

FINAL PERFORMANCE REPORT

The completed Final Performance Report will be posted to the AMS website.

FINAL PROJECT REPORT TEMPLATE

Final Performance Reports must illustrate the completion of the project within the grant agreement.

PROJECT INFORMATION

Project Title	Developing integrated pest management approaches for sour rot control in Michigan vineyards			
Recipient Organization Name:	Michigan State University			
Period of Performance:	Start Date:	4/1/2020	End Date:	7/31/2021
Recipient's Project Contact				
Name:	Timothy Miles and Rufus Isaacs			
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PERFORMANCE NARRATIVE

PROJECT BACKGROUND

Provide enough information for the reader to understand the importance or context of the project. This section may draw from the background and justification contained in the approved project proposal.

The Michigan wine grape industry has grown rapidly within the state and nearly doubled within the last 10 years to 3,050 acres (USDA NASS Statistics 2017). While the production acres have grown, there are still issues with several pests especially with late season fruit rots that can compromise the quality of grapes and wine. Fruit rots (i.e. sour rot and Botrytis bunch rot) are challenging to control and are multifaceted. Recent research has shown that fruit flies and other insects are a critical component of the sour rot complex, and the two rots themselves can sometimes interact. There are issues with pesticide resistance within this system as well. The purpose of this project is to 1) gain new insight on how to best manage both sour rot and Botrytis and the vectoring insects and 2) to develop sound cultural, biological and chemical practices for Michigan vineyards. Furthermore, we plan to improve MSU's communication of our findings using a variety of available platforms. Overall, this project is expected to reduce pesticide inputs and increase control for these important fruit rots, and thereby reduce pesticide residues and increase fruit quality used for Michigan wine. Also this project aims to deliver resulting information to the industry through our extension programs with the goal of improving fruit quality and reducing environmental impact of Michigan viticulture.

Two technicians have been funded on this project (Randy Smith and Jackie Perkins) which fulfill roles in plant pathology and entomology, respectively. We conducted a small plot efficacy trial in 2020 and began

another in 2021 as outlined in Objective 1 and that trial has been rated, several samples have been gathered and results have been analyzed from the 2020 trial. We have sampled these clusters for soluble solids/Brix and titratable acidity and samples have been subjected to a salt test and rearing cup tests in the entomology program. The results from this trial were presented at winter grape extension meetings when appropriate and we have altered extension information as a result of the work. Specifically, this work expanded the range of insecticides and fungicides that are capable of controlling sour rot. We have also been able to fund scouting efforts related to Michigan grape production and several of these weekly reports have featured cluster rots. Finally, we applied for additional external funding and we are waiting to hear the results of those grant proposal submissions.

ACTIVITIES PERFORMED

Address the below sections as they relate to the entire project's period of performance.

OBJECTIVES

Provide the approved project's objectives from your approved proposal/grant agreement.

#	Objective	Completed?	
		Yes	No*
1	Investigate alternative fungicide/insecticide combinations for sour rot control	Y	
2	Determine fruit chemistry predictors associated with Botrytis bunch rot and sour rot.	Y	
3	Determine the main insect vectors in the sour rot complex	Y	
4	Develop extension materials for MI growers for bunch and sour rot control.	Y	

**If no is selected for any of the listed objectives, you must expand upon this in the challenges and lessons learned sections.*

ACCOMPLISHMENTS

List your accomplishments for the project's period of performance, including the impact they had on the project's beneficiaries, and indicate how these accomplishments assist in the fulfillment of your project's objective(s), outcome(s), and/or indicator(s).

#	Accomplishment or Impact	Relevance to Objective, Outcome, and/or Indicator
1	A small plot efficacy trial was conducted for this disease/insect complex on a tight clusters Vignoles variety. Rating results showed a clear separation between the treatments. We ran statistical analyses on these data and have presented this information to growers at multiple extension events throughout the state. We are currently preparing these data for publication.	Objective 1. Investigate alternative fungicide/insecticide combinations for sour rot control
2	Fruit samples were collected from the Obj. 1 plot and sugar content / Brix values were recorded and we identified some of the critical time periods when clusters	Objective 2. Determine fruit chemistry predictors associated with Botrytis bunch rot and sour rot.

