Feeding *Phyllotreta striolata* F. (Coleoptera: Chrysomelidae) males emit an aggregation pheromone

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Background

The chrysomelid beetle *Phyllotreta striolata* is a serious pest of crucifer crops in the tropics (Fig. 1A-C).

Our goal was to identify volatile semiochemicals involved in host-plant location.

Attractive compounds are promising tools for monitoring *P. striolata* in the field.

Fig. 1 A *Phyllotreta striolata*. **B** infested pak-choi **C** "Shot-hole" damage caused by flea beetles.

Fig. 2 A Design of water trap. **B** Average numbers of trapped *P. striolata* + SEM. The bioassay compared the attractiveness of plant volatiles with volatiles emitted from feeding male and/or female *P. striolata*. March 9-10, 2009. **C** Average numbers of trapped *P. striolata* + SEM. This experiment tested under which conditions males emit behaviourally active compounds. March 12-13, 2009. Experiments conducted at AVRDC-The World Vegetable Center, Taiwan.

Field Bioassay

Attractiveness of different volatile blends was tested in the field using water traps (Fig. 2A)

Only volatiles from actively feeding males were attractive to male and female conspecifics in the field (Fig. 2B, 2C).

Identification of male-specific compounds

Volatiles from feeding male and female *P. striolata* were collected and analyzed with GC-MS.

Gas chromatograms were compared and 7 male-produced sesquiterpenes identified (Fig. 3 A,B).

Compound 1 was most abundant in all volatile collections.

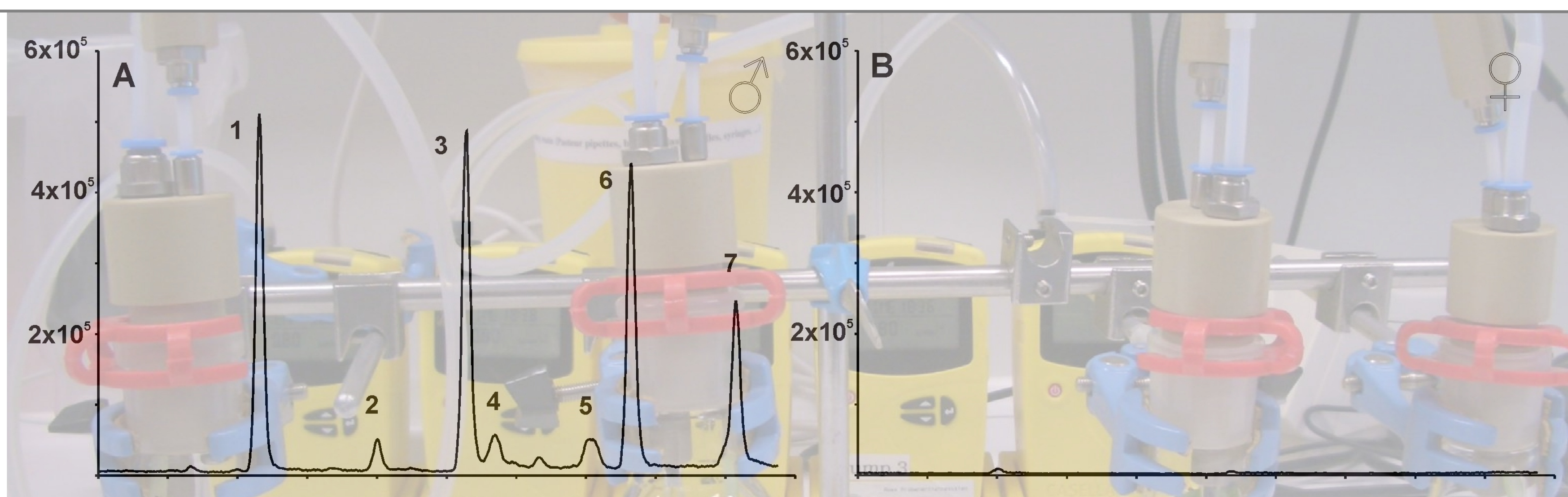

Fig 3 A Gas chromatogram of volatile sesquiterpenes collected from feeding male *P. striolata*. Seven male-specific sesquiterpenes were identified. **B** Corresponding gas chromatogram of volatiles collected from feeding females. These collections lack sesquiterpenes.

