The Effects of Cut Flowers at Farms on Bee Pathogens

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Introduction

- 35% of global food production relies on pollinators, but many bee species are currently at risk due to stressors such as pathogens (van der Sluijs & Vaage, 2016).
- *Crithidia bombi* is a gut pathogen that infects up to 80% of bumble bees in Massachusetts (Gillespie, 2010) and can reduce colony size, colony-founding ability, male production, and general fitness (Brown et al., 2003).
- Past research in the Adler lab shows that sunflower pollen dramatically reduces *Crithidia bombi* infection.
- Many other species in the sunflower (Asteraceae) family are grown on farms, including *Zinnia, Cosmos, Echinacea, Ageratum*, and *Rudbeckia.*
- We are investigating whether other flowers in the sunflower family (Asteraceae) also have this medicinal effect.
- **We hypothesized that bumble bees collected from farms with more Asteraceae cut flowers would have reduced pathogen loads compared to bees collected from control farms with few cut flowers.**
- If our hypothesis was supported, farmers could plant these cut flowers to improve bee health while growing a specialty crop.

Zinnias at Laurenitis Farm

Methods

- We visited 3 "cut flower" farms with a high acreage of Asteraceae flowers (at least ½ acre) and 3 "control" farms with a lower acreage of Asteraceae flowers (less than 1/10 acre).
- Each farm was visited 3 times to collect bees and quantify floral resources.
- To confirm that the bees were collecting pollen from cut flowers, we observed visitation to 4 of the most abundant cut flower species on each farm. We recorded how many bees visited, taking note of pollen collecting behaviors.
- After collection, bees were dissected to count the number of *Crithidia* cells in a gut sample

Results

There were no significant differences between "cut flower" farms and control farms. SIMP (Simple Gifts Farm) had a significantly lower amount of *Crithidia* despite being a control farm with few Asteraceae flowers. Although LAUR (Laurenitis Farm) had planted the most Asteraceae, it still had a high *Crithidia* count (Figure 1).

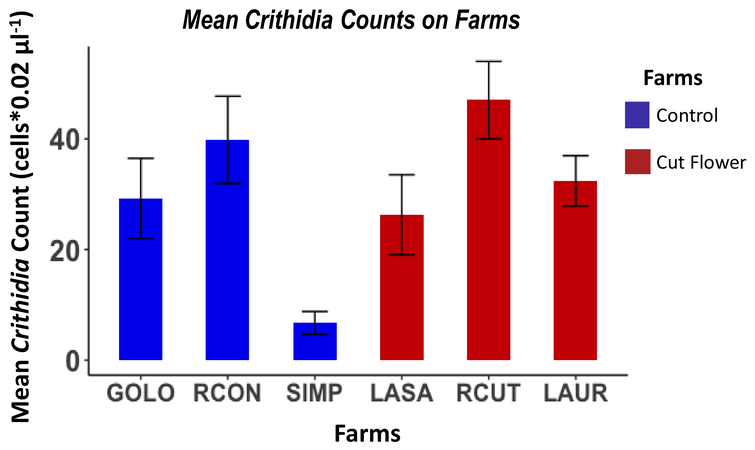

Figure 1. Mean counts of *Crithidia* cells per 0.02uL at each farm. GOLO, RCON, and SIMP were control farms with less than 1/10 acre of Asteraceae, and LASA, RCUT, and LAUR were "Cut Flower" farms with at least ½ acre of Asteraceae.

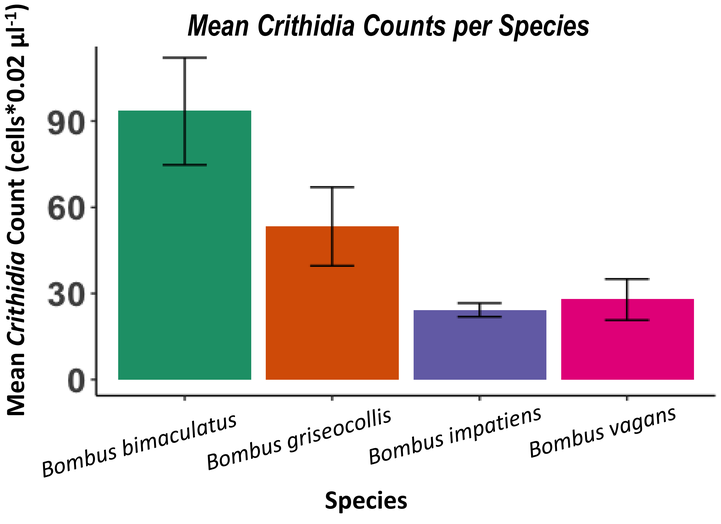

Figure 2. Mean counts of *Crithidia* cells per 0.02uL for 4 species.

Results

We observed significant differences between *Bombus bimaculatus*, and *Bombus griseocollis*. *Bombus vagans* and *Bombus impatiens* were not significantly different from each other, but both were significantly different from *B. bimaculatas* and *B. griseocollis* (Figure 2). The sample sizes for *B. griseocollis* (32), *B. vagans* (63), and *B.bimaculatas* (42), were much smaller than for *B. impatiens* (551).

Conclusion

- "Cut flower" farms do not significantly reduce infection compared to control farms.
- Possible explanations are that bees may have not been collecting enough Asteraceae pollen to reduce infection levels or that Asteraceae pollen does not reduce *Crithidia* levels.
- The data does not support planting Asteraceae flowers on farms to reduce *Crithidia* infection.
- In the fall, an experiment will be performed that tests if Asteraceae pollen can reduce infection in a laboratory setting. This experiment will use microcolonies of *Bombus impatiens.*

Bombus impatiens on *Ageratum.*

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