Use of Chemical Ecology for Detection and Management of Insect Pests

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Chemical ecology consists of the study of naturally occurring chemicals that mediate interactions between organisms. This includes pheromones, which are chemical signals that organisms of the same species use to communicate with each other, and a variety of other chemical signals and cues that are used to transmit information between organisms of different species. Pheromones, and particularly sex pheromones that females use to attract males (or vice versa) are probably the most well-known types of chemical signals, but there is all kinds of other chemical communication going on in the world around us. For examples, bees and other pollinators use flower scents to find flowers, in an interaction which is positive for both the bees and the flowers. In constrast, pest insects use chemical cues such as scents and tastes to find and recognize the plants or animals that they feed and lay eggs on, to the benefit of the insect and the detriment of the host plant or animal. If we can figure out the chemical signals that are being used in these interactions, we can then exploit those signals to detect, manipulate, and control insect populations in a number of ways. Thus, pheromone-baited traps are now a major part of the arsenal of tools used by by growers to assess populations of native insect pests, so that control measures can be applied accurately, and only when needed. Chemical ecology can also be used to control insect pests directly, for example, by use of mating disruption, toxic baits, or in some circumstances, mass trapping. An area of increasing importance is the use of pheromone-based methods for detecting invasive species as they come into the US, because these methods are often the most sensitive methods available. This presentation will cover several examples of our recent work that targets both native and invasive pest insects, and how we are identifying and developing pheromone-based methods for detection and management of these pests. Pests to be discussed will include native and exotic mealybugs and scales, wood-boring beetles, and red palm weevil. Finally, I will discuss some of the critical chemical, biological, and economic factors that determine whether pheromones or other chemical signals can be used successfully for monitoring or control of an insect pest.