#	Accomplishment or Impact	Relevance to Objective, Outcome, and/or Indicator
	are the most susceptible. We are currently preparing these data for publication with data from Objective 1.	
3	Insects were collected and identified at a variety of vineyards throughout Michigan during this growing season. Within our small plot trial wasps and fruit flies were observed and rearing cups and other measures of Drosophila infestation were recorded. Interesting we found many native Drosophila and some spotted wing Drosophila in our experimental plots.	Objective 3. Determine the main insect vectors in the sour rot complex
4	A fact sheet has been published on Botrytis bunch rot and some of this work informed that fact sheet. Additional fact sheets are planned on sour rot for the winter of 2021.	Objective 4. Develop extension materials for MI growers for bunch and sour rot control.
4	<p>We have incorporated extension information about cluster rots into many weekly grape scouting reports for MSU Extension News. Page views were calculated using an MSU CANR reporting tool looking at page views from July 1, 2020 to September 6, 2020 and in total cluster rots were discussed in 9 times.</p> <p>As we approach harvest during 2021 we plan on reviewing some of the content discussed in the 2020 articles to keep the information current for this season.</p> <p>See below the attached articles:</p> <ol style="list-style-type: none"> 1.) Reinke, M., Perkins, J., Isaacs, R., Miles, T., Sabbatini, P., Longstroth, M., Nasrollahiazar.E., Chaudhari, S. August 26, 2020. Michigan grape scouting report – September 2, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-sept-2-2020 (Pageviews: 277) 2.) Reinke, M., Perkins, J., Isaacs, R., Miles, T., Sabbatini, P., Longstroth, M., Nasrollahiazar.E., Chaudhari, S. August 26, 2020. Michigan grape scouting report – August 26, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-aug-26-2020 (Pageviews: 83) 3.) Reinke, M., Perkins, J., Isaacs, R., Miles, T., Sabbatini, P., Longstroth, M., Nasrollahiazar.E. August 19, 2020. Michigan grape scouting report – August 19, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-aug-19-2020 (Pageviews: 166) 	Objective 4. Develop extension materials for MI growers for bunch and sour rot control.

#	Accomplishment or Impact	Relevance to Objective, Outcome, and/or Indicator
	<p>4.) Reinke, M., East, K., Perkins, J., Isaacs, R., Miles, T., Sabbatini, P., Nasrollahiazar, E. August 12, 2020. Michigan grape scouting report – August 12, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-august-12-2020 (Pageviews: 166)</p> <p>5.) Reinke, M., East, K., Perkins, J., Trammel, M., Isaacs, R., Miles, T., Sabbatini, P. August 5, 2020. Michigan grape scouting report – August 5, 2020. https://www.canr.msu.edu/news/michigan-grape-scouting-report-aug-5-2020 (Pageviews: 166)</p> <p>6.) 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 (Pageviews: 166)</p> <p>7.) 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 (Pageviews: 222)</p> <p>8.) 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 (Pageviews: 416)</p> <p>9.) 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 (Pageviews: 332)</p>	

CHALLENGES AND DEVELOPMENTS

Provide any challenges to the completion of your project or any positive developments outside of the project's original intent that you experienced during this project. Also, provide the corrective actions you took to address these issues. If you did not attain an approved objectives, outcome(s), and/or indicator(s), provide an explanation in the Corrective Actions column.

#	Challenge or Development	Corrective Action or Project Change
1	COVID-19 shutdowns	Due to these shutdowns we have been able to prioritize fieldwork but needed to limit laboratory analysis. We were able to freeze samples and hope to make more progress in Winter and Spring as laboratory spaces at MSU are beginning to open.

#	Challenge or Development	Corrective Action or Project Change
2	Due to cool harvest time weather, significantly more Botrytis infections were observed in our Objective 1 plot.	This has caused us to focus a little bit more on Botrytis interaction of the cluster rots in our data analysis.
3		
4		

LESSONS LEARNED

Provide recommendations or advice that others may use to improve their performance in implementing similar projects.

For this project we have noted significant differences in parts of the canopy and sections of the cluster that appear to be more susceptible to cluster rots. This information will likely be an important component of future work and we propose in the future to look at differential feeding of insects and the impact that cluster architecture has on the microbial community of grape fruits. Future research at MSU research centers (i.e. Clarksville Research Center) will allow us to study when clusters are most susceptible and what cultivars are most impacted by cluster rots. We also learned through a 2021 survey effort on wasps how important Michigan growers feel insect related issues are in specific vineyards.

CONTINUATION AND DISSEMINATION OF RESULTS (IF APPLICABLE)

Describe your plans for continuing the project (sustainability; capacity building) and/or disseminating the project results.

We have established a collaboration with other grape researchers in Wisconsin and in 2021 applied for a USDA Crop Protection Pest Management proposal that wasn't funded. We received positive feedback plan to re-submit this proposal in 2022. There are significant extension aspects tied to this proposal. Also, we have communicated our results to the Great Lakes Fruit and Vegetable Expo, Northwest Orchard and Vineyard Show and at field days with the Michigan Grape Society on several occasions.

BENEFICIARIES

Number of project beneficiaries: >100

ADDITIONAL INFORMATION

Provide additional information available (i.e., publications, websites, photographs) that is not applicable to any of the prior sections.

Within the next few months, we will be uploading the results of our grape trials to MSU's Small Fruit and Hop Pathology website and on the MSUE grape extension webpage so growers can utilize these results to make management decisions. In 2022 we will hold several field days that will showcase the importance of cluster rots and the results of 2 years of efficacy research.

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:



8/15/2021
