The Use of new and novel Biocontrol agents for Berry pests

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Overview of Insect Pest Control

• Estimated that 50% of PPP’s registered in EU by 2020 will be Biocontrol Agents

• The proposed ‘Sustainable Use of Pesticides Directive’ may restrict the use of some pesticides – Worker Re-entry

• Current available biocontrol products are increasingly effective
Black Vine Weevil
What is the Damage?

Strawberry

Effect of 5 Larva per plant = 21g decrease in Fruit per plant

Raspberry

1.52 Kg reduction per plant

*Clark et al., 2012. Crop Protection, Vol. 32, p76-82
Growth of Weevil Populations - Temperature

No. of Adults emerging

Yr 1                  Yr 2                   Yr 3

11°C  12°C  15°C  18°C  21°C  24°C
Growth of Weevil Populations - Substrate

% of Eggs surviving till mid instar larvae

Soil | Bark | Peat | Coir

Infection Cycle of *Metarhizium anisopliae*

- **Conidia in the soil**
- **Sporulation on the cadaver releasing infective Conidia (spores) into the soil**
- **Germination on surface of cuticle**
- **Appresorium**
  - **Epicuticle**
  - **Endocuticle**
  - **Epidermis**
  - **Haemolymph**

**Multicellular mycelium fills body cavity - no insecticidal activity**

**Death caused by:**
- starvation,
- physical disruption of organs,
- intoxication,
- autointoxication

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The Irish Agriculture and Food Development Authority
Metarhizium and Vine Weevil
Nursery Scale Trial
Nursey Scale Field Trial

Percentage Control (%)

- Metarhizium Premix
- S. kraussei
- Metarhizium Premix + S. kraussei Drench
- suSCon Green Premix
- Imidacloprid Premix

* indicates significant difference.
Control Options

Nematode Application v Metarhizium Application

Cold Glasshouse

Outdoors

Tactical Deployment?
Tactical Deployment?

Metarhizium conidia can persist and remain efficacious

Gaffney et al., 2006 IPPS
Timing of Nematode Application

Effect of Temperature

Average Temperature 7 Days Post Application

September: 14.1 C
October: 9.3 C

S. Kraussei
20 BVW eggs/pot
Persistence of Met 52

% Larval Control

Month 0

Month 14

Month 24
Persistence of Met 52

- Decrease in the no. of viable conidia
- No decrease in efficacy
Persistence of Met 52

- Decrease in the no. of viable conidia
- No decrease in efficacy
Secondary Benefits to using *Metarhizium*

Sciarid Larvae

![Bar chart showing the number of surviving Sciarid flies under untreated and Ma conditions.](chart1)

Thrips pupae

![Bar chart showing the mortality of Thrips pupae under various conditions.](chart2)

Ansari *et al.*, (2007) Biological Control 4 293-297
Applying Nematodes and Metarhizium

Nematode Application Guide

• Remove filter screens
• Do not apply in direct/bright sunlight
• Do not apply to dry compost
• Do not apply unless you have / expect to have at least 4-5 hours of temperatures above 10°c for the following 7 days

Metarhizium Application Guide

• Applied as a premix – be vigorous!
• Does require a ‘settling’ in period
• Do not let the growing media dry out
## Control of Adult weevils?

**UK situation – Talstar (Bifenthrin) withdrawn in 2010**

Current Trials assessing –

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Effectiveness</th>
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</thead>
<tbody>
<tr>
<td>Steward</td>
<td>indoxacarb</td>
<td>Killed 60-70% of Adults Present*</td>
</tr>
<tr>
<td>Chess</td>
<td>pymetrozine</td>
<td>Killed 60-70% of Adults Present</td>
</tr>
<tr>
<td>Hallmark</td>
<td>Lambda-cyhalothrin</td>
<td>Some effect in 2010, none in 2011</td>
</tr>
<tr>
<td>Calypso</td>
<td>Thiacloprid</td>
<td>Not Effective</td>
</tr>
<tr>
<td>Gazelle</td>
<td>Acetamiprid</td>
<td>Not Effective</td>
</tr>
<tr>
<td>Pyrethrum 5EC</td>
<td>Natural Pyrethrin</td>
<td>Not Effective</td>
</tr>
<tr>
<td>Toppel</td>
<td>Cypermethrin</td>
<td>Not Effective</td>
</tr>
</tbody>
</table>

*Steward has a specific restriction on Soft Fruit in the UK

## Future Options?

*T. Pope, HDC News March 2012 24-25*
Azadirachtin – A possibility for Soft Fruit?

Azadirachtin A was registered in the EU last summer. It is a plant chemical extracted from the fruit kernel of the Neem tree. First use is likely to be against PCB on potato in Germany.

However work conducted in Kinsealy has identified its ability to cause sterility in adult weevils.

Also has recorded efficacy against RSM, Aphids and Thrips.

Is also fungicidal, with reported effects against *Botrytis spp.* and Powdery Mildew.
Azadirachtin – Effect on Adult Egg laying

Consecutive (two-week) feeding cycle

Total no. of Viable eggs laid

- 0 ppm
- 10 ppm
- 50 ppm
- 100 ppm
- 200 ppm

The Irish Agriculture and Food Development Authority
Azadirachtin – Effect on BVW Egg Survival

![Graph showing the effect of Azadirachtin on BVW egg survival. The x-axis represents the effective concentration of Azadirachtin (p.p.m), and the y-axis represents the hatch rate (%). The graph compares Azadirachtin and Azadirex, with lines indicating the decrease in hatch rate as the concentration increases.]
What’s the Future of Pest Control?

Work in Waggeningen and USDA has led to the identification of the vine weevil aggregation pheromone (Kaironome) – potentially these could be baited with Insecticide and used to lure adults into traps.

Work in the UK is looking at Traps, with the Roguard trap showing initial promise. Again this could be baited with insecticide to kill arriving adults.

UVB Light as a Control option? UV has direct effect on RSM and some Aphids – Cladding available now, Bulbs 5 yrs +

Work in Teagasc and NUIM at conditioning EPN (Ends 2012)
Thank You

Technical updates on the work discussed in this presentation will be available from your Teagasc Advisor or the Teagasc website shortly.

Thanks to Teagasc for Funding the Work, Prof. Tariq Butt for supplying the fungal strains Dr Munno Prasad and Bord Na Mona Staff at Kinsealy Research Centre
Questions?