

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

Activity #15: From carbon sequestration to terroir: Understanding the impact of abiotic stresses on grapevine, berries and wine quality to foster sustainable grape and wine

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

Grapevines are particularly promising due to their resilience and ability to thrive in diverse environments with minimal inputs. However, challenges such as climate change-induced extreme weather events and energy-intensive practices threaten the industry's sustainability. Our program seeks to address these challenges by developing innovative viticulture and winemaking techniques that prioritize carbon sequestration, low input usage, and reduced greenhouse gas emissions.

To achieve this goal, we will particularly focuses on three aspects: 1) Explore the potential of perennial crops like grapevines to capture carbon from the atmosphere in different conditions, offering a sustainable solution to reduce greenhouse gas emissions; 2) Improve our understanding of highly resilient cold-hardy/disease resistant (CHDR) grape varieties ; 3) Develop low-GHG and sustainable viticulture and winemaking approaches to improve the quality of wines made from CHDR grape varieties.

By leveraging new technologies and resilient grape varieties, we aim to enhance vineyard resilience, improve berry quality, and foster sustainable postharvest practices. Through comprehensive assessments of the environmental, economic, and social impacts, our research endeavors to advance the sustainability of Canadian grape growers and wineries, ultimately reducing Canada's carbon footprint and enhancing the industry's long-term viability.

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

In 2024–25, we made significant progress across milestones related to objective 2 and 3 of our activity, including on the evaluation of the impact of UV-C, leaf removal, and temperature modulation in a field experiment (Obj. 2), and on the effect of postharvest treatment on berry and wine quality of disease resistant (Vidal, St. Pepin) and V. vinifera (Riesling) varieties (Obj. 3).



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During the Summer 2024, we launched a large experiment to assess the effect of UV-C flash treatments, pre-veraison leaf removal, and increased canopy temperature during pre- and post-véraison on berry quality at harvest. Results showed that temperature and UV-C treatments differently affect the aroma content of berries.

On the winemaking side, trials on postharvest treatments such as cold storage and partial grape drying showed that the organic acid content of berries can be modulated when temperature higher than 20 C are used for treatments, and that such treatment can also improve the level of aroma precursors in berries. In autumn 2024, we extended this work to include cryomaceration, carbonic maceration, and a new round of partial grape drying (= passerillage) trials on Riesling, Frontenac gris and Vidal, and carried these samples down to winemaking. This allowed us to assess impacts on grapes and juice, but also on final wine composition and aroma content. While analyses are still ongoing, first results showed that partial grape drying significantly enhanced the content in free thiol in Vidal wine, whereas treatments such as cryomaceration and nitrogen maceration were more effective in Frontenac gris.

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 activity focuses on developing different angles of sustainable viticulture and winemaking practices to eventually conduct to improve the sustainability and the resilience of the Canadian wine industry. Our research aims to benefit growers, wineries, and consumers alike. For growers, implementing sustainable practices and resilient varieties can lead to improved vineyard resilience, reduced input costs, and increased profitability. Sustainable methods also contribute to environmental conservation and minimize the industry's carbon footprint, aligning with consumer preferences for eco-friendly products. Wineries stand to gain from enhanced grape quality, resulting in higher-quality wines that appeal to discerning consumers. Additionally, by adopting sustainable postharvest practices, wineries can streamline operations and reduce waste, further improving their bottom line.

Ultimately, consumers can expect to enjoy wines of superior quality, produced in a manner that prioritizes environmental sustainability and social responsibility. This research not only benefits industry stakeholders but also contributes to the broader goal of building a resilient and sustainable Canadian wine industry for future generations to enjoy.



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

Several communication materials and presentations related to this research activity have been produced over the 2024-2025 year. These include:

- Webinars and professional presentations for the CRAAQ and SERVO platforms, covering sustainable viticulture, postharvest innovations, and climate adaptation strategies for disease-resistant grape production.
- Technical presentations delivered at industry events such as the Journée sur la viticulture durable (Conseil des vins du Québec), highlighting the impact of postharvest techniques to enhance the quality of disease-resistant berries.
- Scientific posters and conference presentations at both national and international events (ISFORT, OIV, ASEV, etc.), addressing topics such as UV-C treatment as an alternative to pesticides, the modulation of grape secondary metabolites, and postharvest innovations for improving berry chemistry and wine quality.

Some of these materials are publicly available via ResearchGate or institutional repositories. Others can be shared upon request (email <u>karine.pedneault@uqo.ca</u>).



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