

Assessment of Sublethal Effects of Imidacloprid on Honey Bee and Colony Health

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Executive Summary

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Imidacloprid has been targeted as a possible stress factor to honey bees, although there is no conclusive scientific evidence to directly link any neonicotinoid with the recent colony collapse disorder. Published and unpublished effects of sublethal exposure to imidacloprid residues on honey bees are conflicting, although most lab studies suggest that imidacloprid can cause disorientation and associative learning problems in honey bees at exposure levels >20 ppb. Few studies have examined chronic effects of dietary exposure to imidacloprid in functional colonies over multiple brood cycles.

In this project, we expose honey bee colonies for up to 12 weeks to sublethal doses of imidacloprid to examine the potential effects on colony performance and foraging behavior. The test period over multiple broods represents a realistic exposure regime that pollination colonies might be subject to during a typical growing season. Colonies are started each year with packages of bees and sister queens obtained from the same commercial supplier. New hive equipment is used to eliminate possible carryover contamination. Replicate colonies are exposed by in-hive feeding on MegaBee diet patties either untreated or spiked with 5, 20, and 20 ppm of imidacloprid. Exposure levels represent the range of concentrations observed in pollen and nectar in crops treated with imidacloprid. Pollen traps are installed at the entrance of each hive to induce bees to consume maximum amounts of diet. Each colony is inspected biweekly to estimate the percentage of comb area covered with bees, capped brood, and food stores; and whether the queen, eggs, successive stages of larvae, and queen cells were present. Missing queens are either replaced or superseded by new queens to minimize breaks in brood rearing. To measure foraging success, we record data on the weight of pollen collected and the number of foraging bees. After exposure, colonies are fed sugar syrup to build up bee populations and honey stores to ensure winter survival. Bee and bee bread samples are taken and analyzed for imidacloprid residues. Finally, colony health and performance are monitored during the winter and following spring.