

Effects of Insecticide-Fungicide-Adjuvant Combinations Commonly Applied to Almonds During Bloom to Honey Bee Development and Survival

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PROJECT SUMMARY

Objectives for current year:

- Identified the most common insecticide/fungicide combinations applied to almonds during bloom using the California Pesticide Use Reporting Database
- Tested the effects of the most common insecticide/fungicide combinations, plus a spray adjuvant, administered in pollen, on adult honey bee survival in a laboratory bioassay
- Tested the effects the insecticide chlorantraniliprole combined with the fungicide propiconazole on honey bee development using honey bee queen development as a model.

Background:

Beekeepers providing honey bees for almond pollination continue to observe unexplained losses of bees following almond bloom. Two different bee loss events have been reported: 1) A loss of adult bees during or immediately after almond bloom; and 2) A loss of developing larval bees in the weeks following almond bloom. Beekeepers have blamed bee losses on the exposure to pesticides applied to almonds during bloom.

The California Pesticide Use Reporting Database (<http://calpip.cdpr.ca.gov/main.cfm>) provides information on the pesticides applied to almonds during the blooming period (Feb. 15-Mar. 15). In 2014, the most recent year for which data is publicly available, insecticides were applied to 178,000 acres of almonds during bloom. Insecticides are almost always tank-mixed with fungicides, however, the effects of insecticide-fungicide mixtures on bees are not well understood.

Discussion:

To test the effects of insecticide, fungicide and adjuvant combinations, young adult honey bees were placed in cups provisioned with pollen artificially contaminated with formulated insecticide (chlorantraniliprole, diflubenzuron or methoxyfenozide) and fungicide (propiconazole, iprodione or boscalid + pyraclostrobin) at the maximum label rate combination. The combination of chlorantraniliprole and propiconazole significantly reduced adult bee longevity over the subsequent 10 days.

The effects of the combination of chlorantraniliprole and propiconazole was also tested on bee development using queens as a model. Queen rearing boxes were provisioned with contaminated pollen and queen rearing success was assessed 4 days later. A subset of new queens were placed in mating nucleus colonies and their survival measured 4 weeks later. Queen larvae in all pesticide treatments survived similarly to capping, but reduced survival of queens exposed to either diflubenzuron or the combination of chlorantraniliprole and propiconazole was observed in subsequent weeks.

These results suggest that pesticides combinations applied to almonds during bloom may be reducing the longevity of both adult bees and queens reared during that period and may be partially responsible for some of the effects observed by beekeepers.

Project Cooperators and Personnel:

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For More Details, Visit

- Poster location 117, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2017) at Almonds.com/ResearchDatabase
- Related projects: 16-POLL16-J. Johnson/Pettis; 16-Poll18-Berenbaum; 16-POLL19-Cox-Foster