The Longitudinal Effects of Supplemental Forage on Honey Bee Colony Growth, Immunity, and Pathogen Resistance

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PROJECT SUMMARY

Objectives for current year:

1. To verify and extend previous data, we will determine whether the availability of supplemental forage in or near almond orchards before, during and after bloom affects colony growth.
2. Determine if supplemental forage affects honey bee immunity by measuring pathogen load.
3. Determine if the availability of supplemental forage affects honey bee immunity by measuring production of immune compounds.
4. Determine if rapini cover crops and native plant cover crops provide the same quality of forage in regard to honey bee immunity.

Background and Discussion:

Lack of forage is one of the major contributing stressors leading to poor honey bee colony health. To determine if the availability of supplemental forage before the almond bloom increases honey bee colony health, we followed 32 colonies over the winter and spring of 2015-2016. We split these colonies among 4 sites in late December; 2 sites with readily available forage and 2 sites with limited forage. We then followed colony weight, temperature, growth metrics, nutrition, and microbiome through April 2016. We are still conducting laboratory analyses and will have a better understanding of the effects of forage availability soon. Even without these final data, however, our colony survival data allow us to recommend supplemental forage to improve honey bee health. Small differences in forage availability (one month of forage, with ~2.5X more pollen in the forage treatment colonies compared to the no forage colonies) led to drastic differences in post-almond bloom colony survival. 81% of the no-forage treatment colonies failed while only 19% of the forage treatment colonies failed. Importantly, these trends only became apparent after the almond bloom. These data suggest that even moderate amounts of supplemental forage made available to honey bees before the almond bloom will likely lead to greater colony survival. Almond growers may be able to secure honey bee contracts by providing pre-bloom forage as an incentive.

We currently lack an understanding of the mechanism by which winter forage improves colony survival. To address this question, we will monitor the longitudinal effects of supplemental forage on honey bee colony growth, immunity, and pathogen resistance during the 2017 bloom. Dr. Neal Williams of UC Davis has forage plots in almond orchards of two different kinds: rapini and a mix of native plants. Dr. Elina Nino of UC Davis will monitor colony growth in areas with rapini forage, native plant forage, or no forage available. As previous research has shown that compounds found in nectar stimulate the honey bee immune system, we will measure pathogen load and honey bee immune system function. This will allow us to determine if rapini and native plant cover crops provide the same benefits, if that benefit arises via increased honey bee immunity. If so, for future research we can investigate which plant compounds are responsible for priming the honey bee immune system, which would allow us to make recommendations for specific cover crop plantings and for possible artificial food supplements.

Project Cooperators and Personnel 2015-16: William Meikle, Mark Carroll, Nick Brown, Milagra Weiss USDA. **2016-2017 Project Cooperators and Personnel:** Elina Nino, Neal Williams, UC Davis

For More Details, Visit

- Poster location 115, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at Almonds.com/ResearchDatabase
- 2016 - 2017 Annual Reports (16-POLL14-McFrederick/Anderson) on the web at Almonds.com/ResearchDatabase
- Related projects: 17-POLL13-Williams; 17-POLL20-Niño