



Harper Adams  
University

**Enhancing Biological Pest Control:**  
Learning Mechanisms and Olfactory Conditioning in Parasitoid  
Wasps

Nikoletta Foskolou



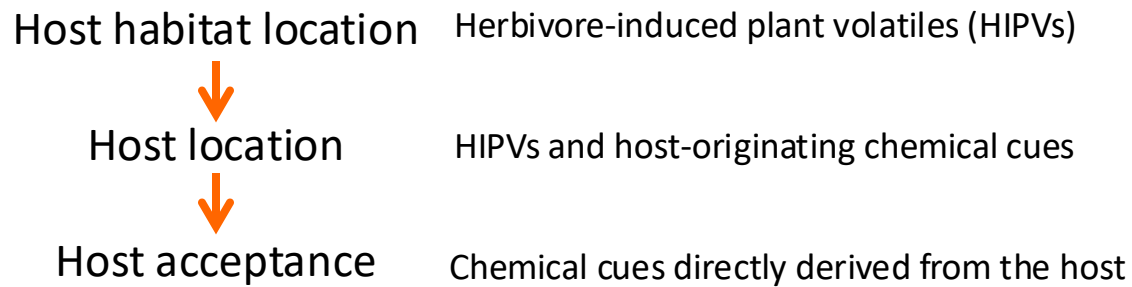
[nfoskolou@haper-adams.ac.uk](mailto:nfoskolou@haper-adams.ac.uk)



# Parasitoid foraging behaviour and learning

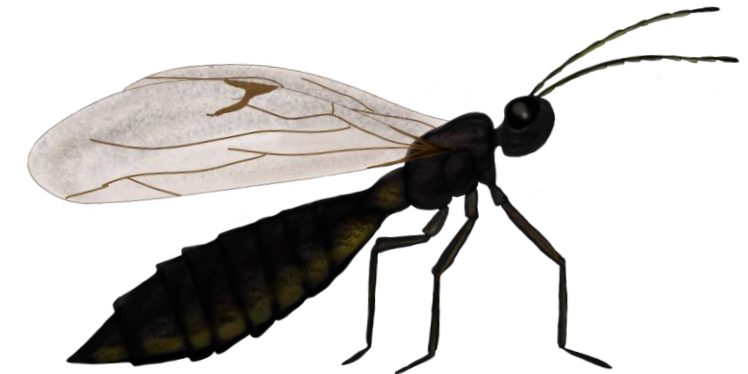
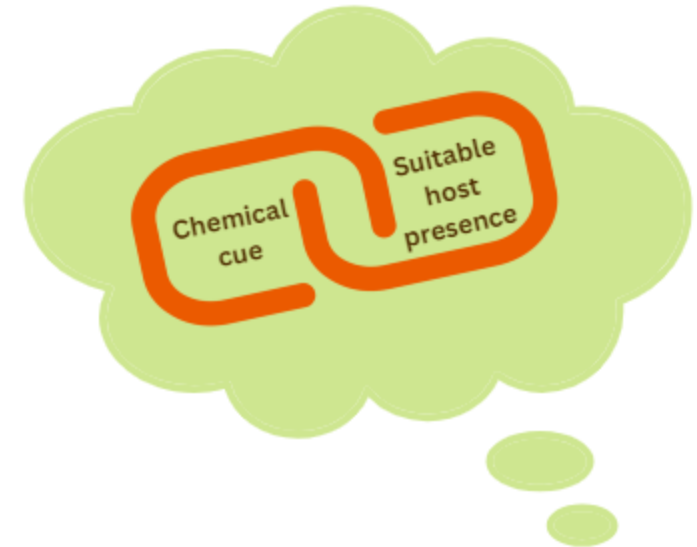
▶ Parasitoid wasps are mass reared and commonly used in augmentative biocontrol programs to regulate aphid populations<sup>1</sup>

## ▶ Host searching behaviour<sup>2</sup>:



## ▶ Parasitoid behavioural responses to chemical cues

- **Innate**
  - Fixed responses
- **Learned** → “The process that produces an adaptive change in an individual’s behaviour as the result of experience”<sup>3</sup>
  - Associative learning



1. Boivin, G., Hance, T. and Brodeur, J. (2012) ‘Aphid parasitoids in biological control’, *Canadian Journal of Plant Science*, 92(1), pp. 1–12. doi:10.4141/cjps2011-045.

