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Odours released by bacteria affect the foraging behaviour of primary and secondary parasitoids differently

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Insects rely to a large extent on odours while searching for resources such as food, hosts or mates. While most researchers have focused on odours derived from plants and insects, there is mounting evidence that indicates that also microbial odours may play an important role in insect behaviour. Microorganisms, such as fungi and bacteria, are present virtually everywhere in nature, and they are known to produce a wide variety of odours. However, to date only very little is known about whether and how microbial odours influence insect behaviour.

In this study, we investigated how primary and secondary parasitoids respond to the odours from a variety of bacteria occurring in the parasitoids' habitat. Experiments were performed using the primary parasitoid *Aphidius colemani*, which is often used to biologically control economically important aphids, and one of its secondary parasitoids, *Dendrocerus aphidum*. Parasitoids are insects whose larvae develop in or on the bodies of other arthropods (mostly other insects), eventually killing them. While primary parasitoids are of tremendous importance in biological pest control worldwide, secondary parasitoids are considered unwanted guests, as they represent important enemies of the primary parasitoids, thereby reducing their efficacy. Our results indicated that both insect species strongly responded to bacterial odours, ranging from attraction to repellence. Additionally, we found that the primary parasitoid responded differently to the bacterial odours compared to the secondary parasitoid, indicating that these two parasitoid species exploit different odours while foraging for food or hosts. Our study indicates that bacterial odours may have an important impact on the foraging behaviour of insects, and should therefore be considered as an additional, but often overlooked, factor in studying multitrophic interactions between plants and insects.

The primary parasitoid Aphidius colemani searching for aphid hosts. Photograph credit: Tim Goelen

Our results are not only interesting from an ecological point of view, but are also important from an applied perspective as these bacterial odours may be exploited to develop novel eco-friendly strategies to manage pest insects and secondary parasitoids.