Can plants multitask? Interactions between aboveground and belowground herbivore-induced plant responses

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Abstract

In their natural environment, plants are commonly challenged by multiple herbivores at the same time, for example at the roots and the shoots. Each of these herbivores may induce a variety of induced responses via a limited set of plant signaling pathways. As a consequence of systemic signaling, simultaneous induction by aboveground and belowground herbivores may lead to cross-talk and therefor the induced chemical response may be modified. By studying these aboveground-belowground interactions between herbivores at different levels, i.e. gene expression via hormones to plant volatiles and other defense metabolites, we are trying to elucidate the underlying mechanisms. In this presentation I would like to show some of our recent research on the molecular regulation of root induced responses in Brassica species, and how this affects the metabolome of the shoot as well as shoot feeding herbivores and their natural enemies. The general pattern that emerges from these studies is that in Brassica root herbivores have a stronger effect on the production of direct and indirect defenses in the shoot than vice versa. This may have ecological implications for the plant as well as their multitrophic communities which may limit the ability of the plant to 'multitask' and to fight a battle at two fronts.

Keywords: induced defenses, volatiles, metabolomes, insect herbivores, chemical ecology

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