Scents and Sensibilities: Assessing the Attraction of *Coleomegilla maculata* to Solanacous Plant Volatiles for Conservation Biological Control

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Introduction

The **Colorado potato beetle** (CPB, *Leptinotarsa decemlineata* Say) is a major insect pest of solanaceous plants with a preference for potatoes. Due to **increasing insecticide resistance** and insecticide deregistration, there is a need for **alternative management tactics**.

The pink spotted lady beetle (***Coleomegilla maculata*** De Geer) is a **natural enemy** of CPB, with high predation rates of CPB larvae and eggs. Natural enemies are known to be attracted to **herbivory-induced solanaceous plant volatiles** and **insect prey pheromones**.

This study uses a **4-arm olfactometer bioassays** to determine which herbivory-induced plant volatiles produced by solanaceous plants are attractive to *C. maculata,* and if the CPB male aggregation pheromone is attractive to *C. maculata*. Results of the study will be used to create a **semiochemical attractant lure** to attract *C. maculata* to CPB-infested solanaceous crop fields for conservation biological control.



Objective

Investigate use of semiochemicals to promote colonization of *C. maculata* on potato and tomato crops for conservation biological control of CPB.

- ❖Identify volatiles produced by solanaceous plants that attract *C. maculata*.
- ❖Determine if the CPB male aggregation pheromone, S-CPB I, is attractive to *C. maculata*.

Methods

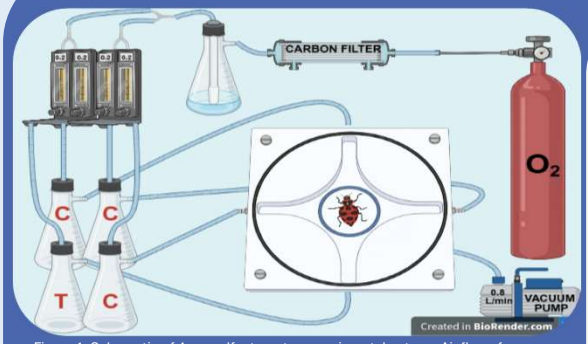


Figure 1. Schematic of 4-arm olfactometer experimental set-up. Air flows from oxygen tank (O_2), through carbon filter, bubbler, and flow meters, and into flasks containing volatile treatment (T) or control (C) stimuli on filter paper. Air carrying volatiles then flows into the olfactometer.

- **Equipment:**
  4-arm olfactometer.
- **Treatments:**
  2-(*E*)-Hexenal
  2-Phenylethanol
  β-Caryophyllene
  Hexenal
  Linalool
  Methyl Salicylate
  Nonanal
  → Herbivory-induced solanaceous plant volatiles

  S-CPB I → CPB male aggregation pheromone
- **Rate:**
  Treatment: 16.67 µg in 10 µL of carrier
  Control: 10 µL of carrier alone. Mineral oil for plant volatiles and hexane for pheromone.
- **Insects:**
  At least 54 adult female and 54 adult male *C. maculata* per treatment.
- **Block:**
  Every 5 insects tested, treatments were replaced, and olfactometer rotated.
- **Data:**
  First arm chosen in a 90 s time span.
  A choice was considered to have been made when insect spent ≥5 s in olfactometer arm.

Results

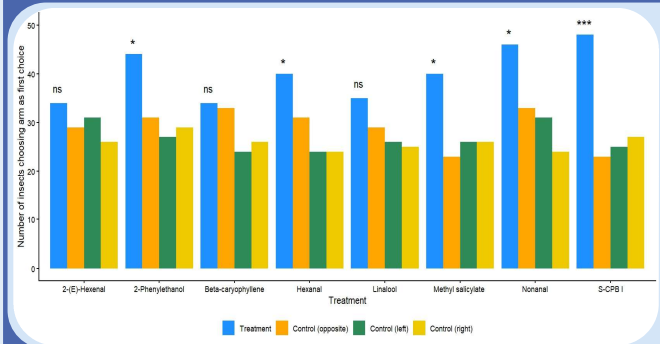


Figure 2. Number of adult *C. maculata* choosing each arm for 7 herbivory-induced solanaceous plant volatiles (2-(*E*)-hexenal, 2-phenylethanol, β-caryophyllene, hexenal, linalool, methyl salicylate) and the CPB male aggregation pheromone (S-CPB I). Sexes and blocks are pooled.

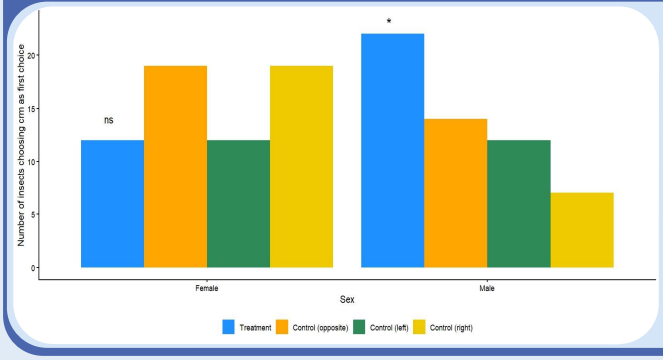


Figure 3. Number of adult female and male *C. maculata* choosing each arm in the β-caryophyllene bioassay. Sexes are not pooled, blocks are pooled.

Coleomegilla maculata chose the treatment arm at significantly higher rates than the control arms for **6** of the volatiles tested (Figs. 2, 3):

- 2-Phenylethanol
- β-Caryophyllene* (♂♂)
- Hexenal
- Methyl salicylate
- Nonanal
- S-CPB I

*Males, but not females, chose the β-caryophyllene treatment arm significantly more then the control arms (Fig. 3).

Conclusion

Coleomegilla maculata showed attraction to several herbivory-induced solanaceous plant volatiles, suggesting that these compounds may function as olfactory cues used by *C. maculata* to locate suitable foraging habitats and/or prey. Attraction to the CPB male aggregation pheromone (S-CPB I), further suggests that *C. maculata* may use prey-associated olfactory cues to locate CPB.

The male specific response to β-caryophyllene indicates that responses to some plant volatiles may differ between sexes.

Together, these findings identify several candidate semiochemicals for further evaluation as attractants for *C. maculata* in solanaceous crop fields. Future trials are needed to determine whether these compounds can effectively attract *C. maculata* under field conditions and ultimately enhance biological control of CPB in agroecosystems.

References

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