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Original Article

An ecogenomic analysis of herbivore-induced plant volatiles in *Brassica juncea*

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Abstract

Upon herbivore feeding, plants emit complex bouquets of induced volatiles that may repel insect herbivores as well as attract parasitoids or predators. Due to differences in the temporal dynamics of individual components, the composition of the herbivore-induced plant volatile (HIPV) blend changes with time. Consequently, the response of insects associated with plants is not constant either. Using *Brassica juncea* as the model plant and generalist *Spodoptera* spp. larvae as the inducing herbivore, we investigated herbivore and parasitoid preference as well as the molecular mechanisms behind the temporal dynamics in HIPV emissions at 24, 48 and 72 h after damage. In choice tests, *Spodoptera litura* moth preferred undamaged plants, whereas its parasitoid *Cotesia marginiventris* favoured plants induced for 48 h. In contrast, the specialist *Plutella xylostella* and its parasitoid *C. vestalis* preferred plants induced for 72 h. These preferences matched the dynamic changes in HIPV blends over time. Gene expression analysis suggested that the induced response after *Spodoptera* feeding is mainly controlled by the jasmonic acid pathway in both damaged and systemic leaves. Several genes involved in sulphide and green leaf volatile synthesis were clearly up-regulated. This study thus shows that HIPV blends vary considerably over a short period of time, and these changes are actively regulated at the gene expression level. Moreover, temporal changes in HIPVs elicit differential preferences of herbivores and their natural enemies. We argue that the temporal dynamics of HIPVs may play a key role in shaping the response of insects associated with plants.

Supporting Information

