NYWGF RESEARCH - FINAL REPORT TEMPLATE

Funding for fiscal year: 2023-2024

SECTION 1:

Project title: Driving rogueing to manage viruses in diseased vineyards

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New Research ☒ **Continued Research** ☐

Amount Funded **$**39,488

SECTION 2:

Project Summary Impact Statement: Leafroll and red blotch viruses have detrimental impacts on vine vigor, as well as fruit production and quality in vineyards of New York. Rogueing, i.e., the elimination of infected vines and their replacement by clean vines, reduces the prevalence of viruses in vineyards. A pending challenge for growers adopting rogueing is the accurate identification of infected vines; this is because many confounding biotic and abiotic factors impede visual diagnostics. To facilitate the recognition of infected vines for rogueing, our proposal provides a solid technical foundation for (i) laboratory-based virus testing of candidate vines selected by growers to reliably identify virus-infected plants, and (ii) guiding the implementation of rogueing decisions by growers. By testing 1,734 leaf samples including 287 samples from Long Island, 871 samples from the Finger Lakes, 57 samples from Lake Champlain, and 519 samples from Lake Erie, and communicating virus test results to growers, this project facilitated the adoption of rogueing as a virus disease management strategy, thus limiting virus prevalence in vineyards, reducing production uncertainties, and enhancing the competitiveness of the New York grape and wine industries.

Objectives:

1- Communicate to grower communities on rogueing as a strategy to mitigate the impact of virus diseases
2-. Receive grapevine leaf samples to the laboratory from vines selected by growers for rogueing
3-. Process and test grapevine leaf samples for viruses
4-. Communicate virus test results to grower participants
5-. Provide guidance to growers for the implementation of tailored rogueing approaches

Materials & Methods: Growers who participated in the project were advised to collect leaf samples from selected vines in leafroll and/or red blotch diseased vineyards in late summer/fall (September-October). Some growers located in the Finger Lakes and Long Island have been working with the Fuchs laboratory on rogueing projects in their diseased vineyards over the past 3-5 years, despite challenges in accurately identifying virus-infected

vines based on visual observations. Additional growers were recruited through sustained communication and extension efforts. Leaf samples collected by grower participants were delivered or shipped to the Fuchs lab at Cornell AgriTech. Then, samples were processed and tested for grapevine leafroll-associated virus 1 (GLRaV1), grapevine leafroll-associated virus 2 (GLRaV2), grapevine leafroll-associated virus 3 (GLRaV3), grapevine leafroll-associated virus 4 (GLRaV4) by enzyme-linked immunosorbent assays with specific antibodies, and for grapevine red blotch virus (GRBV) by polymerase chain reaction with specific primers. Established diagnostic protocols were applied. After completion of the virus tests, Fuchs communicated results to grower participants in a timely manner to facilitate an efficient implementation of rogueing in diseased vineyards. Finally, some growers who participated in the project provided access to diseased vineyards to Fuchs for guiding the implementation of rogueing. Discussions with growers also centered on the need to carefully select clean planting stocks derived from virus-tested, certified stocks is important for vineyard sustainability.

Results/Outcomes/Next Steps: A total of 1,734 leaf samples were processed and tested including 287 samples from Long Island, 871 samples from the Finger Lakes, 57 samples from Lake Champlain, and 519 samples from Lake Erie. A visual inspection of the leaf samples at delivery suggested that some of them displayed typical virus-like symptoms including discoloration, downward rolling of the leaf blade, and malformations. However, other samples displayed discolorations suggestive of nutrient imbalances or mite damage. Nonetheless, all the leaf samples were tested for viruses by DAS-ELISA and PCR. Test results revealed that only 27% (468 of 1,734) of the samples tested were infected with a virus. Most infected samples (21%, 364 of 1,734) contained GLRaV3, less infected samples (5%, 87 of 1,734) had GLRaV1, and fewer had GLRaV4 (0.8%, 14 of 1,734) or GLRaV2 (0.4%, 7 of 1,734). None of the leaf samples tested was infected with GRBV. Virus test results were communicated to growers in a timely manner so that rogueing could be implemented diligently in selected vineyards.

The project helped increase the efficiency of rogueing by accurately identifying virus-infected vines in diseased vineyards. It facilitated the adoption of rogueing as a virus disease management practice in vineyards of Long Island, the Finger Lakes, Lake Champlain, and Lake Erie. The project also increased the level of grower's confidence in the usefulness of rogueing to reduce the prevalence of viruses in vineyards while increasing production and vineyard profitability. It is anticipated that the successes of this project will provide new incentives for more growers to adopt rogueing as a profit-driven virus disease management strategy.

Technology Transfer Plan: n/a

Attachments: relevant charts and graphs, photos etc.

Figure 2. Rogueing in a leafroll-diseased 'Cabernet franc' vineyard in the Finger Lakes. Note the certified, clean replants (in blue grown tubes on the back row) replacing diseased vines.

SECTION 3:

Project summary and objectives: Leafroll and red blotch viruses reduce fruit production and quality in vineyards of New York. Rogueing, i.e., the elimination of infected vines and their replacement by clean vines, reduces the prevalence of viruses in vineyards. An outstanding challenge for the adoption of rogueing is the accurate identification of infected vines. To facilitate the recognition of infected vines for rogueing in vineyards selected by growers participating in the project, a total of 1,734 leaf samples were processed and tested for viruses. Virus test results were communicated to growers, thus facilitating the implementation of rogueing, and limiting virus prevalence in vineyards.

Importance of research to the NY wine industry:
Viruses are threatening grape production and vineyard profitability with financial impacts estimated at $1,100-$16,200 per acre over the lifespan of a 'Cabernet franc' vineyard in NY. There is no cure for viruses in the vineyard. The only management option consists of rogueing, i.e., removing infected vines and replacing them with carefully selected clean ones that are derived from certified, virus-tested vine stocks. Rogueing usually relies on visual inspections to identify infected vines; this can be very challenging because abiotic factors can cause similar leaf symptoms than viruses. We assisted the adoption of rogueing with the identification of virus-infected vines by testing 1,734 leaf samples and communicating virus test results to growers for an accurate and timely removal of infected vines in selected vineyards.

Project Results/next steps:
Test results revealed that only 27% (468 of 1,734) of the samples received from growers were infected with a virus. Most infected samples (21%, 364 of 1,734) had GLRaV3, less

infected samples (5%, 87 of 1,734) hadGLRaV1, and fewer infected samples had GLRaV4 (0.8%, 14 of 1,734) or GLRaV2 (0.4%, 7 of 1,734). None of the leaf samples tested was infected with GRBV. These virus tests helped with an accurate identification of virus-infected vines for their elimination and replacement with clean certified vines, thus reducing the incidence of viruses in selected vineyards. Based on the success of this project, it is anticipated that more NY growers will adopt rogueing as a beneficial response to viruses in vineyards.

Supporting attachments: (Choose a maximum of 1 supporting figure or table to demonstrate results if desired)