Final Plain Language Research Summary - AgriScience Grape & Wine Cluster 2018-2023

Activity: *Crown Gall Disease of grapevines: Identification, bio-control, and sustainable management strategies*

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Crown gall of grapevines, caused by the bacterium Allorhizobium vitis, is an economically important disease in grape-growing regions with a continental climate, particularly in those where winter freezing occurs. Crown gall significantly reduces plant vigor and the disease may cause partial or complete vine death, especially in young vines, resulting in significant economic losses for the grapevine industry. The disease is found in many vineyards in BC and ON and seems to be on the increase, likely due to introduction of A. vitis through contaminated nursery stock. The pathogen can also be present in vineyard soil, enters the vine through wounds in plant roots and trunks caused by winter freezing and survives systemically in grape plants. Galls can be formed in trunks or even in 1-year-old canes.

We have developed a methodology to quantify the abundance of A. vitis in nursery stock in an earlier study but have previously only tested the methodology on a small number of samples from different nurseries. Currently, there is no chemical or biological control commercially available for crown gall.

The objectives of this study were:

- Testing of dormant grapevine nursery stock for abundance of A. vitis
- Isolation of potential biocontrols for A. vitis from vineyards in British Columbia and Ontario
- Evaluation of potential biocontrols to prevent crown gall in a greenhouse assay
- Evaluation of organic amendments to prevent or suppress crown gall in a greenhouse assay
- Evaluation of compost treatments to suppress crown gall in a commercial vineyard
- Evaluation of organic amendments to prevent crown gall in an experimental vineyard

We found that most ready-to plant grapevine material originating from national and international nurseries that sell vines to Canadian growers harbours crown gall causing bacteria. Unfortunately, it is not known where in the propagation process the infection occurs, and therefore no recommendations for nurseries can be made. However, we found that the bacterial threshold for disease development is high (>5,000 bacteria), which means that plants with bacteria may not develop disease after planting. Emphasis of growers needs to be placed on avoiding vine injuries in the early years after planting by using viticultural management practice that lead to less freeze injuries (good site selection, less water and fertilizer in fall).

We also found that hilling up around the graft union prevented the development of galls, but more data, including economic analyses, are needed and will be done in future research. Soils are likely already infected with crown gall bacteria, due to earlier planting of contaminated nursery material, but it is not known how long bacteria stay in the soil. Biocontrol will be the most important tool to prevent disease in newly planted vines, and we found bacterial and fungal strains that inhibited the growth of A. vitis in-vitro. We were not successful to show biocontrol using these organisms in greenhouse experiments but have made advances in establishing greenhouse assays for future biocontrol assays. In future research, emphasis will be placed on testing more biocontrols in-planta form different sources, including wild grapes and biocontrols found by other researchers. We also established a collection of locally isolated A. vitis strains, the first of its kind in Canada, which will be helpful when treatment options are explored. Compost treatments had no effect on crown gall incidence, but improved soil health and influenced nematode populations. Crown gall bacteria in the soil were greatly reduced at the end of 2022, compared to high numbers in 2017, independent of treatments.