

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

Activity: *Field strategies to mitigate the impact of grapevine viruses in British Columbia*

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Grapevines (*Vitis vinifera* L.) host the largest number of viruses than any other agriculture crop. Among them, Grapevine leafroll-associated viruses (GLRaVs) and the recently discovered Grapevine red blotch-associated virus (GRBV) cause the most economic impact to the grapevine industry as a result of delayed ripening and reductions in yield and fruit quality. These negative impacts on grapevines are of particular concern to the Canadian wine and grape industry due to the short growing season and an emphasis on production of high-quality fruit. Accordingly, the main objectives of this research project were to i) determine the impacts that GLRaVs and GRBV have on plant health and fruit and wine quality in both red and white grape cultivars in BC, ii) evaluate cultural practices that can ameliorate these impacts and iii) identify and control GLRaV-3 and GRBV insect vectors in BC.

### **Main results achieved from this project are:**

1. We have determined the significant impact that GRBV has on grapevine health and fruit and wine quality in BC, including reduction of soluble solids of up to 4 °Brix and yield reduction of up to 40% on infected vines. Similarly, we have also determined the impacts that GLRaV-3 has in red and white cultivars. GLRaV-3 reduced soluble solids on red varieties (up to 1.8 °Brix) and affected wine quality; however, its impact was shown to be year dependant. Contrary, GLRaV-3 had no effect on fruit quality parameters on white cultivars.
2. We have determined the current status of GPGV throughout vineyards in BC. GPGV is an emerging virus with unknown impacts to grapevine health and fruit and wine quality. Overall, the prevalence of GPGV (46 positive samples out of 468 total samples collected) was 9.8% in BC. The genetic diversity of GPGV isolates from BC was determined by full genome sequencing of seven isolates. All GPGV isolates from BC but two were collected from asymptomatic vines.
3. Cultural practices such as crop thinning did not have any effect on reducing the impact that GLRaV-3 and GRBV have on plant health and fruit quality.
4. ‘Rogueing’, which is the removal of virus infected vines from vineyards and replacing them with virus free certified material, was demonstrated to be a very effective practice to reduce GRBV incidence in BC vineyards. Vineyards where ‘rogueing’ was implemented reduced the infection rate from over 10% to less than 1% incidence in five years. Studies on the spread of GRBV showed very low rate of spread in BC.
5. An artificial feeding system was successfully developed to screen potential insect vectors present in BC to transmit GRBV. Results from this study showed two species of buffalo treehoppers, *Stictocephala basalis* and *S. bisonia* to be able to transmit GRBV under these

experimental conditions. These results demonstrate that treehoppers present in BC have the capacity to transmit GRBV.

6. Studies on the spread of GLRaV-3 showed the highest rate of infection to occur within the first 0-5 m interval from an infected vineyard block and infected vines decreased as the distance from the nearest virus source increased. Preliminary results for infection rates in relation to vector species and numbers showed mealybug to be more important vectors than scale insects in BC.
7. Parasitism rates were determined and species identified. Adult cottony vine scale (CVS) were >80% parasitized by 5 species; the main one being *Coccophagus scutellaris*. Dr. Gariépy completed DNA extractions from CVS and optimized primers and 91 parasitoids from CVS have been processed and sequenced using the standard DNA barcode primers. Preliminary assessment suggests there may be as many as 9 different species of parasitoids among the samples.
8. Rates of parasitism and parasitoid species were then studied in a long-term field trial at SuRDC comparing the neonicotinoid Clutch to the pyrethroid Pounce. Results showed long term effects of these insecticides on parasitism rates and parasitoid species compositions.

Results from this project have demonstrated i) the impact that GLRaV-3 and GRBV have on plant health and fruit quality, ii) have increased awareness among the grape and wine industry on this important issue, and iii) have developed and implemented the first management strategies to ameliorate these impacts in BC vineyards.