HOVERFLY USE FOR POLLINATION OF COMMERCIAL SOFT FRUITS

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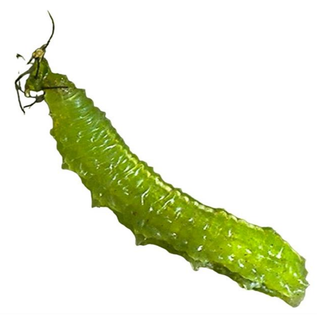
Introduction

European horticulture often relies on managed pollinators especially Bombus and Apis are important inputs in commercial horticulture[1]. However, there is increasing evidence that better pollination is delivered by a diverse assemblage of flower-visiting insects. Hence, growers attempt to attract wild pollinators using habitat manipulation strategies like creating field margins and hedgerows[2]. These attract diverse beneficials like aphidophagous hoverflies that offer dual ecosystem services as the larvae are predators, and adults are pollinators[2]. However, these strategies possess challenges as different pollinator guilds preferentially use flowers from different plant families, e.g., bees often visit wildflowers from Fabaceae and Lamiaceae, and hoverflies often prefer Asteraceae and Apiaceae[3].

Bumble bee worker (*Bombus terrestris*) (NRI, 2023)



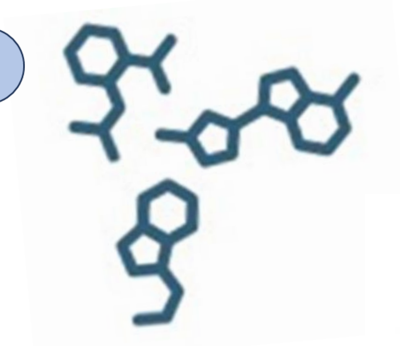
Hoverfly larvae consuming aphid prey (C.U, n.d)

Hoverfly (*Syrphus* sp., female) (Mason, 2014)

Aims

To develop a semiochemical blend that is attractive to hoverflies and improve commercial pollination efficacy.

A



B

Objectives

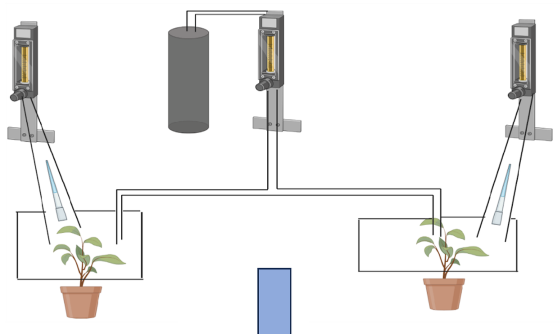
1. To identify attractive volatile organic compounds (VOCs) to hoverflies (A).
2. To produce a synthetic lure based on these VOCs
3. To investigate the impact of VOCs on crop pollination services (B) and the potential contribution to enhancing fruit quality and marketability (C)[4].

C

Identification of Attractive Semiochemicals

A

B



C

VOCs are collected from plants in the greenhouse (A) using a push-pull collection method (B), where charcoal-filtered air is passed over the leaf/flower and then collected on Porapak resin at a controlled rate[5]. VOCs are subsequently identified by gas chromatography and mass spectrometry (C)[6].

