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

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

Activity #12: Selection of superior grapevine material using traditional field evaluations and genomic/metabolic signatures for cold resilience

Principal Investigator(s): Dr. Jim Willwerth (Brock University)

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

Climate change is a threat to the Canadian grape and wine industry and adaptation strategies are urgently needed. The main objective of this research is to support the Canadian Grapevine Certification's domestic clean plant program through accelerated selection of superior grapevine material for improved performance, cold resilience, and quality using traditional evaluations and genomic and metabolic signatures.

The goal is to improve the sustainability of grape production by greater cold tolerance resilience through identification of superior vine material and their genomic and metabolic signatures and mitigation strategies such as the use plant growth regulators such as Abscisic acid analogs.

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

In 2024-25, different *Vitis* genotypes of varying cultivars, clone and rootstock combinations were evaluated for their vine performance, fruit composition, cold hardiness and dormancy responses. Different cultivars such as Chardonnay, Cabernet franc, Cabernet Sauvignon, Merlot and Sauvignon blanc were used for these studies as well as different clones of each grafted to different rootstocks. While it is well understood that cultivar differences exist, we continue to find that rootstocks and clones can impact yields, fruit composition and cold hardiness of grapevines. However, there is some differences of performance based on the specific year and weather conditions as well as site characteristics.

We also performed experiments using plant growth regulators including a cold hardiness promoter called Tetralone which is an abscisic acid analog. We examined the impacts of different types and timing of applications on dormant grapevines to help gain further understanding of how these compounds may delay cold deacclimation and bud break. We are

also trying to learn more practical ways of applying these compounds for commercial applications. These were performed using grapevines with different cold tolerances including a more sensitive variety such as Merlot, and intermediate, Riesling, and a very cold hardy variety that breaks bud early (Marquette). In addition, metabolite analysis is ongoing so we can learn what biochemical changes differ with respect to applications of a cold hardiness promoter such as Tetralone. These data will allow us to determine what key metabolites change, allow us to target specific genes of interest and design new experiments for 2025.

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?**

Research, innovation, and technology are critical components to ensure the industry's economic growth. Like all agriculture, the grape and wine industry is threatened by extreme weather, variability associated with climate change. Freeze injury is a continuous threat to the sustainability of the Canadian grape and wine industry even as other threats may exist, such as virus infection, freeze injury can result in significant fruit shortages and economic losses across the entire value chain from one single cold event. Innovation is required to mitigate climate change effects.

One of the most important strategies are adaptation using more resilient plant material to weather variability and extremes. This is also critical to the Canadian Grapevine Certification Network's goal of providing the Canadian grape and wine industry with the highest performing grapevine material possible. Cultivar, clone and rootstock selection is critical for Canada's diverse grape growing regions and adaptation to local climate and future climate conditions that regions may face (i.e., excessive rainfall/drought, "polar vortex" events or high volatility). Aside from plant material, the use of plant growth regulators is also a potential mitigation strategy to abiotic stress like freezing stress. Abscisic acid analogs have been shown to act as a cold hardiness promoter and maintain hardiness in grapevine. Therefore, the goal is to improve the sustainability of grape production by greater cold tolerance resilience through identification of superior vine and develop new mitigation strategies such as the use plant growth regulators such as Abscisic acid analogs. Commercialization and product registration opportunities are being explored currently by industry partners.

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

Willwerth J. (2024). Building resilience in Canadian vineyards through grapevine selections. January Issue (55). Open Access Government. United Kingdom. https://www.openaccessgovernment.org/article/building-resilience-in-canadian-vineyards-through-grapevine-selections/186661/

Willwerth J. (2024). Innovative grape and wine industry in a cool climate region. Open Access Government. Issue 44. October 2024. United Kingdom. https://www.openaccessgovernment.org/article/innovative-grape-and-wine-industry-research-in-a-cool-climate-region/182696/