Laboratory Evaluation of Chemical, Biorational and Microbial Insecticides Against *Thrips parvispinus*

Alexandra M. Revynthi

German Vargas, Livia Ataide, Yisell Velazquez-Hernandez, M. Alejandra Canon, Isamar Reyes, Paola Villamarin

Tuesday, September 19, 2023
Life Cycle

- **Egg**: 4.79 days
- **Prepupa**: 1.08 days
- **1st instar larva (L1)**: 1.36 days
- **2nd instar larva (L2)**: 3.54 days
- **Pupa**: 1.96 days
- **27°C (80 °F)**: 12.73 days

**Hutasoit et al., 2017, Indonesia Journal of Entomology, 14:107-116**
Chemical Insecticides
<table>
<thead>
<tr>
<th>#</th>
<th>Product Name</th>
<th>Active Ingredient</th>
<th>Group</th>
<th>Rate</th>
<th>Site</th>
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<td>8 fl oz/100 gal</td>
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Direct spray on *Thrips parvispinus*

1. Bean leaf discs 24mm diameter

2. Five L1, L2 or adults

3. Treatment application → Potter Tower

4. Mortality at 24h and 48h post treatment

5. Feeding damage at 48h → Image J
First-instar Larval Mortality (Direct)

Proportion of dead larvae

Treatment:
- Piston
- Xplore
- Overture
- Conserve
- Pradia
- Timecin
- Pedestal
- Hachi-Hachi
- Tristar
- Sarisa
- Kontos
- Mainspring
- Acephate
- Merit
- Altus
- Control
- Azasol
- Aria
- Fulcrum
- Rycar
- Sevin
- Talstar

Legend:
- a
- b
- c
- cd
- cde
- de
- de
- e
Feeding Damage - First-instar Larvae (Direct)

Leaf area (mm²) damaged

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</table>
Feeding Damage - First-instar Larvae (Direct)

Control

Sevin

Conserve

Overture

Piston
Second-instar Larval Mortality (Direct)

Proportion of dead larvae

Treatment

- Piston
- Conserve
- Xspire
- Pedestal
- Tristar
- Hachi-Hachi
- Pradia
- Overture
- Timecin
- Kontos
- Sarisa
- Rycar
- Control
- Merit
- Sevin
- Mainspring
- Talstar
- Aria
- Acephate
- Altus
- Azasol
- Fulcrum
Feeding Damage - Second-instar Larvae (Direct)

Leaf area (mm$^2$) damaged

- Rycar
- Merit
- Azasol
- Control
- Talstar
- Fulcrum
- Sevin
- Altus
- Pedestal
- Aria
- Tristar
- Kontos
- Xspire
- Acephate
- Hachi-Hachi
- Textra
- Conserve
- Mainspring
- Pradia
- Sarisa
- Overture
- Piston

The treatments are shown horizontally, with leaf area (mm$^2$) damaged on the y-axis. Each bar represents the mean leaf area damaged, with error bars indicating the standard deviation. Letters above the bars indicate significant differences among treatments.
Feeding Damage - Second-instar Larvae (Direct)

Control

Merit

Rycar

Timectin

Mainspring

Piston
Feeding Damage – Adults (Direct)

Leaf area (mm²) damaged

Treatment

Rycar, Kontos, Pedestal, Control, Aria, Fulcrum, Azasol, Talstar, Sevin, Altus, Merit, Sarisa, Pradia, Hachi-Hachi, Acephate, Tristar, Mainspring, Overture, Timec, Xplore, Conserve, Piston
Feeding Damage – Adults (Direct)

- Control
- Rycar
- Kontos
- Piston
- Xxpire
- Conserve
Spray on Plants – Indirect Spray

1. Treatment application → bean plants

2. Bean leaf discs 24mm diameter

3. Five L1, L2 or adults

4. Mortality at 24h and 48h post treatment

5. Feeding damage at 48h → Image J
First-instar Larval Mortality (Indirect)

Proportion of dead larvae

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</table>
Feeding Damage - First-instar Larvae (Indirect)

Leaf area (mm$^2$) damaged

- **Atasol**
- **Control**
- **Rycar**
- **Aria**
- **Talstar**
- **Fulcrum**
- **Altus**
- **Tristar**
- **Timectin**
- **Sevin**
- **Merit**
- **Hachi-Hachi**
- **Pedestal**
- **Overture**
- **Pradia**
- **Piston**
- **Mainspring**
- **Kontos**
- **Sarica**
- **Acephate**
- **Xplore**
- **Conserve**

