Canadian Grapevine Certification Network
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Plain Language Research Summary - AgriScience Grape & Wine Cluster - *2024-25*

Activity #9: Influence of temperature and heat-stress mitigation strategies on grape quality in British Columbia vineyards

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

This project aims to assess the effects of heat stress on grape production, and on developing new strategies to mitigate heat stress effects in vineyards. We will elucidate whether varying irrigation levels influences the response to a heatwave in Okanagan Valley vineyards and study the capacity of bio-stimulants and to mitigate heat stress and heatwaves in vineyards. We will also assess how major grape cultivars grown in BC are susceptible to heat stress and which cultivars better recover from heat stress. Finally, we will conduct a regional-scale study of temperature effects on grape quality (sugars, acids, and aroma) in the Okanagan Valley, and model optimal environmental conditions for grape quality.

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

Due to the major damages that the extremely low temperatures of January 2024 had generated to the Okanagan Valley vineyards, the field experiments related to irrigation levels and bio-stimulant effects on heatwave mitigation were not performed. However, we did identify the research fields where the experiments will be conducted in the summer 2025, 2026, and 2027. The focus of 2024-25 research activity was in conducting greenhouse- and growth chamber-based experiments to test the tolerance of major grapevine varieties grown in BC to heat stress. We tested how the photosynthetic activity of Cabernet Franc, Chardonnay, Riesling, Viognier, Gewürztraminer, Merlot, Malbec, and Semillon responds to heatwaves (with maximum day temperatures of 40 °Celsius) and we identified sensitive (Cabernet Franc, Malbec, and Semillon) and tolerant varieties (Chardonnay, Riesling, Viognier, Gewürztraminer, and Merlot). Some varieties (Chardonnay, Gewürztraminer, and Merlot) decrease their photosynthetic activity soon after the exposure to the heatwave; however, they recover from the stress after few days, showing an adaptation process to the high temperatures.

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We also tested what temperature would permanently damage the leaf photosystems in Cabernet Franc, Chardonnay, Riesling, Pinot Gris. Our results indicate that the threshold where damages become permanent is 47 °Celsius for all those varieties. The above greenhouse and growth chamber experiments will be repeated in 2025-26.

Regarding the regional-scale study of temperature effects on grape quality, this year we expanded our contact with industry partners and vineyards across the Okanagan for conducting the experiments. Training of a doctoral student in environmental modeling is progressing well with investigation into historical heatwaves/extreme weather and growing-degree day (GDD) variability within the Okanagan region. Recorded temperature data from deployed sensors and weather station data for the 2024-25 growing season is being acquired and analyzed.

We continued the knowledge transfer activity by presenting our research plan to the BC wine industry and community, and to the international scientific community. An online dashboard has been designed and deployed for sharing information from various analyses.

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 study will allow us to identify the effects of heatwaves on canopy function (photosynthesis and transpiration) and grape quality and to assess how the impact of irrigation regimes on heatwave effects. The study will also assess the sensitivity of BC grape cultivars to heatwave events and the impact of climate-change mitigation strategies on grapevine canopy function and grape quality in major grape cultivars cultivated in BC.

We will also model the effects of temperatures on grape quality. These models will allow us to make future predictions for the regional suitability and quality of aromatic cultivars. This information may also be useful to aid growers in seasonal management decisions.

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

We presented results related to this project to the BC wine industry and community and at international conferences. These presentations cannot be shared at the moment as results are preliminary and publications have not been finalized.