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**Project title:** Pheromone technology for management of capsid pests to reduce pesticide use in horticultural crops – 2 year extension

**Project number:** HL0184 (PC/SF 276)

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## AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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## GROWER SUMMARY

### Headlines

- A European tarnished plant bug trap has been successful at predicting the invasion of the pest into strawberry and cucumber crops.
- For the first time, the common green capsid has been attracted to a synthetic sex pheromone lure.

### Background and expected deliverables

Capsid bugs are important pests of several high-value horticultural crops in the UK and many more worldwide. In the UK, the common green capsid, *Lygocoris pabulinus*, and the European tarnished plant bug, *Lygus rugulipennis* are the most important species. *L. pabulinus* is a sporadic but very damaging pest of apples, pears, blackcurrants, strawberries, blackberries and raspberries. *L. rugulipennis* is an important pest of late season strawberries and of various glasshouse salad crops, notably cucumber.

Crop invasion by capsids is sporadic and unpredictable, and, in the absence of effective control measures, capsid bugs cause severe economic losses. They cause damage at low population densities and are difficult to detect at such levels in normal crop inspections.

In conventional crops, capsids are controlled by sprays of broad-spectrum insecticides, organophosphorus insecticides being the most effective and frequently used. Neonicotinoids and other modern insecticide groups are only partially effective against capsids whilst insect growth regulators are totally ineffective. In the future, chlorpyrifos and thiacloprid, the main control methods for capsids, are likely to be withdrawn from use in many edible crops. In organic crops the pests cause high levels of damage because the insecticides available are inadequate and of short persistence. Capsids have few natural enemies and effective biocontrol methods have not yet been developed.

Without accurate monitoring information, growers are forced to use remedial applications of broad spectrum insecticides. Although these treatments can be effective against capsids, they disrupt the biological control of other pests and can lead to the application of further sprays. The recent outbreaks of pesticide-resistant western flower thrips on strawberry are probably due, at least in part, to routine spraying against capsids.

The need to use broad spectrum insecticides for control of capsid bugs is a major obstruction to the implementation of IPM and the quest towards pesticide-free foods.

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Effective monitoring systems for capsid pests would help to ensure that pesticides are only used when necessary thereby reducing routine applications of broad-spectrum pesticides that disrupt the IPM of these and other pests. They would also enable the use of more selective insecticides and biological approaches for which timing of sprays is critical.

### Summary of project and main conclusions

Progress on each objective of the project is summarised below;

#### 1. Improve and test the lure for *L. rugulipennis* so that it is long lasting and practical for use by growers (Yr 1)

The life and release rate of pheromone components from the pipette tip lure have been enhanced. Shielding the pipette tips from sunlight by wrapping them in duct tape extended the life of the lure to over 4 weeks in the field.. The use of larger pipette tips also gave a more consistent release rate.

In the laboratory windtunnel the 1 ml pipette tips proved much more reliable than the 0.2 ml tips, releasing a blend very similar to that loaded into the dispenser for up to 2 months at 27°C and 8 km/h windspeed. They also released at a higher rate than the 0.2 ml pipette tips. Furthermore, the 1 ml pipettes were easier to load with the pheromone blend and to seal with the crimp cap. The results have confirmed that disposable pipette tips are suitable dispensers for the three candidate components of the *Lygus* bug pheromone trap.

The Agrisense sachets proved unsatisfactory for dispensing the pheromones (*E*)-4-oxo-2-hexenal (KA), hexyl butyrate (HB), and (*E*)-2-hexenyl butyrate (E2HB).. The components diffuse through a polyethylene disc such that release of KA is proportionately faster than that of HB and E2HB. This results in a very high relative amount of KA initially which drops to a very low level within 10 days under windtunnel conditions. Thus, in the field the sachet performed well in comparison with the pipette tip during the first 5 days but much less well subsequently.

The pipette tip lure was also shown to be as attractive as live female *L. rugulipennis*.

Improvements have been confirmed using field trapping tests.

The trap was further tested by adding Fluon to the cross vanes. This increased the catch by more than a third in week one, but catches of males decreased subsequently – probably because of contamination by debris on the cross vanes over time (enables the insects to grip the surface more easily). Products such as Teflon should be considered as an alternative

coating for the cross vanes.

Traps that combined the lures of *L. rugulipennis* and/or *Anthonomus rubi* with either white or green cross vanes showed that white cross vanes cannot be used as they reduce the catch of *L. rugulipennis* in the traps. In addition, the grid designed for preventing capture of bees attracted to white cross vanes prevents the *Lygus* bugs falling into the bucket of the trap.

**2. Calibrate the trap for *L. rugulipennis* for use in pest monitoring to establish a treatment threshold for its use in late season strawberry and/or cucumber (Yrs 1 and 2)**

Extensive trapping in both cucumber and strawberry crops has proven the monitoring trap to be an excellent early warning system of invasion into the crops. The pest is detected in high numbers in the trap at least 2 weeks before detection in cucumber and up to 2 months in strawberry compared to using traditional monitoring methods. More than 3 sites of each crop were monitored. Pheromone baited traps positioned outside cucumber greenhouses appeared to provide useful prior warning of crop invasion and plant damage by *L. rugulipennis*. Those positioned within the crops were of little value.

**3. Develop an effective lure and trap for *L. pabulinus* with associated data for pest monitoring (Yrs 1 and 2)**

For the first time, significant numbers of male *L. pabulinus* have been trapped using synthetic sex pheromone lures. Trap design is of major importance and the green cross vane and delta traps were found to be ineffective at catching males. The lure was more attractive than caged virgin females at attracting males to sticky stake traps. These traps are not practical for use by growers. Sticky platform and water traps were also tested, but were not found to be more effective than sticky stake traps. There should be more focus on trap design in year 2 of the extension of the project.

Camera recordings have been made using pheromone lures and virgin females as bait. However, no direct observations were made of the interactions. This is believed to be because recordings were made between generations, so another attempt will be made next year with improved equipment.

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### **4. Encourage commercial production of traps and lures and produce grower information sheets on the use of the traps for monitoring capsids**

It is the intension of the consortium to make available the *L. rugulipennis* trap for testing by strawberry and cucumber growers in 2011 in order to establish an action threshold.

#### **Future research**

In the final year of the project, research will focus on;

- Determining the best height for the traps in strawberry and cucumber crops
- Determining a trap threshold for *L. rugulipennis*
- Filming the behaviour of *L. pabulinus* around the synthetic lure
- Investigating grower convenient trap designs for monitoring *L. pabulinus*

#### **Financial benefits**

The financial benefits for growers will be realised in more accurate predictions of a capsid attack and more focused, not prophylactic, control measures.

#### **Action points for growers**

Growers interested in trialling the European tarnished plant bug trap in 2011 for monitoring the pest in strawberry or cucumber crops should contact Michelle Fountain ([michelle.fountain@emr.ac.uk](mailto:michelle.fountain@emr.ac.uk); 01732 523 749).