Predicting Cross-Pollination and Nut Set in Almond Orchards Using Weather, Orchard Design and the Size of the Pollinator Population

Project No.: **08-POLL1-DeGrandi-Hoffman**

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Objectives:

1. Determine the progression of bloom for almond cultivars based upon temperature.
2. Estimate the number of bees on trees of different cultivars throughout bloom.
3. Estimate the proportion of bees carrying cross-pollen while foraging almond blossoms.
4. Estimate cross-pollination rates and nut set.
5. Start programming the almond pollination software package, and establish an area on the Carl Hayden Bee Research Center WWW site to disseminate information on almond pollination and findings from this project to date.

Interpretive Summary:

Data on blossom opening, honey bee foraging activity and nut set were collected from an orchard planted with Nonpareil, Fritz, and Monterey. The data were incorporated into a web-based software package to predict nut set based upon orchard design, weather conditions, and size of the honey bee population foraging on almond trees. The structure of the model has been defined and programming of the software package is well underway. Model prediction of relative amounts of nut set among the cultivars based upon weather and bloom overlap were accurate. We are incorporating information on other almond cultivars into the program, and adding components to capture the foraging behavior of *Osmia*. This will enable growers to simulate conditions

where both honey bees and *Osmia* are present in orchards. An initial version of the program is available on the internet at http://gears.tucson.ars.ag.gov/almopol/.

Materials and Methods:

The following data were collected daily during bloom: the number of open blossoms on trees of each cultivar, the number of honey bees foraging blossoms on trees of each cultivar throughout the day, percentage of bees foraging on trees of each cultivar with compatible pollen on their bodies, initial and final nut set expressed as the percentage of blossoms setting nuts. In addition, the logical flow of the program, derivation of all equations, ability of users to incorporate weather data for their orchard sites, and input and output screens were completed.

Results and Discussion:

In 2008, we expanded our efforts incorporating field data into the pollination model, and writing the program so that it can be accessed on the internet. The model is available in its initial form at: http://gears.tucson.ars.ag.gov/almopol/. We will be making many modifications especially as we receive input and suggestions from users as to the ease of use and clarity of the menus.

Recent Publications: none