Longitudinal Evaluation of Colonies with Access to Supplemental Forage in Almond Orchards

Elina L. Niño and Bernardo D. Niño

Department of Entomology and Nematology, University of California, Davis

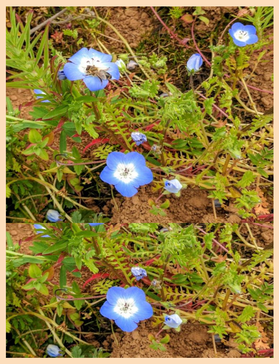
ABSTRACT

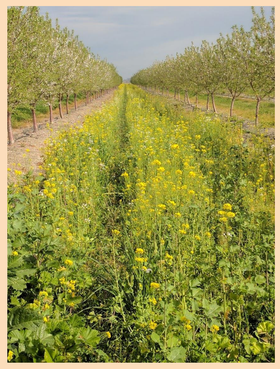
Agricultural pollination of almonds and many other fruits, nuts and vegetables is highly dependent on commercial honey bee colonies. However, annual honey bee colony losses of approximately 45% have been reported by beekeepers. Potentially negative effects of many biotic and abiotic factors affecting honey bees, could be rectified by providing access to supplemental forage plantings. We examined the immediate and long-term benefits of wildflower and mustard plantings on honey bee colony growth and survival in Northern California almond orchards in 2017. We also determined foraging preferences in these orchards. Our preliminary analysis confirms that there are immediate beneficial effects of access to mustard forage in terms of adult population size and brood production, and potential long-term positive effects on colony survival. Analyses of long-term health effects (immune response, pathogen load) are underway.

INTRODUCTION

High colony losses are persisting over time and are due to various factors such as presence of various pathogens, pests, pesticide exposure and insufficient nutrition. Research findings indicate that negative effects of these factors can be minimized by providing honey bees with adequate nutrition (e.g., Alaux et al. 2010; Schmehl et al. 2014). Almond production in California requires the use of ~2 million commercial colonies for successful pollination. However, during this time, honey bees usually have access to only almond flowers. Providing additional forage options could have a positive effect on honey bee colony growth, health and ultimately long-term survival. Therefor, we examined the effect of two different foraging plant mixes (mustard and wildflower) present during almond bloom on honey bee colony population size, Varroa mite infestation, pathogen load, immune response, survival and foraging preferences.

Materials and Methods

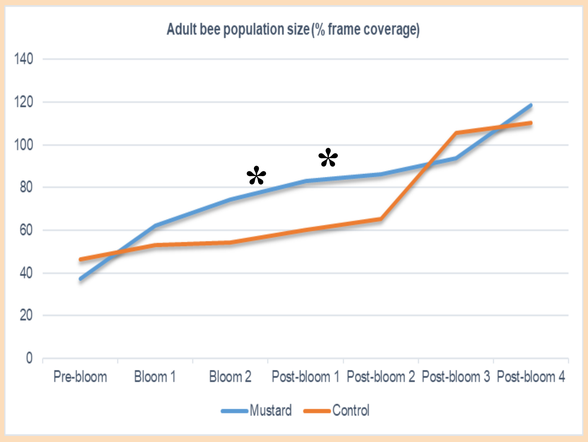




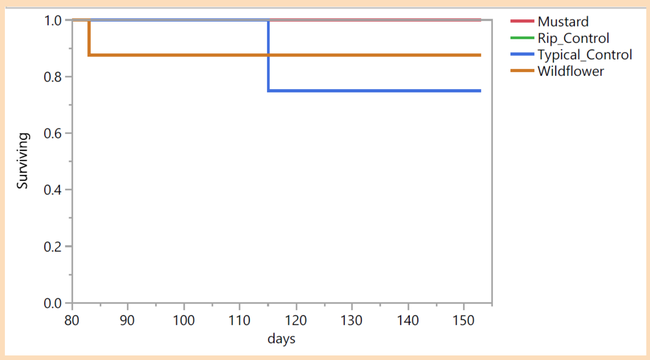
- **Two colonies were placed in a vicinity of the commercial hives in almond orchards with mustard plantings, wildflower plantings, and matching control sites with no planted supplemental forage.**
- **We had access to four sites per treatment for a total of 32 experimental colonies (8 per treatment).**
- **Colonies were evaluated pre-bloom, twice during bloom, post-bloom and monthly after they were returned to a stationary apiary.**

- **Colonies were evaluated for:**
  - **Adult bee population size**
  - **Size of the brood area**
  - **Varroa mite infestation levels**
  - **Annual survival**
- **Samples were collected for:**
  - **Pathogen analysis**
  - **Immune gene expression**
  - **Resource utilization via pollen identification**

Preliminary Results



- **Access to mustard plantings increased adult population size during two timepoints (ANOVA on transformed data).**
- **Brood production increased during Bloom 2 as well.**
- **Colony populations equalized after placement in a stationary apiary at UC Davis.**
- **Wildflower plantings had a late blooming period so were not utilized by experimental colonies, and were excluded from this analysis.**



- **While mortality level was not significantly different between groups, all lost colonies belonged to control or wildflower groups.**
- **Similarly, there were no significant differences in Varroa mite infestation.**
- **Preliminary analysis supports the idea that supplemental forage during bloom has benefits for colony growth, health and survival and this approach should be implemented in orchards during bloom.**

Collaborators: N. Williams, Q. McFrederick, K. Anderson. We thank K. Ward, S. Ciboti, J. Tauzer, R. Purrington, Project Apis m, and collaborating almond growers. We also thank the Almond Board of California for providing the funding (16-POLL20-Nino).