PubMed

Format: Abstract

Full text links

SpringerLink FULL-TEXT ARTICLE

J Chem Ecol. 2013 Jul;39(7):840-59. doi: 10.1007/s10886-013-0306-z. Epub 2013 Jun 23.

Microbial volatile emissions as insect semiochemicals.

Davis TS[1], Crippen TL, Hofstetter RW, Tomberlin JK.

Author information

Abstract

We provide a synthesis of the literature describing biochemical interactions between microorganisms and insects by way of microbial volatile organic compound (MVOC) production. We evaluated the functionality and ecological context of MVOC signals, and explored important metabolic pathways involved in MVOC production. The cosmopolitan distribution of microorganisms creates a context for frequent, and frequently overlooked, insect responses to microbial emissions. There are numerous instances of MVOCs being closely associated with insect feeding behaviors, but some MVOCs are also powerful repellants. Emissions from microorganisms in situ may signal aspects of habitat suitability or potential exposure to entomopathogens. In some ecosystems, bacterial or fungal volatiles can also incite insect aggregations, or MVOCs can resemble sexual pheromones that elicit mating and oviposition behaviors from responding insects. A single microorganism or MVOC can have different effects on insect behaviors, especially across species, ontogenies, and habitats. There appears to be a multipartite basis for insect responses to MVOCs, and complex tritrophic interactions can result from the production of MVOCs. Many biochemical pathways for behaviorally active volatile production by microbial species are conserved across large taxonomic groupings of microorganisms. In addition, there is substantial functional redundancy in MVOCs: fungal tissues commonly produce polyketides and short-chain alcohols, whereas bacterial tissues tend to be more commonly associated with amines and pyrazines. We hypothesize that insect olfactory responses to emissions from microorganisms inhabiting their sensory environment are much more common than currently recognized, and that these signals represent evolutionarily reliable infochemicals. Insect chemoreception of microbial volatiles may contribute to the formation of neutral, beneficial, or even harmful symbioses and provide considerable insight into the evolution of insect behavioral responses to volatile compounds.

PMID: 23793954 DOI: 10.1007/s10886-013-0306-z

[Indexed for MEDLINE]

Publication type, MeSH terms, Substances

LinkOut - more resources