Canadian Grapevine Certification Network
CGCN · RCCV
Réseau Canadien de Certification de la Vigne

Plain Language Research Summary - AgriScience Grape & Wine Cluster - *2024-25*

Activity #14: Increasing climate change resilience by a better understanding of cold hardiness and with novel frost protection methods

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1. **What is the overall focus of this research activity?**

Cold damage is the biggest economic threat to grape growing in cold climate. Extreme weather events like polar vortex and spring frosts are now recurring in regions where they were seldom observed before. Current cold protection methods can only go so far. Passive methods like site and cultivar selection are not helpful when vineyards are facing unpredictable winters or fall and spring frosts. Active methods, such as wind machines and burning logs throughout the vineyard have a high carbon footprint and cannot protect against certain types of weather events. Important decrease in yield caused by cold and frost damage are well known, but cultural practices and spray program still need to be implemented, with their related greenhouse gas emissions and economic cost. This means that the yield reduction associated to cold damage is significantly increasing the ratio of energy input and greenhouse emission per bottle of wine. Mitigating yield reduction associated to cold damage would positively impact this ratio, the industry, and the environment.

This project was designed to address the current challenges in the industry and the gap in literature regarding the scientific knowledge and application of specific technologies with regards to cold events in the winter and in the spring. To achieve this, the project proposes three specific objectives: 1) to improve bud survival and overall yields by strengthening our knowledge of site differences and physiological influences on cold hardiness for hybrids and *Vitis vinifera* cultivars, 2) reduce cold damage under geotextiles by a better understanding of their impact on acclimation, maximum hardiness, deacclimation, and bud break, and 3) mitigate yield reductions associated to primary bud damage and tissue mortality caused by deep-freeze event and spring frosts by using novel protection methods in vineyards. Three methods will be tested as part of this final objective: an application of phytohormone called abscicid acid, the use of heated electric wires, and the use of a cellulose nanocrystal spray. These three objectives will help the Canadian grape growing regions deal with the extreme weather events they are regularly facing. By stabilizing or improving yields annually, this proposal will also support the economic growth of the sector by helping growers make more wine per acre.

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2. **What are the main progress updates/milestones in terms of work that was done on this research activity this year?**

This was the first complete year of activity for this project which focuses on improving our understanding of grapevine cold hardiness and testing innovative frost protection methods. In the first sub-activity, we completed a full winter of sampling five hybrid (Frontenac, Marquette, Petite Pearl, St-Pépin, Vidal) and two *Vitis vinifera* cultivars (Chardonnay and Pinot noir) in 6 commercial vineyards to evaluate cold hardiness and dormancy status. We also closely monitored bud break in the field and collected yield and pruning weight data to study the impact of vine balance. The cold hardiness data was made available to the industry through the VineAlert website. Major progress was made on the second sub-activity, with the installation of a complete experimental design to study the impact of geotextile and sunlight on cold hardiness, dormancy and the timing of bud break. Data was collected throughout the winter which will help us clarify the impact of geotextile on vine physiology. In the third sub-activity, we tested multiple frost protection methods. Abscisic acid (ABA) sprays were applied during the growing season with the hope of improving cold hardiness and delaying bud break. Several formulations of cellulose nanocrystal (CNC) solutions were tested to protect buds against frost in the controlled environment of the lab. We also acquired a heated wire system that is yet to be installed but that will be tested next year against cold winter, as well as fall and spring frosts. The progress made this year is significant and lay the groundwork for a more resilient approach to cold temperature events across Canada.

3. **What is this research activity's intended impact on the Canadian grape and wine industry? What benefits could/will the growers, wineries, consumers, etc. see as a result of this research?**

This research aims to help Canadian grape growers with the fight against cold temperatures and unpredictable weather events. Data collected in this activity will be used towards the development of more accurate hardiness models to help growers better understand the risk in the face of cold winters. The work done on geotextile will inform the industry on the impact of the protection method on the vine and will provide evidence-based best-practice guidelines for installation and removal. Finally, our work on frost protection methods will provide novel alternatives to growers to fight the cold temperature. This work aims at supporting growers in their cold-fighting strategies and at building a more resilient industry in the face of climate change. New strategies and updated guidelines for current ones will lead to better yields and reduced risk for the growers, and a consistent supply of quality grapes for the wineries.

4. **Do you have any communications materials, publications, or other content related to this research activity that you would like CGCN-RCCV to share?**

Not yet.