

Physiological and Reproductive Changes in Honey Bee Female Castes Following Direct Colony Exposure to Pesticides

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Abstract : Within a honey bee colony, queen is the sole reproducer of fertilized eggs, while queens are safeguarded by worker bees, trophallactic behavior and food sharing activities could expose them to agrochemicals. Here, we assessed the effects of three widely used pesticides—Acephate, Bifenthrin, and Chlorantraniliprole— on worker bees, to investigate indirect effects on the physiology and reproductive traits of queens as well as the eggs they produce. Using RT-qPCR we measured the expression of several detoxification and immune genes in adult worker bees, queens, and freshly laid eggs after pesticide exposure. These analyses aimed to elucidate the physiological changes in queens and potential transgenerational effects. While no significant changes in reproductive traits were observed following Chlorantraniliprole and Bifenthrin exposure, Acephate caused adverse effects on egg size, egg-laying activity, and queen weight. The expression of detoxification, immune and antioxidant-related genes in workers, queens and freshly laid eggs changed over time in response to these pesticides. The results of this investigation revealed that pesticides can cause negative impact on queen physiology and reproduction indirectly through their effects on exposed worker bees. These effects can potentially extend to the next generation of honey bees.

Keywords : apis mellifera, egg laying, detoxification enzymes, gene expression, honey bee queen

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