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Temporal dynamics of herbivore-induced responses in *Brassica juncea* and their effect on generalist and specialist herbivores

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Abstract

Herbivore feeding may induce an array of responses in plants, and each response may have its own temporal dynamics. Precise timing of these plant responses is vital for them to have optimal effect on the herbivores feeding on the plant. This study measured the temporal dynamics of various systemically induced responses occurring in *Brassica juncea* (L.) Czern. (Brassicaceae) leaves after insect herbivory in India and The Netherlands. Morphological (trichomes, leaf size) and chemical (glucosinolates, amino acids, sugars) responses were analysed. The effects of systemic responses were assessed using a specialist [*Plutella xylostella* L. (Lepidoptera: Plutellidae)] and a generalist [*Spodoptera litura* Fabricius (Lepidoptera: Noctuidae)] herbivore. We tested the hypotheses that morphological responses were slower than chemical responses and that generalist herbivores would be more affected by induced responses than specialists. Glucosinolates and trichomes were found to increase systemically as quickly as 4 and 7 days after herbivore damage, respectively. Amino acids, sugars, and leaf size remained unaffected during this period. The generalist *S. litura* showed a significant feeding preference for undamaged leaves, whereas the specialist herbivore *P. xylostella* preferred leaves that were damaged 9 days before. Performance bioassays on generalist *S. litura* revealed that larvae gained half the weight on leaves from damaged plants as compared to larvae feeding on leaves from undamaged plants. These studies show that although morphological responses are somewhat slower than chemical responses, they also contribute to induced plant resistance in a relatively short time span. We argue that before considering induced responses as resistance factors, their effect should be assessed at various points in time with both generalist and specialist herbivores.

Introduction