Analysis of Highly Attractive Floral Odours

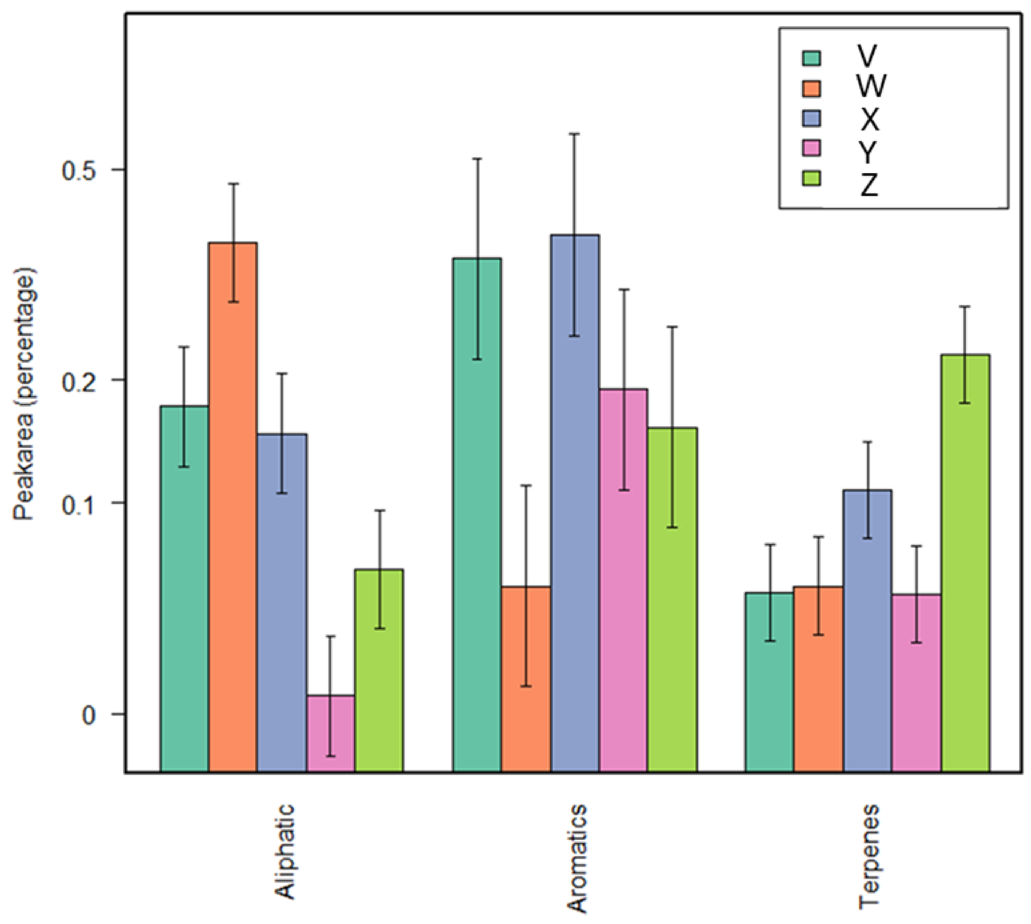
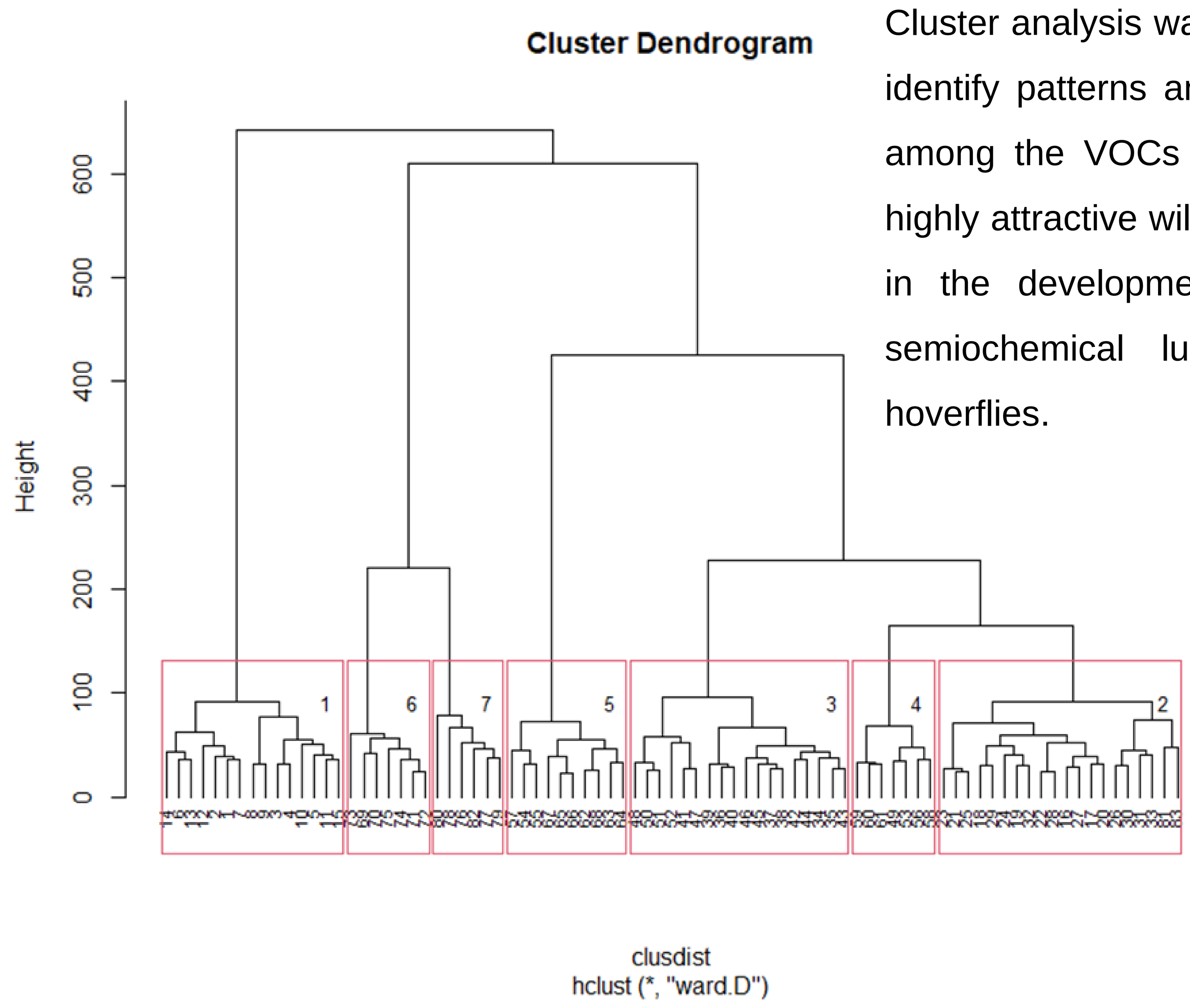


