

## Abstract

Biological control agents heavily rely on volatile cues for host location and can be an important component of managing pests through habitat management-based strategies that enhance trophic interactions. This study aimed at evaluating the influence of greenleaf desmodium (*Desmodium intortum* (Mill.) Urb. (Fabaceae)) infochemicals on the behaviour of three select parasitoids of kale pests (aphids and Diamondback moth), to determine the potential of enhancing the protection of vegetables in integrated push–pull cropping systems. To achieve this, the volatile-mediated behavioural responses of the parasitoids towards *D. intortum* volatiles were evaluated using a dual-choice Y-tube olfactometer. Our results showed that *Cotesia vestalis* (Hymenoptera: Braconidae), a parasitic wasp for Diamondback moth (DBM) (*Plutella xylostella* (Linnaeus)) was not attracted to volatiles from *D. intortum* compared to DCM and empty oven bag controls. Nevertheless, *D. intortum* VOCs elicited higher parasitoid activity, whether in dual-choice comparisons with either empty oven bags or DCM controls, or when paired with kale plants. Conversely, volatiles from *D. intortum* were highly attractive to *Aphidius colemani* (Viereck) (Hymenoptera: Braconidae), a parasitic wasp of aphids. Interestingly, another aphid parasitic wasp, *Aphidius ervi* (Haliday) (Hymenoptera: Braconidae) was attracted to volatiles from *D. intortum* only when paired with kales or by kales alone. Gas-chromatography mass spectrometry of *D. intortum* headspace volatiles revealed 16 compounds: hexanal, (Z)-3-hexenol, p-xylene, o-xylene, nonane,  $\alpha$ -pinene, cumene, octen-3-ol, octanone, (Z)-3-hexenyl acetate, sabinene, (E)- $\beta$ -ocimene, linalool,  $\beta$ -elemene, (E)- $\beta$ -caryophyllene and an unknown compound. In electroantennography assays, all parasitoid antennae commonly detected hexanal and, (E)- $\beta$ -ocimene, whilst only *C. vestalis* and *A. ervi* registered common antennal responses to (E)- $\beta$ -caryophyllene. Additionally, the antennae of *A. colemani* detected cumene, octen-3-ol, (Z)-3-hexenyl acetate and an unknown compound whilst that of *A. ervi* and *C. vestalis* detected (Z)-3-hexenol and nonane, respectively. Dose–response olfactometer bioassays with the synthetic standards of hexanal, (E)- $\beta$ -ocimene and (E)- $\beta$ -caryophyllene revealed that the response of the three parasitic wasps varied with the concentrations of the individual standards. Specifically, (E)- $\beta$ -ocimene and hexanal depicted a broad appeal to the tested parasitoids, by eliciting attraction at varying concentrations ( $P < 0.05$ ). Our results show species- and -context -specific parasitoid attractive appeal of *D. intortum*. Nevertheless, our results show that *D. intortum* may help protect kales against aphid attack through parasitoid recruitment whilst another mechanism may be employed against DBM moth.