

Abstract

The perception of airborne chemical signals by plants can trigger reconfigurations of their metabolism that alter their biotic interactions. While plant-to-plant chemical communication has primarily been studied in the context of eliciting defenses to herbivores and pathogens, recent work suggests that it can also affect plants' interactions with their rhizosphere microbiomes. In this perspective, we discuss the potential for integrating the fields of plant-to-plant communication and microbial ecology to understand the chemical ecology of plant–microbiome interactions. As an introduction for microbial ecologists, we highlight mechanistic knowledge gaps in plant volatile organic compound (VOC) perception and provide recommendations for avoiding common experimental errors that have plagued the plant communication field. Lastly, we discuss potential implications of plant VOCs structuring rhizosphere microbiomes, particularly effects on plant community and evolutionary dynamics. As we continue to discover links between plant metabolism and their microbiomes—from molecular to community scales—we hope that this perspective will provide both motivation and words of caution for researchers working at the intersection of these two fields.