Legend:
- **a**
- **ab**
- **abc**
- **abcd**
- **bcde**
- **cde**
- **cdef**
- **defg**
- **efgh**
- **gh**
- **h**

Treatment
Feeding Damage - First-instar Larvae (Indirect)

- Azasol
- Control
- Conserve
- Xxpire
Second-instar Larval Mortality (Indirect)

Proportion of dead larvae

Treatment

- Piston
- Conserve
- Xplore
- Kontos
- Hachi-Hachi
- Sevin
- Timecide
- Acephate
- Talstar
- Pedestal
- Mainspring
- Azasol
- Fulcrum
- Overture
- Rycar
- Tristar
- Aria
- Sarisa
- Altus
- Control
- Merit
- Pradia

Legend:
- a
- ab
- bc
- cd
- cde
- cdef
- def
- ef
- ef
- f
Feeding Damage - Second-instar Larvae (Indirect)

Leaf area (mm$^2$) damaged

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Leaf area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>a</td>
</tr>
<tr>
<td>Merit</td>
<td>ab</td>
</tr>
<tr>
<td>Talstar</td>
<td>abc</td>
</tr>
<tr>
<td>Rycar</td>
<td>abcd</td>
</tr>
<tr>
<td>Azasol</td>
<td>abcde</td>
</tr>
<tr>
<td>Altus</td>
<td>bcdef</td>
</tr>
<tr>
<td>Aria</td>
<td>bcdefgh</td>
</tr>
<tr>
<td>Fulcrum</td>
<td>bcdefghi</td>
</tr>
<tr>
<td>Tristar</td>
<td>cdefghi</td>
</tr>
<tr>
<td>Pedestal</td>
<td>efghi</td>
</tr>
<tr>
<td>Sevin</td>
<td>fghi</td>
</tr>
<tr>
<td>Hachi-Hachi</td>
<td></td>
</tr>
<tr>
<td>Timecith</td>
<td></td>
</tr>
<tr>
<td>Overture</td>
<td></td>
</tr>
<tr>
<td>Pradia</td>
<td></td>
</tr>
<tr>
<td>Mainspring</td>
<td></td>
</tr>
<tr>
<td>Kontos</td>
<td></td>
</tr>
<tr>
<td>Acephate</td>
<td></td>
</tr>
<tr>
<td>Xspire</td>
<td></td>
</tr>
<tr>
<td>Piston</td>
<td></td>
</tr>
<tr>
<td>Sarita</td>
<td></td>
</tr>
<tr>
<td>Conserve</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- a, ab, abc, abcde, bcdefg, bcdefgh, defghi, cdefghi, efghi, fghi, ghi, hi, i
Feeding Damage - Second-instar Larvae (Indirect)

Control

Conserve

Sarisa

Merit

Piston
Feeding Damage – Adults (Indirect)

Leaf area (mm²) damaged

Treatment

Fulcrum, Control, Talstar, Alitus, Aria, Azasol, Pedestal, Hachi-Hachi, Sevin, Rycar, Merit, Kontos, Tristar, Mainspring, Pradis, Acephate, Timectin, Piston, Xsivre, Conserve, Soria, Overture
Feeding Damage – Adults (Indirect)

