Contributions of managed and wild bumble bees to blueberry pollination

Elizabeth Elle
Kyle Bobiwash
Lindsey Button

Knute Gunderson
Jason Gibbs
Rufus Isaacs

Cory Stanley-Stahr

SFU
Michigan State University
UF IFAS Extension
University of Florida
Pollination is essential for fruit production in blueberry.
Blueberry is “buzz pollinated”

- Poricidal anthers must be sonicated to release pollen
- While many genera of bees use this behavior, *Apis* does not
Visit quality differs among bees

- Honey bees forage for nectar, rarely collect pollen from blueberry (Mackenzie 1994, Javorek et al 2002)
- *Bombus, Andrena* transfer more pollen per visit and have higher visit rates (Javorek et al 2002)
Visit behavior varies among cultivars

• In BC, honey bees visits to Bluecrop are 50% less frequent than visits to Duke
• 43% of “visits” to Bluecrop are nectar robbing

Courcelles, Button, and Elle 2013
Our premise....

• An integrated pollination system that includes managed honey bees and managed and wild other bees should provide pollination insurance for blueberry
Questions

• What are the pollination needs in blueberry, and how do they vary across North America?
  – Visit rates, pollination deficits

• Can diversifying managed bees reduce pollination deficits in blueberry?
  – Bumble bee enhancements
General setup

• Project ICP studies blueberry pollination in British Columbia, Oregon, Michigan, Florida
• Visit rates, fruit set, fruit weight are evaluated at 4 distances from “natural habitat”
Do flower visitors and visit rates differ among regions?
Are there pollination deficits?

- Compare fruit number and weight among three treatments
  - **Bagged** vs. Open: contribution of pollinators
  - **Hand** vs. Open: pollination deficit
Pollination deficits are common in BC

These deficits cost growers an estimated $18,000/ha of lost income!

Button and Elle 2014; Bobiwash and Elle/Project ICP
Pollination deficits do not occur everywhere

- **British Columbia**
  - Bagged
  - Hand
  - Open

- **Michigan**
  - Bagged
  - Hand
  - Open

**Berry weight (g)**
Flower visitors and visit rates differ among regions.
Michigan has greater wild bee species richness
Deficits in BC reduced with more wild bumble bees in the landscape.

Button and Elle 2014
Can adding managed bumble bees improve pollination?

• FL: low vs. high
  – Low: 3 fields, 1 colony/acre
  – High: 2 fields, 3 colonies/acre

• MI and BC: control vs. addition
  – 6 fields per treatment
  – Added 6 quads/field in MI, 2 quads/field in BC; all about 2 colonies/acre relative to Bluecrop acreage
Bumble bees/field across treatments and regions

Similar PROPORTION of Bombus in Low vs. High Fields
Abundance varied with treatment, location, and distance from field edge.
Still to come....

- Yield in control vs. bumble bee addition fields
- Foraging strength, colony size & health
Summary

• Floral biology suggests we need integrated pollination recommendations for blueberry.
• Pollination deficits vary across regions—but do they vary over time?
• Managed bumble bee additions may be beneficial in some regions.