

The effects of imidacloprid and amitraz on immature honey bees (*Apis mellifera*)

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The population of feral and managed honey bee colonies in the U.S. has declined steadily since the mid 1950's. These declines have been attributed to a number of causes including, but not limited to, pesticide exposure, parasite vectored pathogens, arthropod bee pests, and various stressors. Investigators agree that bee declines more likely are due to a mixture of two or more of these causes, but few investigations have been conducted on interactions between these factors. Researchers have focused on testing the effects of various pesticides on honey bee adult workers, queens, and drones. Effects of these chemicals on honey bee brood have not been investigated in detail. To that end, we explored how sublethal doses of imidacloprid and amitraz affect bee larval and pupal development. The data showed that larvae fed brood food laced with 5, 10, 40, and 80 ppb imidacloprid or 25, 50, 100, 200, and 400 ppb amitraz were significantly less likely to survive to adulthood. Larvae fed 25 and 400 ppb of amitraz were less likely to survive to defecate. In general, treated bee mortality was greater during pupal development than during larval development. We found no effects of imidacloprid or amitraz on larval time to defecation, larval weight at defecation, time to adult emergence, adult bee weight, or adult bee head weight. The understanding of sublethal effects of chemicals on developing honey bee brood can lead to better honey bee management and agricultural practices important for sustainable apiculture.