L., and Miles, T. June 11, 2019. Do you suspect grapevine trunk disease in your vineyard? <https://www.canr.msu.edu/news/do-you-suspect-grapevine-trunk-disease-in-your-vineyard>

23. Isaacs, R., Albert, J., Todaro, T., and Miles, T. June 5, 2019. MSU vineyard IPM scouting

<p>report – June 5, 2019. https://www.canr.msu.edu/news/msu-vineyard-ipm-scouting-report-june-5-2019</p>	
<p>This brief communication report summarizes some of these activities related to Grape/wine communication showing a big jump in Email subscribers:</p> <p><u>Email list for MSUE News</u> The number of subscribers to the weekly MSUE News grape/wine emails has grown from <u>2,313</u> in early 2018 to <u>3,113</u> in August 2019.</p> <p><u>MSU grapes website</u> In 2018, webpages within www.grapes.msu.edu had over 19,000 pageviews with an average of 1:20 minutes time spent on a page.</p> <p><u>MSU grape/wine Twitter account</u> The Twitter account has 470 followers as of August 2020. The account posted about our grape/wine team’s extension or research several times a week and retweeted others supportive of the Michigan wine industry.</p>	<p>Objective 2. Report weekly scouting results and pest alerts through MSU Grape online news.</p> <p>In order to determine extension impact, we collected website traffic data on our MSU Extension website in terms of how many people read our extension content to capture impact.</p>
<p>For grape we have completed 3 MSU fact sheets crown gall, grapevine leaf roll disease and botrytis bunch rot with a nice design template for future fact sheets.</p> <p>A popular IPM tool for grape growers has been “A Pocket Guide for Grape IPM Scouting in the North Central and Eastern United States.” The pocket guide is now available as a free, mobile-friendly PDF, allowing growers to download and view the guide right from their mobile device.</p>	<p>Objective 3. Update MSU Extension IPM guidelines and pest / beneficial fact sheets.</p> <p>We developed a design template for a crown gall fact sheet in early 2019 that we plan to utilize this template for other proposed fact sheets.</p> <p>The mobile guide for grape IPM scouting covers many IPM issues in vineyards including insect and mite pests, natural enemies, diseases, and physiological and chemical disorders. The guide also discusses general directions for the timing of pest</p>

	scouting and shows the main grape growth stages. The new free, mobile-friendly PDF allows better access to this vital information.
Data collection is underway during our summer meetings collecting grower responses to our management information	Objective 4. Explore opportunities in sustainability in grape pest management The outcome of this is to gather grower input on various sustainable practices. Based on our findings of fungicide resistance we suspect certain products will be viewed as more sustainable for powdery mildew and botrytis management in wine grapes. Also these surveys will help determine what other areas of sustainability should be focused on in extension materials and fact sheets.

Budget Narrative

Final budget statements will be available from MSU contracts and grants

Cost Category	Amount Approved in Budget	Actual Expenditures To Date
Personnel	20,633.00	
Fringe Benefits	9,093.00	
Travel	5,000.00	
Equipment	5,274.00	
Supplies	9,750.00	
Contractual	0.00	
Other	0.00	
Direct Costs Sub-Total	49,750.00	
Indirect Costs	0.00	
Total Costs	49,750.00	

The project was conducted but due to receiving some additional funds from Project GREEN additional supply money was used to increase our ability to investigate cluster rots in the MSU Plant Pathology Laboratory. These supply funds purchased a titratable acidity meter and a compound microscope that will aid in our investigation of grape cluster rots which were one of the biggest findings during this extension project that most concerned growers.

Additional funding was leveraged from this project from MSU's Project GREEN and two different Michigan Specialty Crop Block grants, one with the Michigan State Horticultural Society and one with the Michigan Grape Society.

