



VITICULTURE RESEARCH PROJECTS

PROGRESS REPORT

April 1, 2020 – February 1, 2021

Project Title: Identifying clean nursery stocks for a sustainable New York viticulture – Phase 2

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Co PI's, Collaborators: n/a

The objectives of this project are to:

- 1.- Index vine stocks at NY nurseries for detrimental viruses
- 2.- Communicate virus test results to the NY State Department of Agriculture and Markets in support of a certification program
- 3.- Disseminate information on the production of virus-tested, clean stocks and ongoing efforts to reinstate a grape certification program in NY to the wine and grape industry

Viruses can be major threats to a profitable and sustainable viticulture by reducing vine growth, fruit yield and quality, as well as by limiting the productive lifespan of vineyards. Viruses are primarily transmitted by vegetative propagation and grafting, although some of them can secondarily be transmitted by insect vectors in vineyard settings. The proposed project is designed to collaborate with local nurserymen on the production of virus-tested, clean grapevine stocks in support of a NY grape certification program.

In conjunction with the NY State Department of Agriculture and Markets (NYSDAM), vine stocks (scions and rootstocks) at NY nurseries were extensively indexed for viruses in 2016-2020 in the Fuchs lab at Cornell AgriTech using established protocols. Leaf samples from increase vineyard blocks at three NY nurseries (Double A Vineyards, Hermann J. Wiemer nursery and Amberg Grapevines) were collected by NYSDAM horticultural inspectors. Collected samples were placed in plastic bags, labeled, and delivered to Fuchs' laboratory. Sample information on the vineyard origin, nursery owner, rootstock or cultivar identity was concealed from the Fuchs program.

To qualify for the NY certification program, every vine in an increase vineyard block must test negative for eight viruses [grapevine fanleaf virus (GFLV), tomato ringspot virus (ToRSV), tobacco ringspot virus (TRSV), grapevine leafroll-associated virus 1 (GLRaV-1), grapevine leafroll-associated virus 2 (GLRaV-2), grapevine leafroll-associated virus 3 (GLRaV-3), grapevine leafroll-associated virus 4 (GLRaV-4) and grapevine red blotch virus (GRBV)] over two consecutive years. Subsequently only 25% of the originally virus-tested, clean vines are re-tested every year so that every vine is tested every five years after it was shown to be clean. In 2020, we aimed at (i) confirming the health of 25% vines that previously tested negative during two consecutive years and (ii) testing new vines that were added to the increased blocks at the three NY grape nurseries.

To address objective #1 on the indexing of vine stocks at NY nurseries for detrimental viruses, a total of 26,994 grapevine leaf samples were collected in June and July of 2020 by NYSDAM and shipped to the Fuchs program. Samples will be processed and tested for the presence of grapevine fanleaf virus (GFLV), arabis mosaic virus (ArMV), tomato ringspot virus (ToRSV) and tobacco ringspot virus (TRSV) by DAS-ELISA using specific antibodies. Testing results revealed an extremely low presence of GFLV (0.2%, 48 of 26,994) and ToRSV (1.4%, 387 of 26,994) but not of ArMV (0%, 0 of 26,994) and TRSV (0%, 0 of 26,994).

A total of 23,016 grapevine leaf samples were collected from late August to October in 2020 by NYSDAM and shipped to the Fuchs program. Leaf samples were tested for grapevine leafroll-associated virus 1 (GLRaV-1), grapevine leafroll-associated virus 2 (GLRaV-2), grapevine leafroll-associated virus 3 (GLRaV-3), grapevine leafroll-associated virus 4 (GLRaV-4) by DAS-ELISA using specific antibodies and for grapevine red blotch virus (GRBV) by PCR. Testing results revealed an extremely low presence of GLRaV-1 (0.6%, 126 of 23,016), GLRaV-2 (0.03%, 6 of 23,016), GLRaV-3 (0.1%, 26 of 23,016), GLRaV-4 (0.03%, 1 of 23,016) and GRBV (0.05%, 11 of 23,016).

To address objective #2 and communicate virus test results to the NY State Department of Agriculture and Markets in support of a certification program, virus test results for spring and fall were communicated to NYSDAM in July and December of 2020. Based on the extremely low detection of viruses in vine stocks managed by the three NY nurseries ranging from 0% to 1.4%, great strides have been made toward the availability of clean vine stocks that test negative for detrimental viruses at NY nurseries. This is a nice accomplishment. This is more so since virus incidence in the nursery increase vineyards has gradually decreased since the first year of testing in 2016. Nonetheless, the objective is to reach a complete absence of these viruses in vine stocks. This goal has been fully achieved for ArMV and TRSV, and nearly achieved for GFLV, ToRSV, GLRaV-1, GLRaV-2, GLRaV-3, GLRaV-4 and GRBV. Therefore, additional testing efforts are needed to screen vine stocks and make sure that appropriate measures are taken to eliminate infected vines and test remaining vines to ensure freedom from detrimental viruses. These will be the objectives of the 2021 surveys.

To address project #3 and disseminate information on the production of virus-tested, clean stocks and ongoing efforts to reinstate a grape certification program in NY to the wine and grape industry, project results were communicated to the wine and grape industry at the following conferences:

1. Hesler, S., Fuchs, M. and Loeb G. 2020. Management of viruses and mealybugs vectors in a commercial leafroll-diseased vineyard. Cornell Recent Advances in Viticulture and Enology Conference, December 10
2. Fuchs, M. 2020. Ecology studies to inform innovative management tactics of virus diseases. Innovations in Sustainable Pest Management. Unified Symposium, February 4-6

3. Fuchs, M. 2020. Multipronged approaches for red blotch and leafroll virus control. Long Island Agriculture Forum, January 9, Riverhead, NY
Communication efforts focused on raising awareness in terms of the value of virus-tested, clean stocks, the impacts of viruses on vineyard productivity and fruit quality, and the status of the NY grape certification program.

Impact Statement

Partial indexing result revealed that only 1.2% (605 of 50,010) of the leaf samples collected from vine stocks at three local nurseries and tested for eight viruses in spring and fall of 2020 were infected. The number of vines infected with a detrimental virus in increase vineyards managed by the three NY nurseries is very low. This is very encouraging for the reinstatement of a grape certification program in NY. However, the number of infected vine stocks identified so far is still too high in terms of a credible certification program. This is because a single infected vine can theoretically produce an average of 250 buds for grafting. By using 250 buds for grafting, it is possible to produce 150 grafted vines, assuming a very conservative 60% graft take. If one is further conservatively assuming that only 50% of the buds collected from virus-infected vines actually contain a virus, a total of 75 virus-infected vines can be produced annually from a single infected vine stock. This means that a single infected source vine can have huge consequences in the dissemination of viruses with all the documented consequence on poor vine performance in a vineyard. Consequently, our objective is to continue achieving a zero-tolerance level for detrimental viruses in increase vineyards managed by nurseries in NY. Our continued efforts will support the reinstatement of a NY grape certification program with unprecedented and unique high standards and will provide a competitive edge to the thriving NY grape, juice and wine industries.