Novel *Brassica* IPM strategies

Exploiting below-ground host recognition cues

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Introduction

Cabbage root fly, *Delia radicum* L., is an important insect pest of Brassica crops. Females lay their eggs near the root-stem interface. Emerging larvae move through the soil to locate the main root, where feeding can cause substantial damage. Below-ground constitutive and/or induced chemical cues emitted by roots are expected to play a key role in larval host-plant location.

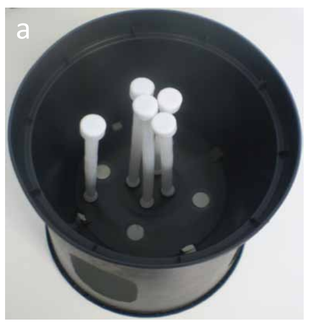
This study focused on identifying differences in secondary plant metabolites released by intact and larval damaged broccoli roots *in situ*. We have developed a novel sampling technique using solid phase micro extraction (SPME) to entrain volatiles in the immediate vicinity of growing roots.

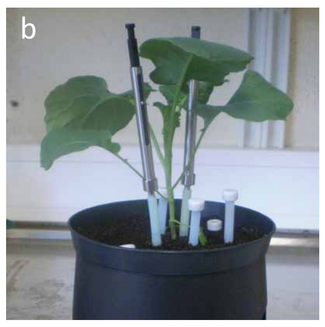
Figure 1 Ovipositing female fly

Figure 2 Larvae

Methods

We used perforated polytetrafluoroethylene (PTFE) tubing positioned next to roots of a broccoli variety 'Parthenon', *Brassica oleracea* L. convar. *botrytis* (L.) Alef. var. *cymosa* Duchesne, for volatiles collection (a). Sheathed SPME fibres were inserted into the tubes and exposed for various sampling periods (b). Entrainments were carried out on undamaged control, and *D. radicum* larval damaged plants using several different fibre chemistries.





Volatiles were desorbed through a PTV injector and analysed by gas chromatography mass spectrometry (GC-MS) (c). Separation of volatiles was achieved on a DB 1701 GC column (30m x 0.25mm x 1.0µm) using helium carrier gas at a flow rate of 1.5ml/min. The GC-MS consisted of a Thermo Electron Corporation Trace DSQ™ II Series Quadrupole system operating at a data acquisition rate of 3 spectra/second. Data was acquired using the Xcalibur 2.0.7 software package. Samples were desorbed for 2 minutes into a PTV injector assembly operating in splitless mode at temperatures varying from 200-280°C, depending on the type of SPME fibre used.

Results and Discussion

Broccoli 'Parthenon' root volatiles analysed using SPME and GC-MS

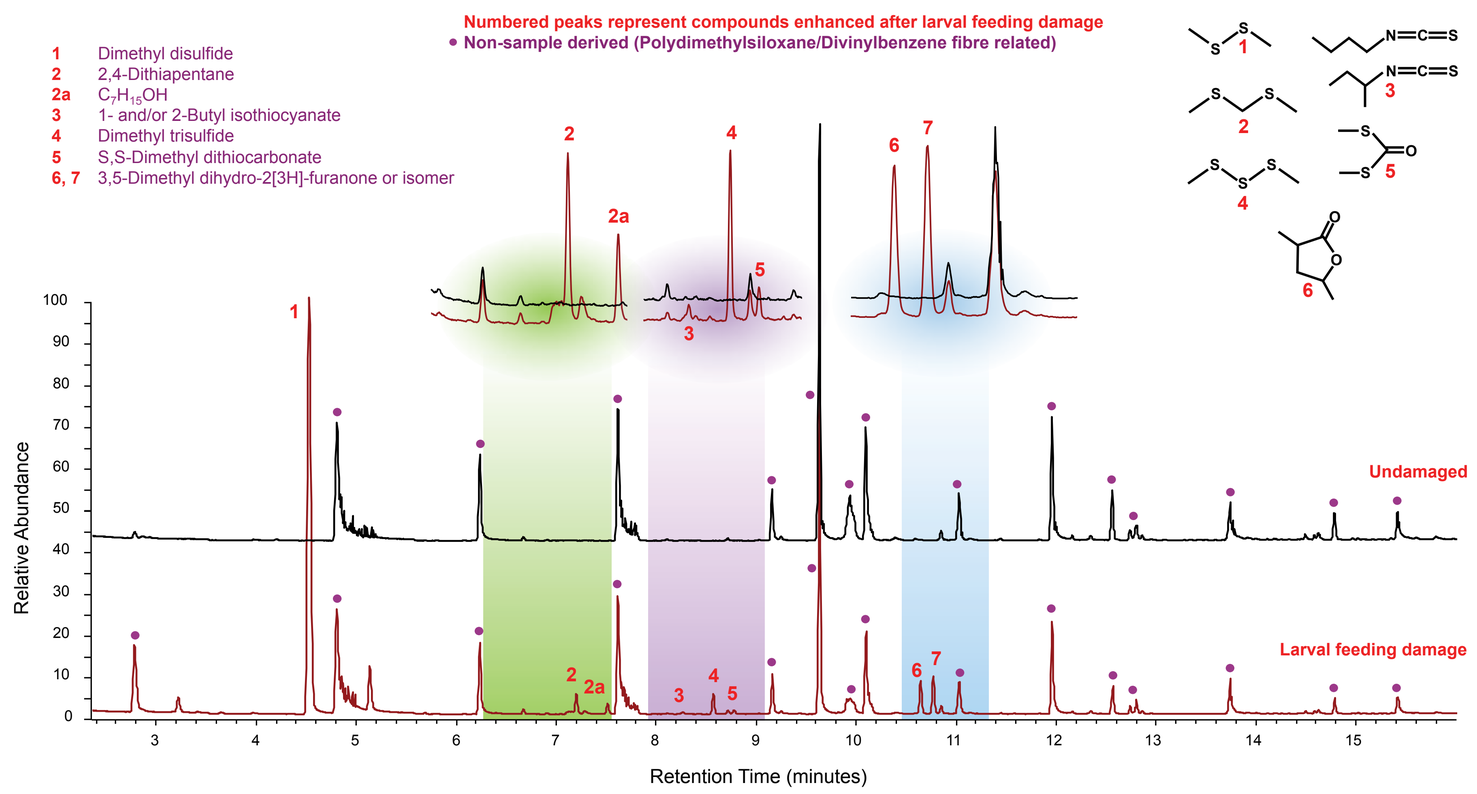


Figure 3 Volatile profiles from undamaged and larval feeding damaged broccoli roots.
Compounds that were not identified by comparing with pure standards were tentatively identified and await confirmation

Preliminary results using a SPME method to trap broccoli root volatiles has revealed a profile of compounds which show a consistent, reproducible pattern of enhancement following *D. radicum* larval damage. The blend largely consisted of sulfur-containing compounds.

Ongoing Studies

Figure 4 Ethovision larval tracking

- Behavioural bioassays using Ethovision video camera and tracking software
- Determine larval responses to SPME-GC-MS identified compounds
- Glasshouse and field trials

Figure 5 Broccoli field trials

Acknowledgements

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