BCBC Annual General Meeting

Research Report

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In my report for the 2020 AGM in December, I summarized the projects currently funded by the Council. The table at the end of this report contains the same summary of issues being addressed through applied research with partners in academia, government, and private industry. In addition, the Council funded one new project on plant viruses (see "**NEW**" in the table below) after running a competitive process to evaluate a range of project proposals during the 2020/2021 winter months.

Since we are all now conversant in how viruses spread and evolve due to media coverage of the current pandemic, I will take this opportunity to highlight the Council's new research project to combat the blueberry industry's own virus challenges. Most are aware that blueberry plant viruses are an increasingly severe production challenge for growers. The virus testing conducted by Phyto Diagnostics Company Ltd. uses a laboratory technique called an enzyme-linked immunosorbent assay (i.e., ELISA). This test uses antibodies that bind to specific parts of the target virus, causing a colour change that can then be detected to provide a diagnosis.

The two most economically important viruses impacting blueberries in BC are Blueberry Shock Virus (BlShV or "Shock") and Blueberry Scorch Virus (BlScV or "Scorch"). Shock is a pollen-transmitted virus and plants recover in a year or two. Scorch is an aphid-transmitted virus and is lethal to the plant one or more years after initial infection. Recommendations are to leave Shock plants in the field and to eliminate Scorch-infected plants by either pruning and killing them with herbicides or digging and physically rogueing them to reduce the chance of Scorch being transmitted to other plants. Control of aphids throughout the season is, of course, another important component of Scorch management.

Managing these two blueberry viruses is difficult because they have similar symptoms, but there are differences in the way that these two viruses show up across different blueberry varieties, or even within a variety. For example, 'Cargo' infected with Shock will usually be completely blighted early in the season just as the buds start to open. Scorch-infected 'Elliott' will usually show symptoms later in the spring, resulting in partial or complete blighting of the plant. 'Duke' infected with Scorch will show a range of symptoms including sporadic wilting of vegetative shoots throughout the bush, a single blighted cane, or a completely blighted plant. In some varieties (e.g., 'Liberty'), it is particularly difficult to differentiate between Shock and Scorch. For these reasons, the lab diagnostic test is required to be 100% sure that the infection is one or the other.

However, getting a definite diagnosis has not been possible in recent years due to a considerable number of "double-negative" tests on plants that, to most experienced eyes, appear to have either one or the other of these two viruses. As we have heard in the news about COVID-19, viruses evolve, and new strains emerge without warning. In some cases, changes in viral strains can make them undetectable by ELISA because the antibodies do not match the altered viral strains. Therefore, identifying potential new strains, and developing the appropriate antibodies to detect them reliably, is a high priority for the industry.

Recent research in the Pacific Northwest is, moreover, leading us to believe that there may be additional uncharacterized pathogens present in the region. Determining whether additional viruses, or other virus-like pathogens, are present in our fields, understanding their implications for plant health, developing improved diagnostics, and providing growers with updated disease-management recommendations are the objectives of our current research projects. This work will be essential to combatting the spread of viruses in BC fields. We are also in the process of establishing a genetic mapping population through the BC Berry Breeding Program. This will be used to develop genetic markers for elimination of highly Shock susceptible blueberry cultivars prior to their released to industry. Breeding against susceptibility to Scorch virus is also a possibility, pending development of appropriate laboratory methods. In summary, the Council continues to invest in research that will help the industry combat plant viruses in the years to come!

Aside from our ongoing virus research, the Council also continues to develop other disease management research (e.g., lab-based methods for nematode diagnostics), breed better berry genetics, evaluate new varieties, combat a variety of pests, improve pollinator health, enhance horticultural management practices, and improve our understanding of pre- and post-harvest fruit quality. Hopefully, many reading this report will have had one or more chance to learn about the latest results from this range of research. In December prior to the last AGM, we held a field-day event that focussed on fruit quality and labour-saving technologies as well as new variety development and evaluation of the fresh-market performance of some new cultivars. In January, the Lower Mainland Horticultural Improvement Association (LMHIA) Short Course also showcased recent results from several of the Council's research projects. Finally, along with the Raspberry Industry Development Council (RIDC) and BC Strawberry Grower's Association (BCSGA), we held a virtual "Research Review" meeting that highlighted recent results from each project, a summary of which can now be found on the BCBC website. As a resource for growers, additional information and links will be added to the website in the coming months.

