March 2020 Progress reports and interim research updates from BCHPA-funded projects

1. Bee Health in Blueberry Pollination
   Project lead: Dr. Marta Guarna. Agriculture and AgriFoods Canada

This was the second year of the study to address the concerns of beekeepers who had reported such poor bee colony health after colonies were used for pollination of blueberries, that they were reluctant to continue the service.
Progress from second year:
a) collection of samples from colonies in or away from blueberry fields. We confirmed that more colonies had European Foulbrood (EFB) symptoms in the group pollinating blueberries (3 vs none during bloom),
b) laboratory analysis of pathogens including *Nosema spp*., *Melissococcus plutonius* and Varroa
c) provided diseased samples to NBDC and our collaborators in SK who determined that an atypical, highly virulent strain of *M. plutonius* is present in colonies pollinating BC blueberries and
d) initiated chemical analysis of honey and bee bread. Honey samples were submitted to the Agri-Food Laboratories Branch of Alberta Agriculture and Forestry in Edmonton, and bee bread samples to Cornell University. Samples are undergoing multi-residue analysis of several fungicides, insecticides and herbicides, including those known to be used on blueberry crops in BC.

We also presented the findings at the international apiculture conference Apimondia and at stakeholder meetings (i.e. Alberta Beekeepers' Commission – IPM Workshop, Feb 2020) and organized a meeting during Apimondia where we discussed with other groups and stakeholders their experiences with EFB and blueberry pollination. The participants included researchers and stakeholders from Michigan, Oregon, British Columbia, Alberta, and Atlantic Canada, as well as EFB expert Jean-Daniel Charriere from the Swiss Bee Research Centre. It was clear that the increase in EFB linked to blueberry pollination is a concern in many regions. However, it was also noted that an increase in EFB symptoms has recently been observed in colonies not involved in blueberry pollination.
The plan for this upcoming year is to complete pathogen and residue analysis, data compilation and evaluation, as well as communicating results and recommendations.

2. A new method for Honey Authentication –
Project Leads: Dr. Leonard Foster, University of BC. Dr. Peter Awram
Adulteration of honey with syrups made from rice or corn is a major and growing problem worldwide. The project seeks a novel method to detect such adulteration, at an attractive cost.
Progress summary:
The project has finalized conditions for testing and is now using the method on reference authentic samples collected and acquired.
Different models for analyzing the data to maximize sensitivity (to detect as small a fraction of adulterant as possible) are in development.
Other funding from NSERC has been arranged and applied for, to do a market assessment of the whole industry, and to formalize the testing process. The objective is to extend the method to diagnostic labs or, perhaps use it as a basis for commercialization.

3. A Novel Compound to Control Varroa
Project lead: Dr. Erika Plettner. Simon Fraser University

With funding from the BCHPA and NSERC we purchased 20 nucleus colonies, which were used in a field trial of a new compound with acaricidal activity against varroa mites. The field trial took place in the town of Langley and consisted of 10 colonies that received the treatment and 10 colonies that were controls (they received the empty release devices). The experimental treatment lasted for 28 days, starting on August 6, 2019. On the 28th day, the experimental devices (sticks) were taken out of the colonies and all colonies (treatments and controls) received two strips of a standard treatement; Apivar strips that remained in the colonies until October 16.
Mite infestation levels were equal at the beginning of the experiment, according to alcohol washes. Once the experimental treatment started, we monitored mites dropping down onto the bottom drawer, using sticky boards. The results show that during the first 7 days the number of mites dropped from the treated colonies was significantly higher (at the 99% probability level) than the number of mites dropped from the control colonies. At two weeks, there was no significant difference between treatments and controls, and after that, the controls showed significantly higher numbers of mites dropped than the treatment. What this tells us is that the compound was able to cause a mite drop right after installation in the colony. The compound also prevented the exponential growth of the mite population (the "mite bloom") in the treatments. The control colonies did experience a mite bloom, as evidenced by significantly higher numbers of mites dropped during the Apivar stage of the experiment. We also noticed that mite reproduction was significantly lower in the colonies treated with the new compound than in the controls.
Chemical analyses of the samples taken during the experiment (to monitor levels of the new compound in the gas phase, on the wax, in honey and on the bees) are underway.

5. Investigation of atypical foulbrood diseases of honey bees in BC
Project lead: Dr. Patricia Wolf-Veiga). National Bee Diagnostic Centre
Foulbrood of honey bees is often considered the worst disease of honey bees, generally leading to death of the bee stock and requiring destruction of the hive equipment.
Progress summary: A form of foulbrood with atypical field symptoms has repeatedly been reported from the southeast regions of BC. Supported by this funding, NBDC has collected and received samples and is working to isolate, culture and characterize bacterial strains in the field material, and compare them to reference samples from strains reported from other areas. A match has not yet been identified, and more work on this topic is required.

5. Quality assessment of BC queen bees using fluorescent microscopy
Project lead: Liz Huxter. BC Bee Breeders Association
Honey bee queen quality (especially as affected by shipping conditions) has been identified as a major constraint to the Canadian bee industry. The project goal is to document the reproductive qualities (sperm viability, using an advanced technique) of queen stock reared and handled in BC.

Progress summary: BC produced queens (55 total) were shipped via ground transportation from seven producers to the University of British Columbia, Vancouver, in the summer of 2019. An additional two shipments travelled from Edmonton to UBC Vancouver via air freight. These were the controls (standard industry practice) and came from Hawaii and California originally. All shipments were accompanied by two temperature data loggers (B-series WatchDog loggers, Spectrum Technologies) set to record the temperature every 10 minutes for the duration of the shipment. Heather Higo and Dr. Marta Guarna organized the loggers and their shipments to the participating queen producers.

Dr. Ali McAfee and Abbi Chapman analysed the queens for sperm viability, sperm count and ovary mass. Sperm viability and sperm counts were similar for the controls and local queens. The queens' ovary mass however, was larger (statistically significant) in the local queens vs the imported ones. The biological significance of the difference has not yet been determined.