

2016 Research Report to the Michigan Grape & Wine Industry Council

Proposal Title:

Statewide survey to determine diversity and impact of grapevine viruses, phytoplasmas and insect vectors on the Michigan wine grape industry

Grant Agreement 791N6600215

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Original goals and objectives for the project:

- 1) Study the incidence of plant viruses and phytoplasmas in wine grape vineyards statewide
- 2) Assess the occurrence of mealybugs and other potential vectors in these same vineyards
- 3) Assess the correlation between virus incidence and other factors such as region, cultivar, vineyard age, presence of insect vectors, and source of planting material (if known).

Work accomplished by objective

1) *Study the incidence of plant viruses and phytoplasmas in wine grape vineyards statewide*

During late summer of 2016, 438 composite grape leaf samples were taken from wine grape vineyards in mid, southwest and northwest Michigan. Each composite sample represented 5 vines. In total, 55 different growers participated in the survey. Over 100 different vineyards were sampled. In most cases, each vineyard is represented by four samples from four randomly selected rows.

Testing was conducted on each sample using real-time polymerase chain reaction (RT-PCR) at the Foundation Plant Services facility on the UC Davis campus. Each sample was tested for 28 different viral or phytoplasma pathogens (see Table 1). In all, only 45 of the 438 samples (10%) were negative for all of the tested pathogens. A large number of samples (85%) tested positive for GRSPaV. Other commonly found pathogens were GLRaV 28% (any strain), GFkV 17%, GVA 11% and TRSV 12%.

Table 1. Pathogen incidence and percent of total samples positive

Pathogen**	Number of positives*	Percent of samples
Arabis mosaic virus (ArMV)	1	0.2
Grapevine fleck virus (GFkV)	75	17
Grape fanleaf virus (GFLV)	1	0.2
Grape leafroll associated virus 1	4	0.9

Grape leafroll associated virus 2	17	4
Grape leafroll associated virus 3	90	21
Grape leafroll associated virus 4	1	0.2
Grape leafroll associated virus 5	3	0.7
Grape leafroll associated virus 7	2	5
Grape leafroll associated virus 9	2	5
Grape leafroll associated virus 2RG	3	0.7
Grapevine Pinot gris virus (GPGV)	1	0.2
Grapevine red blotch associated virus (GRBaV)	26	6
Grapevine rupestris stem pitting virus (GRSPaV)	365	85
Grapevine virus A (GVA)	47	11
Grapevine virus B (GVB)	17	4
Grapevine virus E (GVE)	22	5
Grapevine virus F (GVF)	1	0.2
Tomato ringspot virus (ToRSV)	8	2
Tobacco ringspot virus (TRSV)	51	12
Phytoplasma	2	0.5
**All samples tested negative for the following pathogens: Grape leafroll associated virus 10 (GLRaV 10), Grape leafroll virus 3e (GLRaV 3e), Grape leafroll associated virus 6 (GLRaV 6), Grape leafroll associated virus 4 strain Car (GLRaV 4Car), Grapevine virus D (GVD), peach rosette mosaic virus (PRMV) and Xylella.		
*Number of positive samples out of 438 tested.		

2) *Assess the occurrence of mealybugs and other potential vectors in these same vineyards*

Due to lack of matching funding, we were not able to assess the presence of vectors in the survey fields. However, the MGWIC grant “Biology and management of grape mealybug” (principal investigator: Rufus Isaacs) addresses how to control mealybugs in vineyards.

3) *Assess the correlation between virus incidence and other factors such as region, cultivar, vineyard age, presence of insect vectors, and source of planting material (if known).*

We are still in the process of analyzing the data and looking at associations between virus incidence and region and cultivar. It is initially noteworthy that a high percentage of the samples (85%) were positive for Grapevine stem pitting virus and that only 10% of the samples were negative for all pathogens tested. The results of this survey suggest that there is a significant number of Michigan grapevines that are infected with virus. We will continue to analyze the data to determine if all four samples from a field were uniformly infected with the same viruses. Additionally, we will determine if there are certain virus combinations that occur regularly in the same vines. It has been shown in other crops that synergism of symptoms can occur when multiple viruses infect the same plant. If certain virus combinations occur, it would be interesting to return to those fields and make a detailed analysis of symptoms and fruit quality and yield loss. We know the grape variety for most of the survey samples, therefore we will also look to see if certain varieties of grape are more prone to specific viruses.

Communication Activities, Accomplishments, and Impacts

Since growers often attribute virus symptoms to “fall color” or nutrient deficiencies, the results of this survey confirm the results of other preliminary surveys that a high percentage of wine grapevines in Michigan are infected with virus. The next steps to take are to inform the participating growers of the results of their field samples and to ask them to assess vine vigor,

fruit quality, and yield to determine the significance of the infection. Growers might also want to be sure to control for any vectors that can spread the specific virus found in their field. Growers should be encouraged to purchase virus tested planting stock when establishing new vineyards.

Research publications resulting from this project

No research publications have been completed at this time.

Funding partnerships

There were no funding partnerships associated with this grant.