



Solutions for Farmers and Food for Bees



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INTRODUCTION

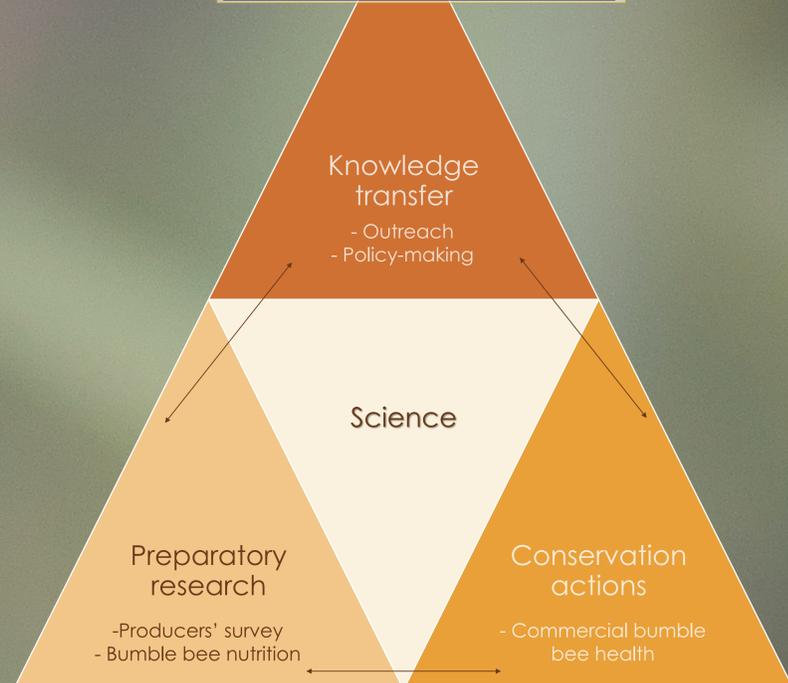
Biodiversity on agricultural land is declining worldwide, threatening food security and human health. In Canada, 70% of fruit and vegetable pollination depends on bees. Bees also play a major role in pollinating wild plants, thus maintaining the integrity of terrestrial ecosystems. However, populations of native bees are declining, and several species are threatened with extinction. Main threats are habitat loss, parasitic infections, malnutrition, pesticide exposure (amplified by the use of managed bees) and climate change. Nonetheless, most of the policy focus has been on non-native and managed honeybees, while information and actions on wild bees are comparatively lacking. To preserve native bees whilst ensuring human food production, we must:

1. Re-establish a two-way dialogue with farmers¹ and integrate their considerations when initiating projects;
2. Improve knowledge of the nutrition and ecophysiology of native bees;
3. Transfer scientific knowledge to aid development of pollinator-friendly and sustainable farming practices quickly and efficiently.

Working with more than 30 partners, including farmers, beekeepers, ENGOs, companies, government advisers, and academics, we co-constructed a project to identify concrete solutions to improve the resistance and resilience of native bees in Canada while offering solutions to farmers that are relevant in a commercial production context.

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METHODOLOGY & APPROACH



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PRODUCERS' SURVEY

Preliminary results

- Have you ever thought about implementing a native pollinator-friendly practice? *



- Would you be interested in learning more about practices supporting the establishment of native pollinators? *



* Charts established based on the responses of 42 agricultural producers or beekeepers to a semi-qualitative online anonymous survey.

Future surveys: What plants or associations would be best adapted to your situation?

- a) Annual plants
 - b) Perennials
 - c) Trees & shrubs
- Options of plants & associations identified as favorable in 4 and 5

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COMMERCIAL BUMBLE BEE HEALTH

Context & protocol overview

Sunflower possesses medicinal values² and could be used to improve commercial bumble bee health & alleviate threats on wild bees³.



N=6 greenhouses, n=10 workers/greenhouse (BioBest), 8 samplings, dwarf sunflower.