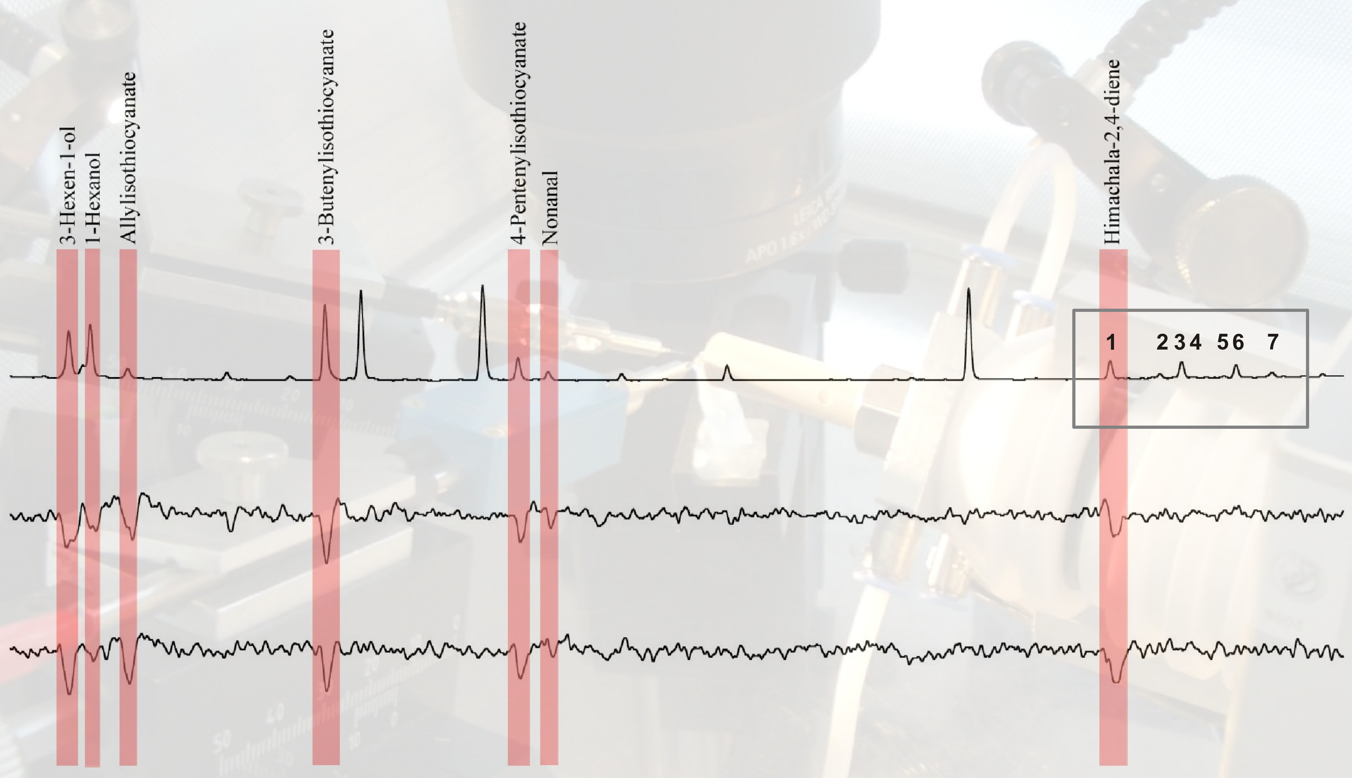

Fig. 4 GC-EAD analysis of volatile collections from male *P. striolata* feeding on *Brassica juncea* leaves. Shown EAD responses were recorded from two males. Male-specific compounds are labeled 1-7. Six plant volatiles and male-specific compound 1 elicited antennal responses from male and female beetles.

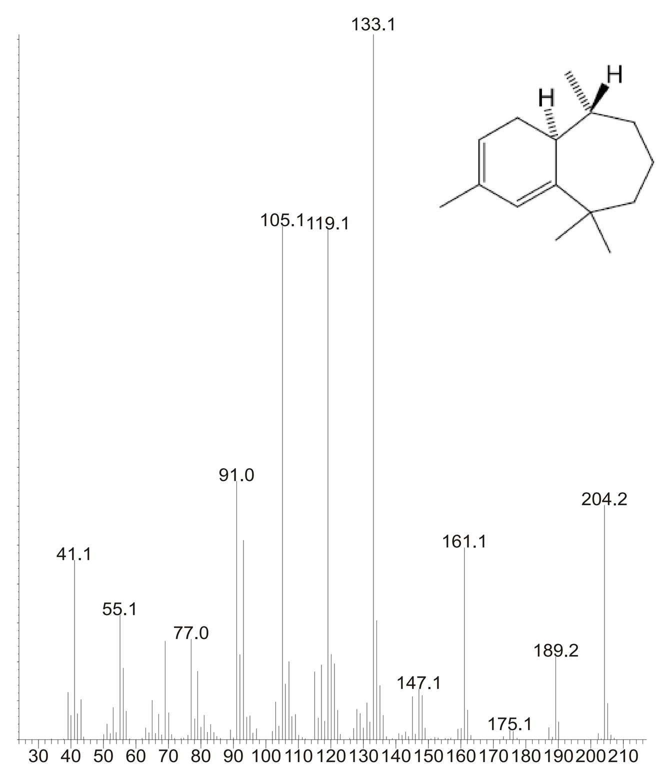

Fig. 5 EI mass spectrum and chemical structure of the electrophysiologically active sesquiterpene Himachala-2,4-diene.

GC-EAD analysis

Plant-derived GLVs and isothiocyanates elicited electrophysiological responses.

From the male-specific sesquiterpenes only compound 1 elicited an antennal response (Fig. 4).

Compound 1 was identified as Himachala-2,4-diene (Fig. 5).

Conclusions

Feeding *P. striolata* males emit behaviourally active compounds.

From 7 male-specific sesquiterpenes, only Himachala-2,4-diene elicited antennal responses from male and female beetles.

We hypothesize that Himachala-2,4-diene is the key aggregation pheromone component of the Taiwanese *P. striolata* population.

What's next?

Identification of the absolute configuration of the emitted Himachala-2,4-diene.

Behavioural tests with the pure compound.

Studies on the interaction between the aggregation pheromone and plant volatiles.

Application in the field.

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