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

Vine weevil larvae

Vine weevil control

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

Met52 – Metarhizium brunneum (M. anisopliae)

Adult vine weevil biology

Vine weevil adults are nocturnal

Vine weevil adults show strong aggregation behaviour

Adult vine weevil biology

Vine weevil

2015/04/19
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
  - 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

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<th>Effective isolates of Beauveria bassiana and Metarhizium brunneum (M. anisopliae) identified</th>
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Graph showing % mortality against time (days) for different fungal isolates.
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

- 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

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

- 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

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

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