

Pathogen dynamics in honey bee and bumble bee communities

Briana Eray, Heather Hines, Elyse McCormick
Department of Entomology, The Pennsylvania State University



Introduction

Bees are in decline nation-wide, and pathogens have been implicated as a major cause of these declines (1). Recent data supports that pathogens are shared between honey bee and bumble bee communities (2), which means they can impact each others' disease prevalence.

Overwintering is a stressful period that could result in the death of infected individuals, thus purging of pathogens every spring.

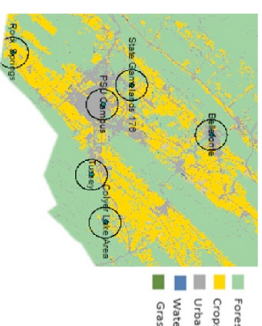
Understanding these pathogens requires comparative study of the abundance, seasonality, and effects of overwintering among these bees.

Goal

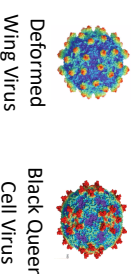
To compare the incidence of bee viruses in honey bees and bumble bees including:

- Viral abundance
- Viral seasonality
- Effects of Overwintering

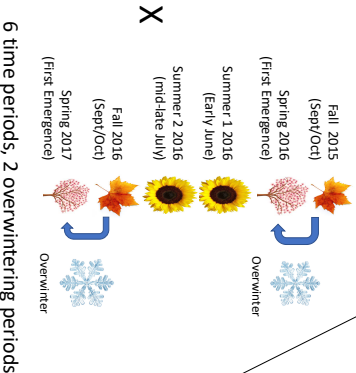
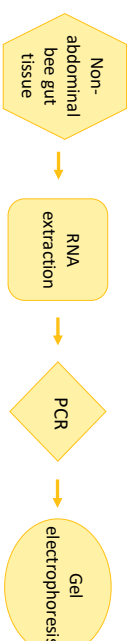
Methods



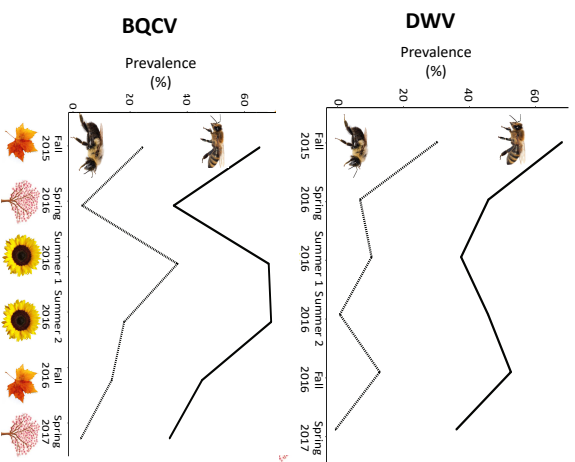
Viruses screened:



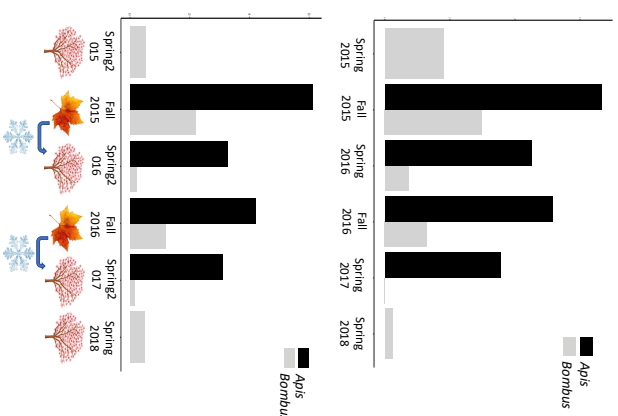
Screening method:



Seasonality



Overwintering



Results

- Both viruses show consistent seasonal peaks between species, DWV in the fall and BQCV in the early summer
- Honey bees harbor more viruses than bumble bees
- Both honeybees and bumblebees purge pathogens overwinter, but more so in bumble bees

Conclusion

Honey bees likely have a larger impact on pathogen transmission than bumble bees

References

1. Cameron, S. A., Loefer, J. D., Strange, J. P., Koch, J. B., Cordes, N., Solter, L. F., & Griswold, T. L. (2011). Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences*, 108(2), 662-667.
2. Singh, R., Levitt, A. L., Rajotte, E. G., Holmes, E. C., Ostrov, N., Lipkin, W. I., ... & Cox-Foster, D. L. (2010). RNA viruses in hymenopterian pollinators: evidence of inter-taxa virus transmission via pollen and potential impact on non-Apis hymenopterian species. *PLOS One*, 5(12), e14357.

Acknowledgments

Northeast SARE Grant GNE16-118-29994, Apes Valentis Research Award, Penn State College of Agriculture NSF GRFP Incentive Award, Diana Cox-Foster, Christina Grotzinger, the Fleischer lab, Ashley Heilmann, Timothy Egner, Casey Carr, Nicole Bracchi, Jesse Schneider and Rebecca Sommer