Grower Summary

SF HNS 127

Characterising vine weevil aggregation pheromone for use in traps at soft fruit and nursery sites

Final 2012

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Project Number:	Characterising vine weevil aggregation pheromone for use in traps at soft fruit and nursery sites
Project Title:	SF HNS 127
Project Leader:	Dr Alison Karley,
Contractor:	Mylnefield Research Services
Industry Representative:	Richard Stanley, Farmline
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Previous report/(s):	N/A
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Project Cost (total project cost):	£22,190 (£56,375)

Headline

- Candidate plant-derived compounds were identified that either attracted ((*E*)-2-hexenol) or repelled (1-hexanol and (*Z*)-3-hexenol) vine weevils.

Background and expected deliverables

Vine weevils (Figure 1a) remain damaging pests of soft fruit and hardy nursery stock. Heavily infested plantations can reduce fruit yield by 50–60% if untreated and can increase the incidence of problems such as crumbly fruit (Figure 1b). Similar reductions in woody plant growth are also apparent with ameliorative measures. Developing effective control strategies is therefore needed. One possibility is the inclusion of chemical attractants that can be incorporated into lure-and-kill traps, which circumvents increasingly stringent legislation on the use of insecticides.

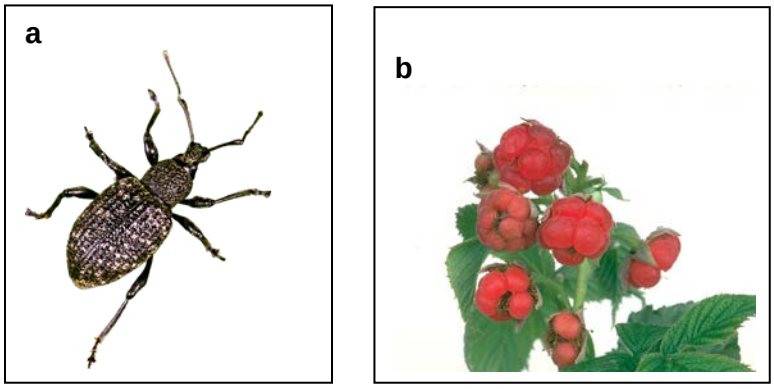

Figure 1.
(a) Adult vine weevil *Otiorhynchus sulcatus*. (b) Damage by weevil feeding leads to 'crumbly fruit'.

This pilot project aimed to identify chemical compounds that could be used in lure-and-kill traps, with an initial hypothesis that an aggregation pheromone might be released and transmitted between adult vine weevils.

Summary of the project and main conclusions

It was found that odours from frass did not attract other weevils, as previously thought, but increased the activity of weevils. The frass emitted high levels of α-farnesene, β-caryophyllene and germacrene-D which may underpin this.

A typical problem found when attracting vine weevils into traps is that a high proportion of the insect population is unresponsive and do not readily move, .which emphasises the need to identify effective attractant compounds. It was found that plant-derived cues, which were dominated by green leaf volatile compounds, were far more attractive than insect-derived volatiles and showed greater potential for use in traps, which became the main focus of this research.

Detailed analysis of the volatile composition of leaf, insect and frass material identified groups of chemicals that might provide cues for insect behaviour, particularly green leaf volatiles (in leaves) and sesquiterpenes (in frass). The analysis was refined by examining antennal electrical responses to volatiles emitted in blends derived from plant material and from purified synthetic sources. Strong and reproducible antennal responses were detected to three green leaf volatile compounds, 1-hexanol, (*E*)-2-hexenol and (*Z*)-3-hexenol.

Synthetic sources of the green leaf volatiles 1-hexanol, (*E*)-2-hexenol and (*Z*)-3-hexenol were tested in a series of behavioural experiments. At intermediate concentrations, (*E*)-2-hexenol attracted 100% of responsive weevils (i.e. those moving) into the chamber containing this compound, and 55% of all weevils tested overall. The compounds 1-hexanol and (*Z*)-3-hexenol were generally repellent to insects. While repellent compounds are unsuitable for use in lure-and-kill traps, this initial work suggests that they might be of use in deterring colonization of weevils from outside the main crop, whilst attractants might be used in traps within the crop.

Financial benefits

As this was a pilot study, it is difficult to identify financial benefits. However, based on the estimates of damage within a four year large scale field trial using raspberry (Clark *et al.*, 2012), some figures can be calculated. If the successful attraction of 55% of all vine weevils by (*E*)-2-hexenol into chambers with this compound were to be directly extrapolated into field captures, this would reduce damage to plants and limit yield losses (Figure 2).

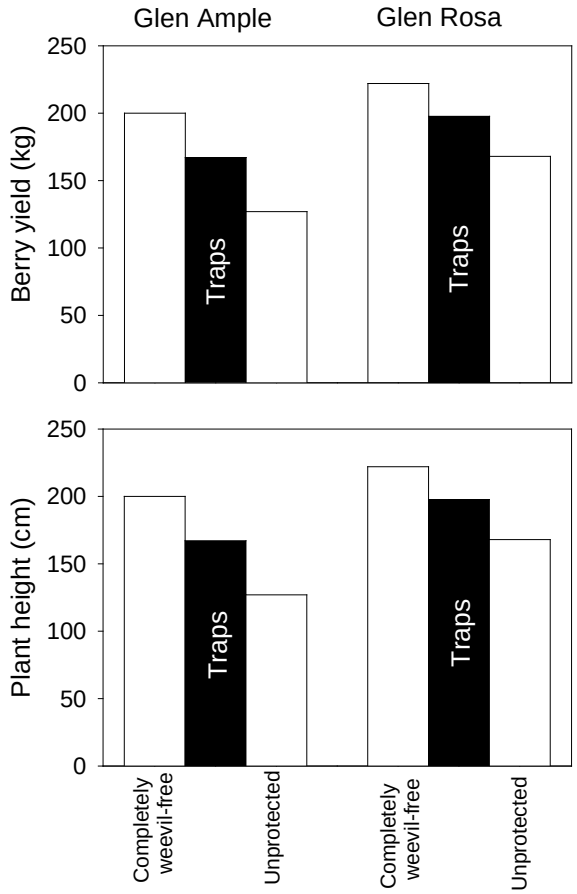

Figure 2. Projected protection to yield loss and reduced plant vigour if traps captured and removed weevils in a directly equivalent manner. Figures based on Clark *et al.* (2012) field trials.

Action points for growers

- The nature of this pilot study is inappropriate for making prescriptive management recommendations, although several aspects can be developed that may lead to effective control recommendations.
- The attractive compound might be included in traps for catching adult weevils already within the crop, potentially supplemented with the mobility stimulating compounds (identified from the excrement).
- Trap captures of vine weevils are frequently low and this needs to be addressed if this approach is to be successful. A recent trial (Van Tol *et al.*, 2012), for example, included weevils in the vicinity of traps in the trap count, but these insects could still contribute to crop damage.
- Prevention of invading weevils may benefit from inclusion of repellent compounds in dispensers at the perimeter of the crop.