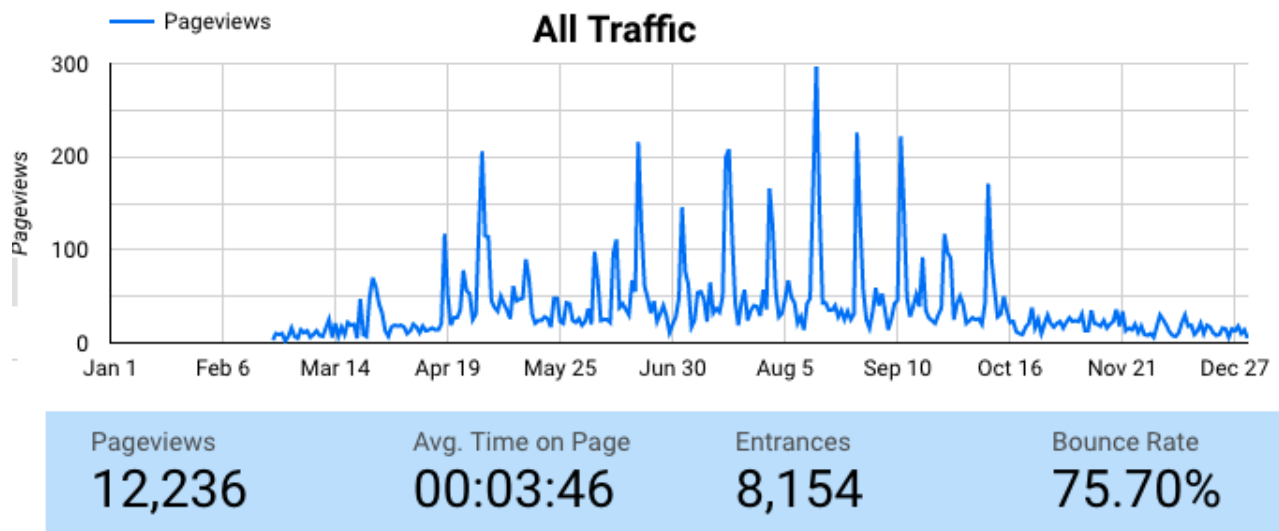


Fig. 1. MSU vineyard grape related web traffic from January 2019 to December 2019. Peaks show when scouting reports were released from the MSU grape team.

MICHIGAN
Grape facts

MICHIGAN STATE UNIVERSITY | Extension

Managing botrytis bunch rot
Gray mold or bunch rot can cause serious yield loss but there are a variety of tools that can be used to protect grapes.

By Safa Alzohairy and Timothy Miles;
MSU Department of Plant, Soil and Microbial Sciences

Key messages

- **Avoidance** - Avoid cluster damage from other pests such as insects, birds and other grape diseases.
- **Exclusion** - Exclude the pathogen by harvesting in a timely fashion and increasing canopy airflow.
- **Resistance** - Choose resistant varieties when possible.
- **Protection** - Protect flowers and clusters with fungicides when the infection risk is high.
- **Eradication** - Eradicate old canes and clusters each season.

Pathogen
Botrytis cinerea
Kingdom: Fungi
Division: Ascomycota
Class: Leotiomycetes
Asexual form: *Botrytis cinerea*
Sexual form: *Botryotinia fuckeliana* or also known as *Botryotinia cinerea*

Introduction
Botrytis cinerea, or the causal agent of gray mold and bunch rot, is one of the most important pathogens of grapes worldwide. *B. cinerea* is a necrotrophic fungus that attacks and infects all different parts of the grape vines; however, fruit rot is the most problematic. *Botrytis* bunch rot infection can cause huge economic losses in grape production due to the preharvest infection in the field (Figure 1), which leads to reduced yield and postharvest losses during storage. Warm and wet weather (59 to 68 degrees Fahrenheit; 15 to 20 degrees Celsius, at least 90% humidity) are inductive to *B. cinerea* infection and spread.

Figure 1. Botrytis bunch rot caused by *Botrytis cinerea* (cv. Riesling).

Disease symptoms
In early spring, infected buds and young shoots will turn brown, while in late spring, V-shaped, large, irregular brown areas appear on the leaves (Figure 2A). Grape inflorescences may appear blighted when infected but flower infection mostly remains quiescent until veraison (Figure 2B). At veraison and beyond, the fungus infects the clusters directly from the skin or through wounds caused by various factors including bird claws or feeding, insects or rain cracks.
Infected berries can dry out in arid conditions while in wet weather, infected berries are covered with grayish mold. This mold contains fluffy mycelia and millions of spores or conidia. As infection proceeds,

Figure 2. *Botrytis cinerea* infection on A. leaves (photo by Florence Tomafina, LIC, Ohio) and B. an inflorescence (photo by Timothy Miles, MSU).

Fig. 2. New Fact Sheet on Managing botrytis bunch rot.

The Authorized Individual must sign this statement after the applicable report form is completed.

I certify that the statements and information contained in these documents are true, accurate, and complete.

Signature of Responsible Official:

Date:

A handwritten signature in black ink, appearing to read "Timothy M." followed by a stylized surname.

8/31/2020