Key Issue(s)	Project Title	Lead	Organization	Objective(s)
Diseases (Fungal & Bacterial)	Berry Crop Pathology	Dr. Rishi Burlakoti	Agriculture and Agri-Food Canada	Developing a decision support system (DDS) for fruit rot will provide growers with better information based on weather station data and predictive models of disease life cycles; isolating and characterizing bacterial blight will be used to develop better screening protocols for the breeding program so that resistant cultivars can be bred for BC and to facilitate evaluation of alternatives to copper-based products to diversify field-management options.
Diseases (Nematodes)	Development of Molecular Diagnostics for Plant-Parasitic Nematodes in BC	Dr. Tom Forge	Agriculture and Agri-Food Canada	Developing a lab method for detecting nematodes in soil and root samples, filling a gap at BC Agri in diagnostic capacity for the industry.
Diseases (Viruses)	Evaluation of Spray-Induced Gene Silencing of Blueberry Scorch and Shock Viruses	Dr. Jim Mattsson	Simon Fraser University	Designing a biopesticide that can be used to prevent the spread of economically important blueberry viruses.
Diseases (Viruses)	Development of PCR Based Methods to Reliably Distinguish Shock or Scorch Virus	Dr. Jim Mattsson	Simon Fraser University	Determining strain variation for blueberry shock and scorch viruses to improve reliability of diagnostic tools available to the industry.
NEW: Diseases (Viruses)	**NEW:** Improved Viral Diagnostics and New Pathogen Discovery	Dr. Jim Mattsson	Simon Fraser University	**NEW:** Genomics-based identification and development of diagnostic methods for detection of novel pathogens in BC blueberry farm and nursery industries.
Genetics & Fruit Quality	Assessing Harvest and Postharvest Fruit Quality in Blueberry	Dr. Simone Castellarin	University of British Columbia	Assessing fruit quality of current cultivars and breeding selections at harvest and at various times postharvest during cooler storage to determine biochemical constituents of fruit quality and direct the development of new cultivars; and evaluating postharvest treatments and advanced packaging materials to improve shelf-life of standard cultivars.
Genetics & Fruit Quality	Canadian Berry Trial Network	Dr. Eric Gerbrandt	Canadian Horticulture Council	Evaluating new cultivars and advanced selections under commercial conditions through on-farm grower trials, linking to similar work in Ontario, Quebec and Nova Scotia as the first Canadian Berry Trial Network.
Genetics & Cultivars	Berry Germplasm Evaluation for the Fraser Valley	Dr. Michael Dossett	BC Blueberry Council	Characterizing germplasm to obtain new genetic sources of resistance to biotic and abiotic stresses, improved fruit quality and novel traits of interest; developing molecular and phenotypic selection tools; and moving the gene pool forward through annual crosses and recurrent selection on each generation of seedlings.

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Horticultural Management	Berry Crop Enhancement	Dr. Eric Gerbrandt	Sky Blue Horticulture Ltd.	Enhancing crop establishment, yield, and fruit quality through evaluating alternative crop inputs and mitigating cultivar-specific challenges related to adaptation to local climatic conditions for novel blueberry cultivars.
Genetics & Cultivars	Berry Cultivar Development for the Fraser Valley	Dr. Michael Dossett	BC Blueberry Council	Implementing unreplicated observation trials; conducting replicated evaluation trials; and propagating virus-free plant material of breeding selections for advancement toward cultivar release.
Horticultural Management	Controlling Blueberry Fruit Development using Plant Growth Regulators	Dr. Charitha Jayasinghege	Agriculture and Agri-Food Canada	Using plant growth regulators to de-blossom new plantings as well as delay the ripening for various blueberry cultivars to shift the harvest window.
Pests (SWD)	Ecological Pest Management for Spotted Wing Drosophila	Dr. Juli Carrillo	University of British Columbia	Developing alternative methods of SWD control to reduce regional pressure and reliance on chemical tools, including evaluation of intercropping options to repel SWD, developing better attractants for lures and traps, and establishing effective biological control species in the region.
Pests (SWD)	Evaluating Mass Trapping as a Tool for Non-chemical Spotted Wing Drosophila Management	Allyson Kang	ES Cropconsult Ltd.	Evaluating mass trapping as an option for reducing SWD pressure in conventional and organic settings.
Pests (Various)	Implementing Integrated Pest Management Practices on Small-Scale Farms	Marjo Dessureault	ES Cropconsult Ltd.	Developing IPM training materials for small-scale fruit and vegetable growers to handle shifts in pest pressure due to climate change and to improve region control.
Pests (Various) & Genetics	Berry Crop Entomology	Dr. Michelle Franklin	Agriculture and Agri-Food Canada	Providing the breeding program with information on the relative susceptibility or resistance of advanced selections to key arthropod pests to inform decisions about release and management of new cultivars.
Pests (Voles)	Non-Chemical Vole Control in Berry Fields	Sofi Hindmarch	Fraser Valley Conservancy	Assessing effectiveness of a non-chemical option for killing voles (i.e., a commercial trap that has a self-resetting, bolt-action kill mechanism) as compared to rodenticides.
Pollination & Bees	Determining Optimal Wildflower Patch Arrangements to Minimize Pollination Deficits	Dr. Rebecca Tyson	University of British Columbia	Developing mathematical models of bee behaviour within blueberry fields to determine optimal placement of wildflower patches to foster native bumblebee populations.
Pollination & Bees	Effects of Host, Pathogen, and Environmental Factors on Increased Incidence of European Foulbrood in Honey Bee	Dr. Sarah Wood	University of Saskatchewan	Determining effects of common pesticides on bee susceptibility to European foulbrood disease and assessing ways to improve bee nutrition and health.