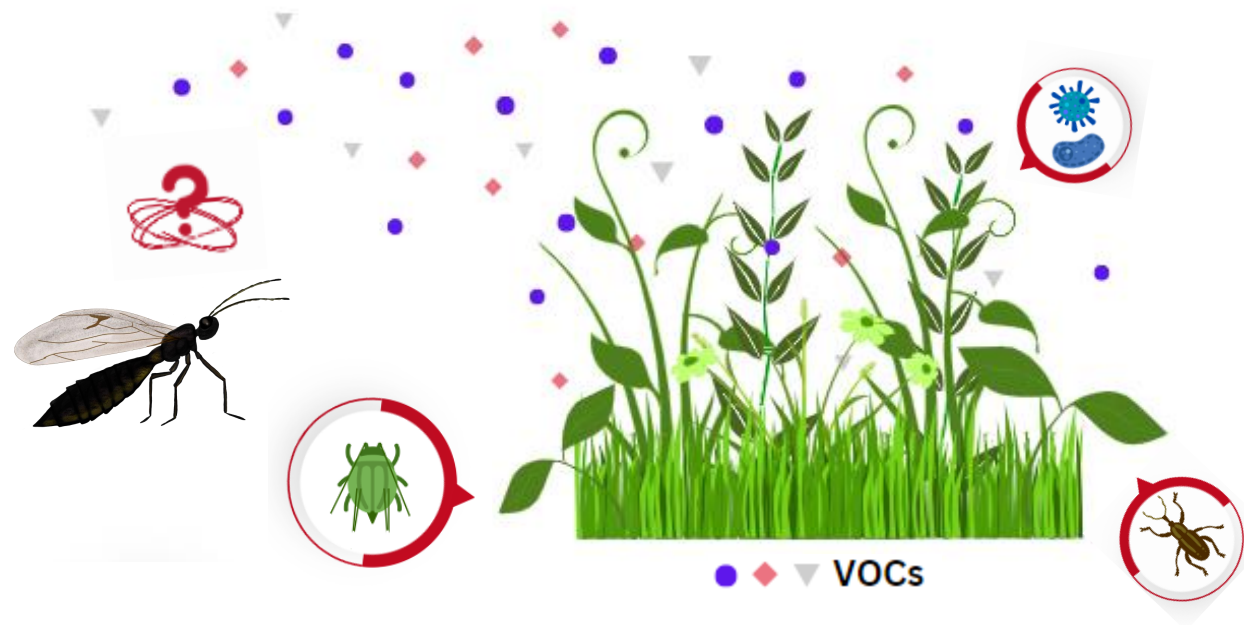
2. Vinson, S.B. (1976) ‘Host selection by insect parasitoids’, *Annual Review of Entomology*, 21(1), pp. 109–133. doi:10.1146/annurev.en.21.010176.000545.

3. Barron, A.B. *et al.* (2015) ‘Embracing multiple definitions of learning’, *Trends in Neurosciences*, 38(7), pp. 405–407. doi:10.1016/j.tins.2015.04.008.

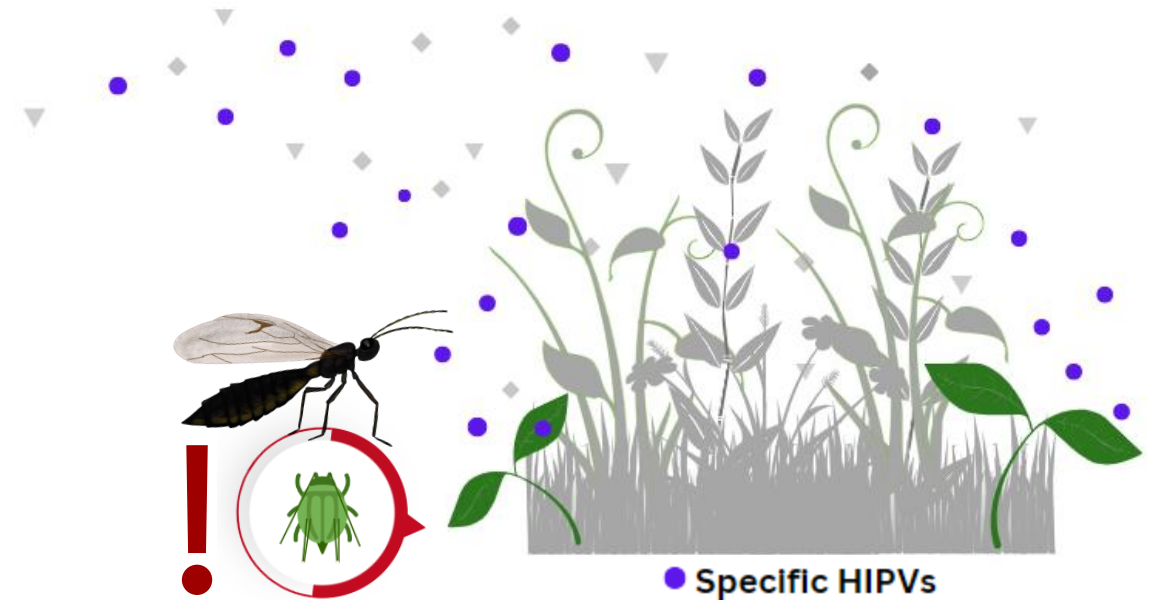
# Applying parasitoid olfactory conditioning

The training of commercially reared parasitoids to respond specifically and/or more strongly to cues involved in the target pest system using the learning mechanisms

Before Conditioning



After Conditioning



## Project Aim and Objectives:

Explore how insect learning can be used to improve the efficiency of parasitoids as biological controls in sustainable crop protection

- Characterise chemical cues associated with host-searching behaviour
- Determine the learning abilities of commercially available parasitoids
- Develop mass-rearing techniques that incorporate parasitoid learning
- Evaluate the impact of improved parasitoid learning on biological control efficacy under semi-field conditions



# Thank you for listening!

## Supervisory Team

Dr Tom Pope

Dr Matthew Back

Dr Joe Roberts

Prof Helmut van Emden

Dr Liam Harvey

Dr Neil Ward



[nfoskolou@haper-adams.ac.uk](mailto:nfoskolou@haper-adams.ac.uk)



**Harper Adams  
University**



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