

Microorganisms and semiochemicals to manipulate aphidophagous predators

François J Verheggen, Gembloux Agro-Bio Tech, Université de Liège, Belgique

Semiochemicals provide a powerful way for organisms to communicate and coordinate their behaviors. But they also represent opportunities for other organisms to intercept and exploit such signals. There are now numerous examples of natural enemies eavesdropping the intraspecific communication of their prey to better locate them. Aphid natural enemies, including predators and parasitoids, frequently exhibit innate responses to chemical cues reliably associated with aphids, and there is also abundant evidence that learning of profitable chemical cues frequently occurs. Thenceforth, the efficiency of aphid natural enemies to locate their prey is mainly based on their ability to perceive and orientate toward aphid-associated semiochemicals.

Aphid predators were shown to respond to different groups of aphid-related semiochemicals, including aphid-induced plant volatiles; aphid pheromones and the more recently identified bacteria-produced honeydew volatiles. These laboratory studies suggest potentially promising avenues for the deployment of aphid-associated semiochemicals for the management of these pest species. While laboratory experiments are invaluable tools for revealing mechanisms, additional field studies are however needed to test ecological relevance of the observed effects. Although it is now possible to attract naturally occurring aphid predators in a crop field using semiochemicals, future work should more fully explore the broader ecological context in which signaling occurs.

The information gained from a deeper understanding of the chemical ecology of aphid-natural enemy interaction will enhance our understanding of the chemical biology and ecology of aphids, and may facilitate the design of novel control strategies.