Canadian Grapevine Certification Network
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Réseau Canadien de Certification de la Vigne

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

Activity #16: Increase productivity, climate change adaptation and resilience of northeastern Canadian vineyards through different weed, insects, fungal disease and virus control strategies

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

Grape growers worldwide face many challenges when managing pests in vineyards, such as fungal diseases, insects, viruses and weeds. Several methods, techniques and products are available to control pests, and it is necessary to implement integrated control strategies that respect the environment and human health. The selection of resistant grape varieties, site selection, management methods, cultural practices, the use of biological control products, the establishment of cover crops, and pest modelling (insects, diseases) are all aspects to be considered in developing an integrated pest management strategy. What's more, climate change is having an ever-greater impact on vineyard pests and grapevine production, so we need to adapt our practices to keep pace with these changes.

This project is in line with all these aspects of evaluating methods and practices to effectively control pests in vineyards while limiting negative impacts on the environment and adapting to climate change. This project comprises four activities related to various issues. Activity 1: The evaluation of disease-resistant grapevine cultivars and other specific cultivars under Eastern Canadian conditions could be an excellent alternative to reduce the use of pesticides, mainly copper, in organic vineyards and improve wine quality and diversity of supply. The main objective of this activity is to evaluate and optimize the potential of new and existing grape cultivars under the growing conditions of Eastern Canada to increase wine production in Canadian vineyards. Activity 2: The impact of viruses (GLRaV and GRBV) has been widely studied for V. vinifera cultivars, but until now, little is known about its effects on yield and physiology (e.g. photosynthesis, cold hardiness, etc.) of symptomless hybrid cultivars. This activity aims to understand the impacts of GLRaV-3 and GRBV on grapevine physiology and productivity in hybrid cultivars. Activity 3: The use of cover crops in the vineyard (row space, alleyway, floral strip) is expected to benefit this ecosystem and enhance environmental and grapevine performance. However, maximizing the benefit of CC requires a careful consideration of environmental features driving multitrophic interactions between CC-vine-soil-insect-microbes

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in vineyards. The main objective is to characterize the impacts of floor management on ecosystem resilience, grapevine performance and pest management in organic vineyards. Activity 4: Diseases of fruit and foliage caused by fungi such as *Erisyphe necator*, *Botrytis cinerea*, and *Elsinoe ampelina* and oomycetes (*Plasmopara viticola*) are generally controlled by the application of fungicides, either synthetic or organic. In this activity, we propose to use process-based modelling to quantitatively describe the development of the main grapevine diseases, namely downy mildew (*P. viticola* fspp *aestivalis* and *riparia*), powdery mildew (*E.necator*), Botrytis bunch rot (*B. cinerea*), and anthracnose (*E. ampelina*). The main objective is to develop and validate disease decision tools to improve the management of the main grapevine fungal diseases under conventional, in transition, and organic production systems.

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

This was the first full year of work for this activity, and significant progress was achieved for all four sub-activities. In the first sub-activity, a full season of data was collected on grape cultivars that are new to the Canadian industry. While grape production was still insufficient to evaluate bloom and veraison timing, bud break, vine vigor, periderm formation, and susceptibility to pests, diseases, and nutrient deficiencies were closely monitored. The second sub-activity focused on identifying virus-infected vines in commercial vineyards. Although no physiological measurements could be conducted this season, over 70 samples were analyzed, resulting in the identification of hybrid vines infected with leafroll, red blotch, and co-infections, setting the stage for data collection next year. In the third sub-activity, the cover crop trial was established in three commercial sites (at the CRAM experimental vineyard and in two commercial vineyards). Treatments were monitored biweekly for weed control, cover crop development, and harvest data were recorded. Soil and microbiome samples were collected and will provide a baseline level for the subsequent year of experimentation. Finally, in the fourth sub-activity, historical data sets were compiled and standardized to develop weather-based forecasting models for major grapevine fungal diseases. New predictive models for downy mildew, powdery mildew, Botrytis bunch rot, and anthracnose were built using disease incidence, weather variables, and phenology data, laying the groundwork for improved disease management strategies in Quebec vineyards.

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?**

The goal of this activity is to develop tools and practices that will make vineyards more sustainable and resilient in the face of climate change. First, we are testing new grape varieties to find those best suited to our climate and disease pressure, with the goal of reducing pesticide use. We are hoping this will lead to the planting of more sustainable cultivars by growers on the eastern side of Canada. Second, we are studying the impact of viruses like leafroll and red blotch on key hybrid cultivars. We are hoping to demonstrate to growers how their vines are impacted by the virus and help them with decision-making. Third, we are evaluating the impact of cover crops to improve soil health, reduce weed pressure, and potentially reduce pest and disease pressure, with special attention to the effect on vine yield and the chemical composition of the grapes. Lastly, we're developing weather-based forecasting models for fungal diseases that have a dramatic impact on grape growers. These models will allow growers to time their disease management more precisely, reducing pesticide use and saving costs. Altogether, this research will help growers make more sustainable decisions in the field while supporting the production of high-quality wines.

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

None yet.