

Comparing the Effects of Protein Supplement vs. Natural Forage in Colonies Used in Almond Pollination

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PROJECT SUMMARY

Objectives:

- Determine nutritional quality of pollen from rapini (*Brassica rapa*) flowers and the bee bread made from it and compare this with protein supplement diets.
- Compare hemolymph protein concentrations, hypopharyngeal gland size, and abdominal lipid levels of nurse bees from colonies foraging on rapini and those feeding on protein supplement diets.
- Compare brood production between colonies foraging on rapini and those feeding on a protein supplement diets.
- Compare expression levels of genes associated with metabolism and immunity, as well as virus titers of nurse bees and larvae, between colonies fed protein supplements and those foraging on rapini.

Background and Discussion:

Before colonies are placed in orchards for almond pollination, they are kept in holding yards. If flowering plants are unavailable, colonies are fed protein and carbohydrate supplements. Under these conditions, colony populations can decline and no longer be of suitable strength for pollination. However, if blooming plants were available, nutritional stress might be alleviated so colonies could survive and build for almond bloom. A bee plant that blooms in the winter in the southwest and southern California is rapini (*Brassica rapa*). Data are needed to determine if there are nutritional differences between protein supplements and rapini, and if they translate into greater colony strength and survival.

Our previous nutrition studies demonstrated that protein availability affects protein levels and virus titers in nurse bees. Others have shown that higher protein titers improve worker longevity. If there is a benefit from growing rapini rather than feeding protein supplements, we should see higher protein titers in nurse bees, greater brood production, lower virus titers, and improved immunity in colonies foraging on rapini. Together, these factors will generate stronger colonies with larger foraging populations that can result in higher nut yields.

Funding for this project was received in August, 2013. We planted 1.5 acre rapini fields at two locations in October. Plantings in greenhouses also were made. We introduced sets of 10 colonies in each field planted to rapini. For comparison, we had hives at sites where flowering plants were not available and fed those colonies protein supplements. Smaller colonies were placed in the Carl Hayden Bee Research Center's enclosed flight area (EFA) and exposed to either blooming rapini plants or fed protein supplements. Data to address the objectives outlined above were collected throughout the winter in the field and the EFA, and comparisons were made between colonies fed protein supplements or foraging on rapini.

The results from this study indicate that colonies foraging on rapini prior to almond bloom have greater survival and lower disease titers than those fed protein supplements, supporting the investment in forage plantings rather than just feeding supplements to colonies prior to almond bloom.

Project Cooperators and Personnel: Dr. Mark Carroll, Carl Hayden Bee Research Center, USDA-ARS, Tucson, AZ, Dr. Judy Chen, USDA-ARS, Beltsville Bee Lab, Beltsville, M

For More Details, Visit

- Poster location 8, Exhibit A + B during the Almond Conference; or on the web (after January 2015) at Almonds.com/ResearchDatabase
- 2013-2014 Annual Reports CD (13-POLL1-DeGrandi-Hoffman); or on the web (after January 2015) at Almonds.com/ResearchDatabase
- Related project: 14-POLL15-Sagili