Fecal screening



Preliminary results

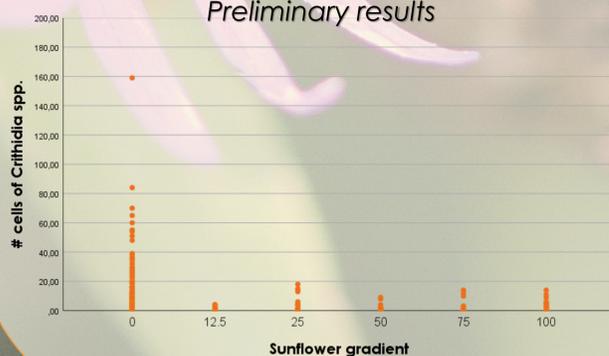


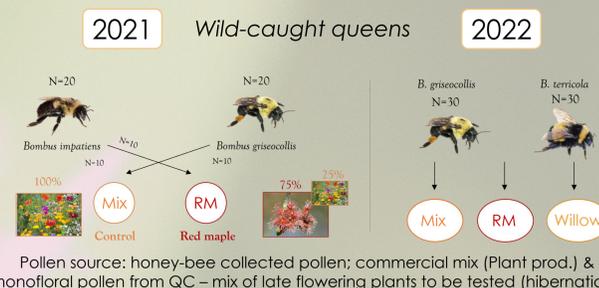
Figure 1: number of crithidia cells² in individual fecal screening according to sunflower gradient (n=460)

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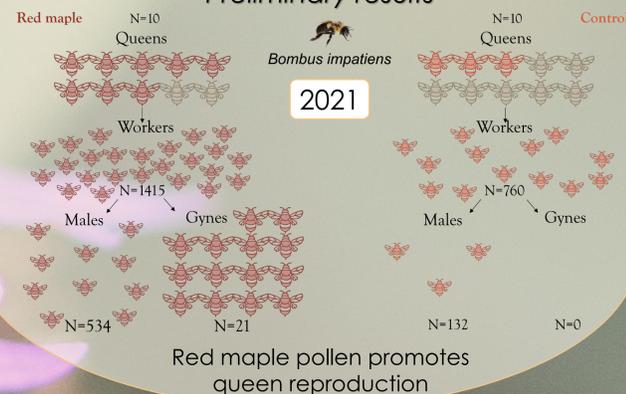
BUMBLE BEE NUTRITION & PERFORMANCE

Protocol overview

Tests of the nutritional & medicinal values of native plants' pollen for bumble bees



Preliminary results



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KNOWLEDGE TRANSFER

To producers, students, & the public

Visit our website at: www.sppb-sffb.net to see our posters, booklets & learn about our partners

To policy-makers



Meetings with MPs J. Singh, R. Cannings & AAFC to discuss the threat of commercial bumble bees on wild native bees. © A. Davis & C. Lamb

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TAKE-HOME MESSAGE

- Consulting farmers from the initiation of research projects fosters their involvement while raising awareness on native bees;
- Considering plants' nutritional and medicinal properties for native bees as well as complementarity with dominant crops can be used as a tool to promote bee health and performance in farmlands;
- This project is ongoing but already values the use of a co-constructive approach and offers promising avenues for sustainable and bee-friendly agriculture practices in Canada.

References: 1. Farmers are more encline to implement new practices when there is a two-way dialogue; Tarnoczi, T. J. & Berkes, F. Sources of information for farmers' adaptation practices in Canada's Prairie agro-ecosystem. Clim. Change 98, 299-305 (2009). 2. Sunflower has medicinal values for bumble bees against Crithidia bombi; Giacomini, J. J., Leslie, J., Tarpy, D. R., Palmer-Young, E. C., Irwin, R. E., & Adler, L. S. (2018). Medicinal value of sunflower pollen against bee pathogens. Scientific reports, 8(1), 1-10. 3. Graystock, P., Yates, K., Evison, S. E., Darvill, B., Goulson, D., & Hughes, W. O. (2013). The Trojan hives: pollinator pathogens, imported and distributed in bumblebee colonies. Journal of Applied Ecology, 50(5), 1207-1215.