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The attraction of bumble bee (Hymenoptera: Apidae, *Bombus impatiens* Cresson) colonies to small hive beetles (Coleoptera: Nitidulidae, *Aethina tumida* Murray)

Abstract

The small hive beetle (*Aethina tumida* Murray, SHB), a pest of the honey bee (*Apis mellifera* L.), was introduced into the United States and Australia from its native range in sub-Saharan Africa. The SHB has proven a difficult pest to control and may be spreading to a new host, the bumble bee (*Bombus impatiens*, Cresson). The bumble bee is similar in many ways to the honey bee and has been shown in laboratory and field studies to act as a potential alternate host. A host shift at the genus level may be devastating to the bumble bee, an important crop pollinator in the United States. There is also the possibility of the bumble bee colony, an often unmonitored and unmanaged niche, providing a hidden source for SHB.

Little is known of what attracts the SHB to honey bee colonies and even less regarding the attraction of bumble bee colonies. There is no known pheromone that the

SHB emits, yet olfaction is likely the driving force of this nitidulid beetle. Nitidulids are often attracted to and have mutualistic relationships with yeasts.

A multitrophic interaction was discovered in which *Kodamaea ohmeri*, yeast vectored by SHBs, was introduced onto bee-collected pollen while the SHB was feeding. When exposed to pollen, the yeast produced isopentyl acetate (IPA), a major component of honey bee alarm pheromone, as well as other compounds that mimic alarm pheromone. When tested in wind tunnel surveys, *K. ohmeri* inoculated pollen was found to attract SHBs. This finding suggests that the yeast may play an important role in the host-seeking behavior of SHBs.

There are other components within the honey bee hive and the bumble bee hive that seem to attract SHB as well. The chemical components of the volatiles involved in these two habitats are not well known. In order to measure the attraction of the bumble bee hive to SHBs, airborne volatiles were collected from bumble bee colonies and honey bee colonies. Volatiles were also collected from each of five components of both colonies: adults, brood, honey, pollen and wax. The chemical composition of these volatiles was analyzed using a gas chromatograph mass spectrometer (GCMS). The volatiles will also be used in 8-way olfactometric choice tests.

The bumble bee hives were also swabbed to test for the presence of yeast. Yeast was discovered in the majority of the colonies tested and is of a similar phenotype to *Kodamaea ohmeri*. Tests are currently underway to determine if the bumble bee yeast also produces IPA in the presence of both honey bee and bumble bee pollen. DNA analysis is also being run on the yeast to determine if it is *Kodamaea ohmeri* or another yeast altogether.

