Seedling VOCs induce host preference in *Bagrada hilaris* Burmeister

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INTRODUCTION

✓ Invasive stink bug *Bagrada hilaris* (Heteroptera, Pentatomidae)
✓ Herbivorous insect
✓ Host range Cruciferous vegetable crops Cauliflower, Broccoli ... etc

B. hilaris feeding on *Capparis spinosa* plant

B. hilaris feeding on *Eruca sativa* seedlings
Growing interest for scientific community

In the lates 10 years the interest of scientific community for *B. hilaris* increased exponentially.
Objectives

✓ Evaluation the host preference of *Bagrada hilaris* toward seedlings VOCs of:
  - *Raphanus sativus*
  - *Eruca sativa*
  - *Brassica rapa*
  - *Brassica carinata*

✓ Define the chemical cues used from *B. hilaris* in the host location processes.
Materials and Methods

✓ **Insect rearing**

- Adults and nymphs were collected from caper fields at Pantelleria island, Trapani, Italy.
- Bugs were fed on Caper bush, cauliflower and Alyssum.
- Adults were used for the experiments.

✓ **Seedling production**

Seeds of
- *Raphanus sativus*
- *Eruca sativa*
- *Brassica rapa*
- *Brassica carinata*

were planted in glass container filled with cotton wool and soaked with water. 7- days seedlings old was used in all experiments.
Bioassays with vertical Y shaped olfactometer

✓ Evaluation the host preference of *Bagrada hilaris* toward VOCs seedlings.

- *Brassica carinata*
- *Brassica carinata*
- *Brassica carinata*
- *Brassica rapa*
- *Brassica rapa*
- *Raphanus sativus*

- *Raphanus sativus*
- *Eruca sativa*
- *Brassica rapa*
- *Eruca sativa*
- *Raphanus sativus*
- *Eruca sativa*

*B. hilaris* distinguish between sources
Results and discussion

Behavioral responses (% first choice) in open vertical Y-shaped olfactometer bioassays of *B. hilaris* adults to seedlings of *R. sativus, E. sativa, B. rapa* and *B. carinata*. N = number of replicates; * = P < 0.01; $\chi^2$. 

![Vertical Y shaped olfactometer](image)
VOCs collection and analysis by SPME

- VOCs were collected separately from each of the four species using clusters of fifty seedlings (seven days old).
- The VOCs collection was carried out for twenty hours by headspace with solid phase micro-extraction (SPME) using a polydimethylsiloxane (PDMS) fiber.
- 1 µl of Nonadecane (50 ppm solution) was used as internal standard.
Results and discussion

VOCs from seedlings of *E. sativa* *R. sativus*, and *B. rapa* were dominated by a single organic compound > 90%, matched in the NIST mass spectral database to Benzophenone with the formula $C_{13}H_{10}O$. and minor amounts of other unknown compounds.

![Representative gas chromatograms of VOCs from R. sativus, E. sativa, B. rapa and B. carinata.](image)

Mean + SE of Benzophenone amount collected by SPME then analyzed by GC-MS for 20 hour
VOCs extract collection and fractionation from *Eruca sativa*
Bioassays with vertical Y shaped olfactometer

Behavioral responses (% first choice) of *B. hilaris* adults to *Eruca sativa* seedlings, to crude extracts of seedling VOCs, and to fractions of the VOC extract, versus controls, in vertical Y-shaped olfactometer bioassays. N = number of replicates; * =P ≤ 0.05; χ².

<table>
<thead>
<tr>
<th>N</th>
<th>Stimulus 2</th>
<th>Stimulus 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>air</td>
<td>Seedlings</td>
</tr>
<tr>
<td>90</td>
<td>Hexane</td>
<td>VOCs extract (seedlings)</td>
</tr>
<tr>
<td>80</td>
<td>Dichloromethane</td>
<td>Polar fraction</td>
</tr>
<tr>
<td>82</td>
<td>Hexane</td>
<td>Non-polar fraction</td>
</tr>
<tr>
<td>83</td>
<td>Ethanol</td>
<td>Highly polar fraction</td>
</tr>
</tbody>
</table>

% of the first choice
Bioassays with vertical Y shaped olfactometer

Benzophenone

Behavioral responses (% first choice) of *B. hilaris* adults to Benzophenone compound at 0.02µg, 0.2µg, 2µg, 20µg, 200µg, 1000µg versus controls (Acetone), in vertical Y-shaped olfactometer bioassays. N = number of replicates; * = P ≤ 0.05; χ².
Conclusions

✓ *B. hilaris* adults were attracted to odor produced by seedlings of *Eruca sativa, Raphanus sativus*, and *Brassica rapa*, more than *Brassica carinata* suggesting a clear role of the olfaction in the host plant searching behavior.

✓ *B. hilaris* adults were attracted to odor produced by seedlings of *Eruca sativa* and their VOC extract and their polar fraction compounds.

✓ GC-MS analysis of *Eruca sativa, Raphanus sativus, and Brassica rapa* seedlings indicated high amount of Benzophenone compound while missing in *Brassica carinata*.

✓ *B. hilaris* adults were attracted to odor of Benzophenone at several concentration.

✓ Benzophenone will be tested as candidate attractants in field trap experiments in order to develop tools useful for monitoring *B. hilaris*. 
Thank You

Get in Touch
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