Grower Summary

TF 209

Feasibility of developing a semiochemical based monitoring trap for the apple fruit rhynchites

Final 2015

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Project Number:	TF 209
Project Title:	Feasibility of developing a semiochemical based monitoring trap for the apple fruit rhynchites
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GROWER SUMMARY

Headline

- Studying the behaviour and appearance of apple fruit rhynchites in orchards has begun to reveal possible attraction to host-plant volatiles and when best to time spray applications.

Background and expected deliverables

Damage by apple fruit rhynchites (AFR), *Rhynchites aequatus* (Figure 1) has been increasing in UK apple orchards and sometimes pear orchards in recent years, probably due to changing patterns of insecticide use. Losses of 1% of fruit are common and losses >5% are not unusual. Hawthorn and blackthorn are the pest's usual host. Damage to apple is caused by feeding punctures in young developing fruitlets during and after blossom. In the first year of this project we found that females sever the stems of apple fruitlets after laying eggs and the development then probably occurs on the fruit on the ground (Massee 1954; Alford 1984). Up to this point it had never been seen or reported by growers or advisors. The pest causes damage at low population densities and the weevils are difficult to spot whilst they are feeding or egg laying. The extent of damage only becomes apparent when the characteristic corky scars develop (Figure 1), when it is too late to take action.

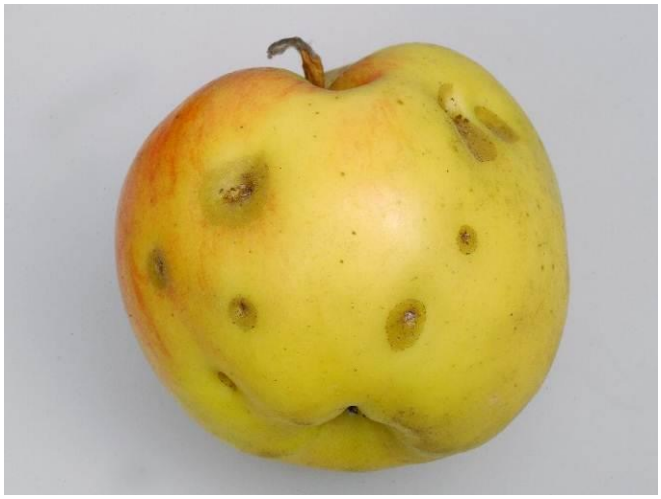

Figure 1. Damage by apple fruit weevil, *Rhynchites aequatus,* on apple

The weevil can be controlled by sprays of chlorpyrifos or thiacloprid (Calypso) but the former cannot be used during blossom because of the risk to bees and growers are reluctant to use thiacloprid during flowering for the same reason. Chlorpyrifos is broad spectrum and can

damage other beneficial insects in the orchard and both chlorpyrifos and thiacloprid are damaging to earwigs.

It would be beneficial to develop a sensitive, species-specific semiochemical based monitoring trap for this pest. However, it is not known whether *R. aequatus* produces a sex or aggregation pheromone, when it is produced or which sex produces it. Many weevils are known to produce sex or aggregation pheromones, e.g. strawberry blossom weevil and pepper weevil, but in others pheromones do not seem to be so important, e.g. apple blossom weevil. Nothing is known about pheromones of Rhynchitidae and so it is important to demonstrate in preliminary studies whether semiochemical-mediated sexual attraction occurs before embarking on a major project to identify, synthesise and exploit it for pest monitoring or control.

Summary of the project and main conclusions

In Year 1 (2013) in the laboratory, it was found that males and females were able to identify each other and successfully mate, resulting in eggs being laid.

In a field experiment no statistical significances were identified to suggest attraction was occurring between males and females. There was some evidence that male AFR was repelled by other male AFR.

Sixteen volatile collections were made, but analyses of these collections by gas chromatography coupled to mass spectrometry (GC-MS) were unsuccessful and no sex specific compounds were identified.

In year 2 (2014) a replication of the year 1 field trial was deployed within the same unsprayed apple orchard. Live AFR were used as bait and tap sampling used as the collection method. Cages in single trees held single males, single females, both a male and a female or no weevils. Data was collected twice a week from the beginning of April (first collection), until mid-May when no more weevils were found within the orchard. Weevils were collected from apple orchards from the bud stage of flowering until fruit setting. In the field trial, no attraction between the sexes was observed. The only significant result was seen in the numbers of female weevils caught on unbaited trees at the fruit setting stage. Mating and egg laying occurred in the laboratory culture, so males are females were able to identify each other. Larvae were found within fruitlets but they did not pupate and died.

Also as a repeat of year 1, volatiles were collected from weevils as individuals or in groups of 1-5 and with or without apple buds as food. Twenty-three collections were made. Analysis of these by gas chromatography coupled to mass spectrometry (GC-MS) showed no apparent differences in compounds present in collections from males or females that might be potential components of a sex or aggregation pheromone. When the collections were tested by electroantennographic (EAG) recording from antennae of *Rynchites*, good responses were obtained to collections made in the presence of food but not to those made without. Analyses of the collections by GC coupled to EAG recording showed a small EAG response to the large amount of benzyl alcohol in collections made with apple buds present. This compound may play a role in attraction of *Rynchites* to host plants.

Financial benefits

This project could eventually lead to the development of a sensitive, specific, semiochemical-based monitoring trap for apple fruit rhynchites. This will enable growers to minimise losses due to the pest, which probably average >1% in apple, and direct sprays against it only when they are needed. This project is therefore consistent with the industry's need to minimise and rationalise the use of pesticides.

Action points for growers

- Growers should monitor for AFR by inspection and tap sampling apple trees and surrounding hawthorn and blackthorn from early April.
- Data, thus far, suggests that spray applications targeted before the blossom is open should coincide with when AFR is in the trees.
- Orchards with high fruit damage the previous year should be treated in the spring avoiding bloom.