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

Plain Language Research Summary - AgriScience Grape & Wine Cluster 2023-24

Activity 11: Wine flavour modification through non-traditional yeasts, oenological treatments and taint remediation

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

The Ontario, and broader Canadian, wine industry is searching for ways to further improve wine quality through flavour modification to increase the competitiveness of domestic wines to capture a higher percentage of wine market share. Canadian wine has always competed on quality rather than price. Our research program will focus on processes that will provide new and improved wine attributes, making our industry more resilient to the challenges of climate change that negatively impact fruit quality, and more resilient to market pressure requiring our wines to be price competitive but with added quality.

Although it is widely accepted that making great wines begins in the vineyard with quality fruit, winemakers still require additional oenological tools to enhance the aroma profile of wines to offer resilience in winemaking to overcome threats from climate change. Those tools include non-traditional yeast strains that alter and improve the volatile aroma compounds in wine, oenological additives and fermentation temperature that allow yeast to create flavours that further enhance wine character. This program will use all of these tools to address industry priority issues facing winemakers.

This project has two main objectives in wine flavour modification, addressing key areas of concern in the Ontario grape and wine industry with application to industries in British Columbia, Quebec and Nova Scotia.

Objective 1: Assess the commercial application of locally isolated *S. uvarum* strains to mitigate the impact of botrytis and sour rot taints in white grape varieties through consumption of acetic acid and assess their use to form volatile fatty acids and acetate esters that increase the fruity volatile aroma compounds in Riesling and Chardonnay wine.

Objective 2: Increase volatile thiol concentrations in Vidal table wine through a yeast micronutrient additive, fermentation temperature and yeast strain to enhance the “Sauvignon blanc” characteristic of Vidal to diversify uses of the Vidal grape, improve marketability and increase the domestic wine market share.

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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?**

Project 1. Mitigation of the impact of Botrytis and sour-rot infected fruit on wine quality.
Strain identification of 6 *S. uvarum* isolates from previously completed commercial fermentations were evaluated by microsatellite analysis to determine if they were different strains. Results showed of the six isolates, 3 unique strains were identified that differ from each other. These 3 strains along with 4 other strains previously isolated and identified as *S. uvarum* (3 from non-inoculated commercial fermentations and 1 from Icewine grapes) along with a control yeast EC1118 (8 in total) will be used for chardonnay fermentations in 2024. MSc graduate students were also recruited to work on this project in 2024.

Project 2. Improving the aromatic profile of Vidal table wine
As part of the Vidal project, it was critical to assess the detection limits for the current GC MS method to measure volative thiols, the fruity compounds that give Sauvignon blanc it's distinctive varietal character. and potentially improve the method of analysis for volatile thiols. We have found the GC MS method in current use for volatile thiol analysis can only detect in a quantitative manner to the parts per billion (ug/L) level. This method was not sufficiently sensitive to quantitatively detect to the ppt (or ng/L) scale for any of the compounds. Detection appears challenging due to the compounds' susceptibility to oxidation, and poor chromatographic behavior. Given that the sensory threshold of these compounds in wine is so low, we have started to adapt a derivatization method that will allow measurements to the parts per trillion or ng/L level. The derivatization method will also assist in stabilizing the thiols for measurement to enhance our ability to measure multiple samples over a longer time period of analysis and differentiate the compounds from any co-eluting compounds in wine. By derivatizing thiols prior to GC-MS analysis, and utilizing deuterated thiol internal standards, we will address the instability, improve chromatographic behavior, improve detection thresholds and improve the mass spectrometric response. Deuterated analogues of our internal standards are being synthesized in the Chemistry Department at Brock University as they are not commercially available in Canada. One MSc graduate student was also recruited to work on this project to start in Sept of 2024.

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?**

Threats from our changing climate are creating erratic weather patterns within a growing season that can result in wet damp conditions close to harvest. These conditions can result in *Botrytis*/sour rot infections in fruit at harvest, which in turn cause fermentation issues and negatively impact wine quality. At the end of 2028, it is expected that the outcome from the research activities will provide solutions or at least tools for the winemaker and find a home for grapes that may otherwise have been discarded for the grower. Using indigenous local *S. uvarum* yeast to consume acetic acid during wine fermentation and form new fruity volatile fatty acids and esters may minimize the flavour impact from rotted fruit and provide new competitive markets for aromatic white wines. These solutions may provide resilience to the sector in dealing with challenges from climate change (erratic weather events) and ensure continued economic growth of the $11.5 billion industry across Canada. Enhancing the volatile aromatic profile in wines from the leading hybrid grape in Ontario (Vidal) and in Quebec (Seyval) by enhancing the production of volatile thiols can offer new growth opportunities for these wines at a competitive price-point that consumers are willing to pay. Our research has already shown consumers will buy a local dry Vidal wine that has a fruity profile in the $13-$16 category. Research results from the proposed program would have significant benefits in Ontario, where 20% of the grape crop is from Vidal and the Icewine market is shrinking, thus offering resilience to this sector of the industry by diversifying the wine style that Vidal can be used for. In Quebec, where both Seyval and Vidal are common white hybrids, and in Nova Scotia where their growing conditions are ideal for aromatic hybrid white wines, improving the aromatic nature of hybrid wine quality will further mitigate the impact of climate change on grape quality and improve the economic growth of the sectors in these provinces. Finding an application for indigenous Canadian yeast, none of which are currently available in the marketplace, would further help Canadian wine differentiate itself in the marketplace not only in terms of aroma/flavour profile, but also in terms of marketing local wine made with local yeast using local grapes.

4. **Do you have any communications materials, publications, or other content related to this research activity that you would like CGCN-RCCV to share? If so, please provide a brief description here and either link it here or send the file as an attachment along with this summary.**

Not at this time.