

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

Activity: From nursery to vineyard: Implementation of effective management strategies against grapevine trunk disease in Canada

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The long-term economic viability of the grapevine industry relies on healthy planting material and effective disease management strategies in vineyards. Grapevine trunk diseases (GTDs) are considered one of the main biotic factors limiting both yield and vineyards' lifespan worldwide (Gramaje et al. 2018). Studies conducted by the Plant Pathology laboratory at the Summerland Research and Development Centre (SuRDC) since 2010 have significantly contributed to a better understanding of the current status of GTDs in British Columbia (BC), laying the foundation for the development of effective control strategies (O'Gorman et al. 2015; Úrbez-Torres et al. 2014a, 2014b, 2015). However, contrary to most grape-growing countries around the world, neither cultural practices nor registered products (chemical or biological) are currently available to control GTDs in Canada. Therefore, the main objective of this research project was to develop and implement sustainable management strategies against GTDs in both young and mature vineyards as well as at the nursery level. This project investigated cultural practices such as best pruning time to reduce GTDs infection and also focused on potential environment-friendly biological control options. Additionally, this research aimed to demystify the role that abiotic and/or biotic stress factors, such as water stress and nematodes play on GTDs development in young vineyards. The ultimate goal of these studies aims to provide scientific-based information to Canadian growers about best planting and growing conditions to minimize the impact of GTDs.

Research conducted in this project and based on Droplet Digital PCR™ technology, allowed us to develop a rapid, accurate and sensitive molecular tool for the detection and absolute quantification of GTDs fungi present in ready-to-plant nursery stock. We implemented this technology in assessing the health status of domestic and international grapevine nursery material sold in Canada. Overall results showed all plant material evaluated to be infected with at least one fungus associated with GTDs. However, fungal abundance varied between sections (roots, base of the rootstock, graft-union, and scion) within the same plant, between plants within the same nursery and between nurseries. This study is the first of its type worldwide and will assist to identify inoculum sources as well as management strategies to mitigate infections at the nursery level. With such high levels of infection reported, it can be hypothesized that the presence of these fungi in the ready-to-plant nursery material may not directly imply the death of the plant or otherwise viticulture in Canada would not exist in its current form. It is possible that these fungi act as latent pathogens in nursery plants, transitioning from endophytic to pathogenic under abiotic and/or biotic stress conditions (Hrycan et al. 2020). Work conducted in this project under greenhouse and natural field conditions has shown abiotic stress factors such as water stress to play a direct role on favoring fungal growth and disease development in young vines. This represents critical

information since long periods of higher than usual temperatures and corresponding water stress are becoming more prevalent across BC grape-growing regions due to climate change.

Work conducted in this project has identified for the first time effective locally sourced biological agents (BCAs) to be used as pruning wound protectants to control GTDs. Seven species in the *Trichoderma* genus, including two novel species for the scientific community, were fully characterized. Laboratory, greenhouse and field trials have been completed and results from these studies showed high efficacy of three of these *Trichoderma* spp. as BCAs. Locally-sourced *Trichoderma* spp. from BC showed similar or better control when applied as pruning wound protectants than commercial BCA and chemical fungicides. In addition, our laboratory has generated required field data to advance the registration of the first commercial products (biological and chemical) for the control of GTDs in Canada. Furthermore, studies to investigate the use of remedial surgery as a cultural practice in BC to mitigate infection were completed. Results showed 100% vine survival and return to economically sustainable production two to three years after treatment.

Despite the difficulties and work limitations experienced due to the pandemic restrictions during 2020 and most of 2021, all objectives scheduled in the project have been successfully completed. Results from this project are of significant importance as they bring the first management options for Canadian grape growers to control and mitigate the impacts caused by GTDs.