

Plain Language Research Summary - AgriScience Grape & Wine Cluster - 2025-2026

Activity #4.2: Vegetation management for long-term productivity and enhanced ecosystem services in Canadian semi-arid vineyards – Volatile organic compound analyses

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

Grape quality is a primary determinant for specific wine styles and their unique quality characteristics. Volatile organic compounds (VOCs) are vital to this grape-quality, as these flavor and aroma compounds directly affect wine quality in both red and white wines. These compounds also serve essential roles in plant development and defense against herbivores, pests, and disease. Viticultural strategies, such as the application of cover crops to improve soil fertility and the capability of soils to retain water, impact plant vigor and canopy characteristics (e.g., canopy and fruit temperature). Consequently, these strategies may have a significant impact on the accumulations of volatile organic compounds during ripening, affecting grape quality at harvest. This project aims to evaluate differences among cover crop treatments for important VOCs that contribute to flavor and aroma composition in grapes. Grapes will be collected from field trials evaluating various pre-screened cover crops through collaboration with the integrated companion SCAP activity 4.1, which focuses on the evaluation of cover crop effects on grape production.

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

Grape samples were collected at three sites in the Okanagan Valley from cover crop field trials. The varieties are Marsanne, Pinot noir, and Cabernet Franc. The cover crop treatments were combinations of fall rye, rolled oats, red or white clover, wheatgrass and ryegrass. Each cover crop treatment received either high or low irrigation.

Methods were developed for grape sample preparation, VOC extraction using solvents and solid phase microextraction (SPME), chemical analysis by Gas Chromatography - Mass Spectrometry (GC-MS), and data collection and interpretation. Authentic standards, Kovats indices and Multiple Reaction Monitoring (MRM) for specificity were used to identify and quantitate to 67 VOCs. Analysis of grape samples from the field trials are ongoing.

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 give Canadian growers a practical, sustainable way to enhance the quality of their grapes by using soil management practices. Rather than relying solely on external additives, this approach focuses on using cover crops, such as fall rye, clover, and wheatgrass, to naturally influence the vineyard environment. By understanding how grapevines interact with different irrigation levels and soil types with respect to cover crop choices, we can provide growers with sustainable strategies to improve soil fertility and water retention while simultaneously boosting the aromatic potential of the fruit. This will help vineyards become more resilient and efficient, ensuring they can produce high-value grapes even as growing conditions become more unpredictable.

For the Canadian wine industry, the impact is twofold: economic resilience and product distinction. Growers benefit from more robust vines that can better handle environmental stress, reducing the need for costly interventions. Meanwhile, wineries and growers will have improved approaches to production systems that will produce grapes with superior flavor and aroma profiles, specifically tailored to Canadian wine production regions. For the industry, it builds a stronger reputation for sustainability and excellence, ensures that Canadian wines remain competitive and high-quality, and supports the long-term economic health of Canada's grape-growing regions.

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 at this time.