



Improved understanding of vine weevil movement within strawberry crops



Vine weevil

- Serious pest of soft fruit crops such as strawberry and raspberry
- Feeding by adults results in leaf notches while larvae feed on the roots of plants



Vine weevil control

- Vine weevil larvae controlled using entomopathogenic fungi nematodes and/or insecticides used after cropping

Steinernema kraussei and *Heterorhabditis bacteriophora* Met52 – *Metarhizium brunneum* (*M. anisopliae*)



Vine weevil control

- However, only insecticides used to control adult vine weevil (unreliable control)



Adult vine weevil biology

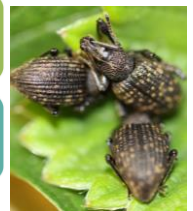
Vine weevil adults are nocturnal



Adult vine weevil biology

Vine weevil adults are nocturnal

Vine weevil adults show strong aggregation behaviour



Adult vine weevil biology

Vine weevil adults are nocturnal

Vine weevil adults show strong aggregation behaviour

Vine weevil adults are attacked by naturally occurring entomopathogenic fungi



Can we exploit vine weevil behaviour in a control strategy? (CRD PS2134)

Potential of artificial refuges to disseminate an entomopathogenic fungus

Test fungal isolates for efficacy against adult vine weevil

Can infected weevils infect previously healthy weevils



Potential of artificial refuges to disseminate an entomopathogenic fungus



Roguard traps readily used as a refuge by adult vine weevil



Potential of artificial refuges to disseminate an entomopathogenic fungus



- Roguard traps effectively disseminated fluorescent powders under semi-field conditions

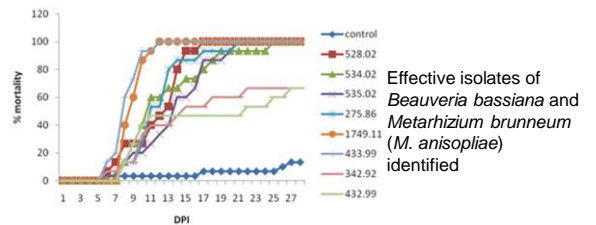
'88-94% of weevils contacted fluorescent powder within one week'



Potential of artificial refuges to disseminate an entomopathogenic fungus



Test fungal isolates for efficacy against adult vine weevil



Can infected weevils infect previously healthy weevils



A - *Metarhizium brunneum* (*M. anisopliae*)

B - *Beauveria bassiana*



Can we exploit vine weevil behaviour in a control strategy? (CRD PS2140)

Potential of using electrostatic EPF spore formulations

Investigate movement of vine weevil and use of refuge traps in the field

Test the efficacy of the best performing EPF formulation(s) under semi-field conditions



Potential of using electrostatic EPF spore formulations

- Entostat powder exhibits electrostatic properties
- The powder adheres to insects and can be passed from one insect to another through direct contact



Investigate movement of vine weevil and use of refuge traps in the field



- Using fluorescent powders under field conditions
- Novel approach using RFID tags



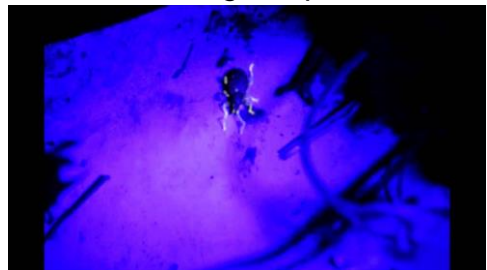
Investigate movement of vine weevil and use of refuge traps in the field



- Refuge traps containing fluorescent powders placed in commercial strawberry crop - four densities used (0.75, 2.25, 3.75 and 6.00 per m²)
- Night-time assessments using UV torches, recording numbers weevils with or without fluorescent powder



Investigate movement of vine weevil and use of refuge traps in the field



Investigate movement of vine weevil and use of refuge traps in the field



- Two days after placing refuge traps in strawberry crop:
- 178 weevils recorded in night-time assessment
- 31 (17%) of weevils had fluorescent powder on their bodies
- Trap density did not affect numbers of powder coated weevils recorded



Investigate movement of vine weevil and use of refuge traps in the field



- 40 RFID tagged weevils released into a strawberry crop
- Position of weevils recorded regularly using RFID detector
- Distance moved by each weevil recorded



Investigate movement of vine weevil and use of refuge traps in the field



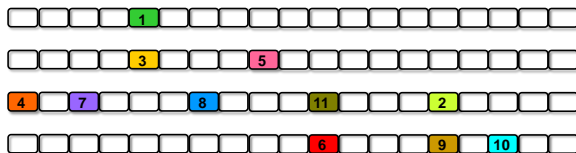
© BBC



Investigate movement of vine weevil and use of refuge traps in the field



- After 35 days a total of 11 (28%) live RFID tagged weevils were removed from the crop
- These weevils had moved between 2.65 and 10.40 m from their release point
- Weevils moved along and between rows of strawberry grow-bags



14% of bags visited
(starting position for each weevil)



62% of bags visited
(assuming most direct route taken)



Testing the efficacy of the best performing EPF formulation under semi-field conditions



Harper Adams University

Conclusions

Simple plastic cockroach traps used as a refuge by adult vine weevil in the field

RFID tagging is improving our understanding of weevil movement within crops

Potential to use artificial refuges containing a suitable fungal pathogen to control adult vine weevil

ADAS THE UNIVERSITY OF WARWICK Harper Adams University

Acknowledgements

- Harper Adams University
 - Eneree Gundalai & everyone at CERC
- University of Warwick
 - Dave Chandler & Gill Prince
- ADAS
 - Gemma Hough, Abby Wood, Charlotte Arbona, Karen Jones, Harriet Roberts, John Buxton & Jude Bennison
- H & H Duncalfe Ltd
- CRD on behalf of Defra for funding this work



defra ADAS THE UNIVERSITY OF WARWICK Harper Adams University



ADAS THE UNIVERSITY OF WARWICK Harper Adams University