
Blue Orchard Bees: Possibilities for Use in Almond Pollination

Project No.: 07-POLL5-Pickel

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Interpretive Summary:

In partnership with the USDA-ARS Bee Biology and Systematics Laboratory in Logan, Utah, (Project 07-Poll6-Cane/Pitts-Singer) management of blue orchard bees (BOBs) from different climates for use in California almonds is being investigated. It is predicted that Utah and Washington populations will develop too quickly for California's longer summer, and that they will require cooling in order to survive. Native CA populations are more adapted to California climate and may not need cooling as they tend to develop more slowly in the larval and prepupal stages.

Blue orchard bee populations from CA, WA, and UT were released in 3 separate almond orchards and their progeny reared under ambient conditions in the Central Valley of California. Field observation and documentation of nesting activities of adults and developmental stages of their offspring, performed by UC personnel, complements data from progeny reared at the Logan bee lab in an incubator simulating current California weather. Information collected will be used to create management guidelines specific to each population.

With the availability of honeybees uncertain in the near future, the need for supplemental pollinators should increase. Standardized management methods for handling BOBs in almonds will increase the chances for successful nesting and rearing of progeny.

Objectives:

The primary goal of this project is the creation of standardized management protocols for the use of BOBs with honeybees in almond pollination. Although BOB population's native to California may not require much climatic manipulation, they are not yet commercially available, so techniques for handling bees from Washington and Utah must also be developed.

Materials and Methods:

On Feb 16, 2008, just as the early almond varieties were beginning to bloom, personnel from the Logan bee lab arrived in Chico with the bees. Nesting shelters were installed at orchard edges and faced east or southeast, to be warmed by morning sun. Empty wooden nest blocks with paper straw liners were placed in each of the shelters. All bees were transported and stored in coolers until the day of release. The bees were at the adult stage, still in cocoons in their original straws, and ready to emerge when exposed to warmer daytime temperatures. The three release sites were in north Chico (N. Butte), south Chico (S. Butte), and just east of Turlock, CA. The bees were released as each specific site began to show some open flowers on the first-blooming varieties. The three sites were observed daily to look for completed nests which were identified by straws plugged with mud at the entrance. Each day, completed nests were removed, labeled with the site and date, and held at 38-40 degrees F. Nests were packed on blue ice and shipped via FedEx to the Logan bee lab once or twice a week, depending on the number of nests produced. Nest collection and shipping continued

until there were enough healthy individuals at the Logan bee lab to complete the planned research. To avoid damaging the developing eggs and larvae, nests were handled very carefully, especially keeping the top side facing up so the egg or larvae would not become dislodged from its provision. In normal pollination activities, the nests would not be handled so extensively at such an early stage. A small percentage of nests from each collection date were not shipped, and kept locally to be reared under ambient conditions. At the Logan bee lab, a portion of the nests from each population were reared in an incubator set to simulate current daily weather in California's central valley. Developmental stages of these were tracked and compared to the nests which had remained in California in actual ambient conditions.

Results and Discussion:

In 2008, cold weather likely caused almond bloom to be delayed about 2 weeks, requiring slightly delayed release dates for the bees. The WA population was released at the South Butte site February 17, just as the earliest variety, Sonora, was beginning to bloom. Males began to emerge immediately, with females following a couple of days later. The first completed nests were found on March 4, about the same time as full bloom in Non-pareils. The females usually forage for several days to complete a nest, so they were actively pollinating since about March 1. The number of completed nests increased each day and 55 were collected on March 7. Collection of nests was halted March 13 because the Logan bee lab had received many more than the desired 200 females and the bees continued to build 10-20 nests per day. The CA population was released Feb 18 at the Turlock site coinciding with first bloom at that location. After about 3 weeks of nest building and collection, the bee lab had received enough nests and the rest of the completed nests were left alone in the nest blocks. The Utah population was released Feb 20 at the North Butte site which is planted with late-blooming varieties only and had just a few flowers open. Emergence and start of nest building was a little slower here, completed nests were first collected on March 9. Nests were collected and shipped to Logan until about March 25 when nest production had slowed to less than one per day.

The almond orchards in this project were stocked with honeybees at a rate of approximately 2 hives per acre, the North Butte site having a slightly higher stocking density. There appeared to be enough pollen and nectar resources to support the activities of both types of bees on the same acreage.

Data collected from this and other related projects can be used to create protocols for the management of BOBs for almond pollination. Differences in handling of populations from WA or UT and those from CA need to be well documented, especially the timing and duration of cooling needed, if any. Growers or beekeepers could use this information to sustain and enlarge a population from year to year, whether it was native to California or from further North.