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Amitraz and its metabolite modulate honey bee cardiac function and tolerance to viral infection

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Abstract

The health and survival of managed honey bee (*Apis mellifera*) colonies are affected by multiple factors, one of the most important being the interaction between viral pathogens and infestations of the ectoparasitic mite *Varroa destructor*. Currently, the only effective strategy available for mitigating the impact of viral infections is the chemical control of mite populations. Unfortunately, the use of in-hive acaricides comes at a price, as they can produce sublethal effects that are difficult to quantify, but may ultimately be as damaging as the mites they are used to treat. The goal of this study was to investigate the physiological and immunological effects of the formamidine acaricide amitraz and its primary metabolite in honey bees. Using flock house virus as a model for viral infection, this study found that exposure to a formamidine acaricide may have a negative impact on the ability of honey bees to tolerate viral infection. Furthermore, this work has demonstrated that amitraz and its metabolite significantly alter honey bee cardiac function, most likely through interaction with octopamine receptors. The results suggest a potential drawback to the in-hive use of amitraz and raise intriguing questions about the relationship between insect cardiac function and disease tolerance.

Keywords

Honey bee; heart rate; virus; acaricide; amitraz; DPMF; octopamine; phentolamine

1. Introduction

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