Plain Language Summary 2019-2020 – CGCN Activity 2

Principle Investigators: Jose Urbez-Torres and Tom Lowery

2019-2020 Executive Summary

Grapevines host the largest number of viruses compared to any other agriculture crop. Among them, Grapevine leafroll associated viruses (GLRaVs) and the recently discovered Grapevine red blotch virus (GRBV) cause significant economic impacts to the grapevine industry as a result of delayed ripening and reductions in yield, fruit and wine quality. These negative impacts on grapevines are of particular concern to the Canadian wine and grape industry due to the short growing season and its emphasis on production of high quality wines. The Wine Grape Research Team at the Summerland Research and Development Center (SuRDC) in British Columbia (BC) is leading grapevine field virology research towards the benefit of the Canadian grape and wine industry since 2013. Outcomes from this research have significantly contributed to a better understanding of the current situation of major viruses throughout both BC and Canada. In addition, significant progress has been made in determining the impact that GLRaVs and GRBV have on grapevine health and fruit and wine quality under BC growing conditions. Studies on potential insect vectors in commercial vineyards in BC have resulted in the identification of mealybug and soft scale spp., capable of transmitting GLRaV-3, allowing the advance for development of best control strategies. Furthermore, the knowledge generated through this research has increased the awareness of the importance of grapevine virus diseases in all grape-growing regions of Canada and the need for the development of a domestic clean grapevine program. Accordingly, and building on previous work, the main goal of the current research is to provide critical information about the long term effects that major viruses have on plant health and to implement effective and practical management strategies to minimize their impact for the long term sustainability of grape production in Canada.

Significant progress has been made in determining the impacts that both GLRaV-3 and GRBV have on red cvs. under BC environmental and growing conditions. Among all vine health and fruit quality parameters studies, overall results from trials conducted during 5 consecutive years have shown a consistent reduction on soluble solids (up to 2°brix) in plants infected with GLRaV-3 vs. healthy vines. In addition, a moderate reduction on some wine quality attributes has been observed from wine made with infected GLRaV-3 against wines made from healthy vines. To date, bud hardiness was not affected by GLRaV-3 infection. Research conducted during the 2019-2020 work year has started the evaluation of the effects that GLRaV-3 has on white cvs. Similar studies have shown a much higher impact on vine health and fruit and wine quality attributes when vines are infected with GRBV. Significant reduction on both yield (up to 40%) and soluble solids (up to 4°brix) was recorded from GRBV infected Cabernet Franc vines when compared to healthy vines. Contrary to vines infected with GLRaV-3, bud hardiness was significantly affected in vines infected with GRBV. Sensory analyses showed an important reduction in several wine quality attributes from wines made with 100% and 20% GRBV infected fruit.

Research conducted by MSc student Dieter Kahl under supervision of both Dr. Úrbez-Torres and Dr. Lowery has help to advance the understanding of GRBV epidemiology throughout the season by

determining virus titer in the plant and thus, establishing best timing for sample collection. In addition, GRBV spread studies conducted in several vineyard blocks throughout the South Okanagan have shown to date none or minimum spread of this particular virus in BC. Following up with these studies, proof of concept rogueing trials (elimination of infected vines and replacement with healthy vines) were conducted in 2019. Preliminary results from these trials showed high potential of significantly reducing or eradicating GRBV from infected blocks by rogueing. These trials will continue during the following years to confirm the 2019-2020 results.

Research led by Dr. Lowey and assisted by MSc Student Dieter Kahl have been conducted to complete surveys for potential vectors of GRBV in vineyards during the 2019-2020 work year. To date, different insect types, including treehoppers, froghoppers, sharpshooters, and leafhopper (nearly 400 specimens) were collected and used in laboratory trials to determine their potential for successful GRBV transmission from plant to plant. An effective buffer distance required to significantly reduce natural transmission of GLRaVs into newly planted vineyard blocks by wind-blown scale and mealybug crawlers is being determined with mapping of infected vines over the first two years of establishment. Vineyard study blocks mapped in 2018 were revisited and remapped in 2019 with new blocks being added.

As an important first step, large numbers of scale parasites have been collected and sent to the National Collection for Insects in Ottawa for identification. In parallel, Dr. Gariepy (AAFC, London RDC), has conducted genetic sequencing and barcoding that will allow for molecular testing of parasitized scale. Scale and mealybug populations were estimated in ~20 vineyard blocks during two visits over 2019) and pesticide spray records for each block were provided by participating growers. Another ~20 sites will be assessed again this year, with winter inspections and collections for 2020 scheduled to begin in early February. A trial was established at SuRDC to measure scale numbers and assess parasitism in replicated plots sprayed with a neonicotinoid versus non-persistent control measures.

A laboratory bioassay method has been developed for the evaluation of the efficacy of novel insecticides to scale. Hundreds of grape cuttings with wintering scale nymphs have been collected and placed in cold storage. Plants rooted from these cuttings that will become infested with scale nymphs will then be treated with various rates of the test insecticides. Insecticides deemed to be effective in this bioassay can then be tested under field conditions should support for eventual registration be obtained from the company.