Integrating Conservational Biocontrol and Chemical Tactics for Managing Aphids in Lettuce

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IPM in lettuce

• Cultural control
  • Agronomical practices
  • Host Plant Resistance

• Biological control
  • Conservational biocontrol
  • Augmentative biocontrol

• Chemical control
  • Different active ingredients
2017 Pesticide residue on water

Data from the Salinas Valley

(Deng 2017)
Conservational Biocontrol

The use of insectary plants to attract beneficials
Insectary plants: 2018 results

Aphids / plant

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Aphids / plant</th>
<th>Hoverfly maggots / plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10</td>
<td>0.05</td>
</tr>
<tr>
<td>One_species</td>
<td>20</td>
<td>0.15</td>
</tr>
<tr>
<td>Two_species</td>
<td>30</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Aphids
df = 2,6
F = 14.58
P = 0.0050

Hoverfly maggots
df = 2,6
F = 2.01
P = 0.2151
The Need

• Short-term:
  • Reduce the use of PYR and NEO
  • Use alternative chemistries

• Long-term:
  • Integrating other tactics

• Overall goals: to evaluate
  • How well alternative pesticides will control aphids
  • Alyssum in conventional lettuce
Design & Data Collection

• Two commercial fields: small plots
  • Romaine (late-July), Tropicana (mid-August)
• Two strips: with and without alyssum
• RCBD: 4 reps / trial
• Three treatments = insecticide regimes
  • Control – no pesticide at all
  • Current regime (yes PYR + yes NEO)
    • Admire Pro + Silencer, Movento + Perm-Up, Admire Pro + Silencer, Sivanto + Perm-Up
  • Alternative regime (no PYR + no NEO)
    • Movento, Sequoia, Fulfill, Sivanto
• Weekly (6) destructive sampling
• Yield = average head weight
Approach 1: Transplant

- Alyssum seedlings added using hand-shovel
- At the seed line and between plants
Approach 2: Direct-seeded

- Alyssum seed coated at 13.0
- 95:5% lettuce:alyssum by weight; mixed before planting
- Keep the lettuce, sacrifice alyssum
Results – Aphid populations

Strip (Flower vs. Non-Flower): Not significant

Strip × Insecticide regimes: Not significant

Green peach aphid

df = 2, 28  
F = 8.49  
P = 0.0013

df = 2, 34  
F = 9.40  
P = 0.0006
Results – Lettuce wet weight

Insecticide regimes:
Not significant

Strip (Flower vs. Non-flower):
Not significant

Strip × Insecticide regimes:
Not significant
Green peach aphid

2019 lab bioassays: maximum label rate

Percent mortality (%)

Hours after treatment

Admire Pro 1.30 fl oz
Movento 5.00 fl oz
Sequoia 5.75 fl oz
Silencer 3.84 fl oz
Fulfill 2.75 oz
Control
Potato aphid

2019 lab bioassays: maximum label rates

![Graph showing percent mortality over time for different treatments.]

- Admire Pro 1.30 fl oz
- Movento 5.00 fl oz
- Sequoia 5.75 fl oz
- Silencer 3.84 fl oz
- Fulfill 2.75 oz
- Control

Percent mortality (%) vs Hours after treatment

0 20 40 60 80 100

24 48 72 96 120
To sum up

• Successfully established alyssum

• Under low pressure: alternatives worked
  • Repeat this experiment under high pressure
  • Additional step – field efficacy trials

• All lab tested materials killed aphids
  • The only difference is timing
Planting alyssum in conventional lettuce

<table>
<thead>
<tr>
<th></th>
<th>Transplant</th>
<th>Direct-seeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicide</td>
<td>Kerb</td>
<td>Prefar</td>
</tr>
<tr>
<td>Planting</td>
<td>Restricted to a watering event</td>
<td>No restriction</td>
</tr>
<tr>
<td>Costs</td>
<td>Seedlings from greenhouse</td>
<td>Seed + coating</td>
</tr>
<tr>
<td>Labor</td>
<td>Additional</td>
<td>Training for thinning</td>
</tr>
<tr>
<td>Timing of flowering</td>
<td>Flowers always present</td>
<td>Flowers at thinning</td>
</tr>
</tbody>
</table>
Acknowledgements

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