Figure 1 The average peak area percentages of floral VOCs by highly attractive wildflowers and compound class. The letters (V, W, X, Y, Z) refer to wildflower species. V is a member of the Polygonaceae family, introduced to the UK; W and Y are from the Apiacea family, introduced to the UK; X and Z belong to the Asteraceae family, native to Europe

Cluster analysis of floral odours



Cluster analysis was carried out to identify patterns and relationships among the VOCs emitted by the highly attractive wildflowers, aiding in the development of effective semiochemical lures to attract hoverflies.

Figure 2 Cluster analysis of highly attractive wildflowers. The analysis identified seven clusters highlighted by the red boxes in the dendrogram. Each number at the bottom of the dendrogram represents an individual VOC emitted by the wildflower species. VOCs from the same species are often grouped within the same cluster.

Discussion and Conclusion

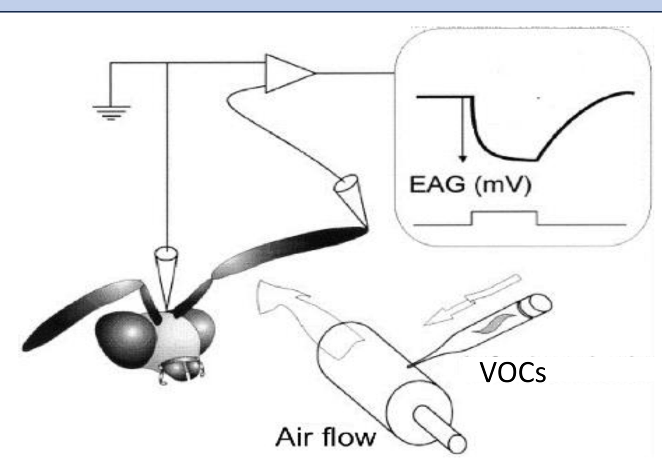
The cluster analysis identified the distinct groups (Table 1, Figure 2) based on unique VOC profiles of different wildflowers. Flower W is commonly used as a culinary herb, and it formed its cluster due to high levels of aliphatic VOCs. Flower V clustered with some VOCs from Flower Z, a wildflower frequently included in pollinator seed mixes, likely sharing aromatic compounds. Flowers X and Y are not from the same plant family. However, they showed partial overlap in one cluster and appeared in separate clusters, suggesting that the differences in their botanical families indicated the differences in their VOC composition. Flower Z's VOCs split across two clusters, suggesting a complex and variable emission profile, possibly reflecting its dual use as a wildflower mix component and traditional plant with medicinal properties.

Table 1 The Cluster distribution of the floral odours. Each number represents the frequency of VOC occurrences within each cluster for the respective wildflower species.

Cluster codes	V	W	X	Y	Z
1	0	15	0	0	0
2	18	0	0	0	2
3	0	0	18	0	0
4	0	0	2	5	0
5	0	0	0	10	0
6	0	0	0	0	7
7	0	0	0	0	6

In conclusion, VOC profiles are unique to wildflowers, with little overlap in compounds. Thus, there is no common set of VOCs characterising hoverfly-attractive wildflowers, and semiochemical lures will need to be context-specific.

Future Work



- Electrophysiological response of hoverflies to VOCs; this method is used to measure insect volatile reception.
- Bioassays of hoverflies to odour blend using a Y-tube olfactometer wind tunnel and cage trials.

Acknowledgements

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