Control

Fulcrum

Sarisa

Overture
# Tested Biorational Insecticides

- Included horticultural oils and one insecticidal soap

<table>
<thead>
<tr>
<th>#</th>
<th>Product Name</th>
<th>Active Ingredient</th>
<th>Group</th>
<th>Rate</th>
<th>Site</th>
<th>EPA Registration #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agropest</td>
<td>Thyme + Rosemary oil</td>
<td>Unclassified</td>
<td>0.5%</td>
<td>S, G, N, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td>2</td>
<td>Thyme Guard</td>
<td>Thyme oil</td>
<td>Unclassified</td>
<td>0.5%</td>
<td>S, G, N, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td>3</td>
<td>Bee Safe 3-in-1</td>
<td>Sesame oil</td>
<td>Unclassified</td>
<td>3 fl oz/1 gal</td>
<td>S, G, N, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td>4</td>
<td>Nuke EM</td>
<td>Citric Acid</td>
<td>Unclassified</td>
<td>8 fl oz/1 gal</td>
<td>S, G, N, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td>5</td>
<td>Bush doctor force of</td>
<td>Garlic oil</td>
<td>Unclassified</td>
<td>128 fl oz/100 gal</td>
<td>S, G, N, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td></td>
<td>nature insect repellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sierra Natural Science 209</td>
<td>Rosemary oil</td>
<td>Unclassified</td>
<td>54 fl oz/50 gal</td>
<td>S, G, N, S</td>
<td>FIFRA 25 (b) exempt</td>
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<tr>
<td>7</td>
<td>Arte + Guard</td>
<td><em>Artemisia afra</em> + Canola oil</td>
<td>Unclassified</td>
<td>1 fl oz/1 gal</td>
<td>G, N, I, L</td>
<td>FIFRA 25 (b) exempt</td>
</tr>
<tr>
<td>8</td>
<td>Stylet JMS</td>
<td>Paraffinic oil</td>
<td>Unclassified</td>
<td>1 fl oz/1 gal</td>
<td>G, N, I, L</td>
<td>65564-1</td>
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<tr>
<td>9</td>
<td>SuffoilX</td>
<td>Mineral oil</td>
<td>Unclassified</td>
<td>2%</td>
<td>G, N, L</td>
<td>48813-1-68539</td>
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<tr>
<td>10</td>
<td>Ultrafine</td>
<td>Mineral oil</td>
<td>Unclassified</td>
<td>3%</td>
<td>G, N, L, I</td>
<td>86330-11</td>
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<tr>
<td>11</td>
<td>M-Pede</td>
<td>Potassium salts of fatty acids</td>
<td>Unclassified</td>
<td>2.5 fl oz/1 gal</td>
<td>G, N, L, I</td>
<td>10163-324</td>
</tr>
</tbody>
</table>

S: shadehouse, G: greenhouse, N: nursery, L: landscape, I: interior
First-instar Larval Mortality (Direct)

Proportion of dead larvae

Treatment

Suffoil-X, Ultrafine, Bee safe, Bushdoctor, M Pede, Control, Agropest, Arte-Guard, Nuke, Sierra Natural, Stylet, Thyme Guard
Feeding Damage - First-instar Larvae (Direct)

Leaf area (mm^2) damaged

- Agropest
- Thyme Guard
- Control
- Sierra Natural
- Arte-Guard
- Bee-safe
- M-Pede
- Stylet
- Ultrafine
- Suffolk-X
- Bushdoctor
- Nuke

Treatment

Superscript letters indicate significant differences at the 0.05 level.
Feeding Damage - First-instar Larvae (Direct)

Control

Agropest
(Thyme + Rosemary)

Nuke (Citric acid)
Second-instar Larval Mortality (Direct)

Proportion of dead larvae

Treatment

- Bee safe
- M Pede
- Ultrafine
- Sierra Natural
- Agropest
- Stylet
- Sufoil-X
- Arte-Guard
- Bushdoctor
- Control
- Nuke
- Thyme Guard
Feeding Damage - Second-instar Larvae (Direct)

Leaf area (mm²) damaged

Thyme Guard  Sierra Natural  Agropest  Control  Ultrafine  Arte-Guard  Bee-safe  Stylet  M-Pede  Sufcoil-X  Bushdoctor  Nuke

Treatment

a ab bc bcd bcde cdef cdefg defg efg efg fg g
Feeding Damage - Second-instar Larvae (Direct)

- Thyme Guard
- Siera Natura Science (Rosemary oil)
- Control
- Nuke (Citric acid)
Feeding Damage – Adults (Direct)

Leaf area (mm$^2$) damaged

Treatment

Arte-Guard, Nuke, Stylet, Sierra-Natural, Thyme Guard, Suffoil-X, Control, Agropect, Ultrafine, Bee-safe, Bushdoctor, M-Pede

abcd

cd
d
Feeding Damage – Adults (Direct)

Arte-Guard
Control
Bushdoctor (Garlic oil)
M-Pede
First-instar Larval Mortality (Indirect)

![Graph showing proportion of dead larvae across different treatments]

- **Proportion of dead larvae**
- **Treatment**

- **Ultrafine**: a
- **Bee safe**: b
- **Stylet**:
- **M.Pede**:
- **Agropest**:
- **Arte-Guard**:
- **Bushdoctor**:
- **Control**:
- **Nuke**:
- **Sierra Natural**:
- **Suffoil-X**:
- **Thyme Guard**:

---

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Tropical Research and Education Center
Feeding Damage - First-instar Larvae (Indirect)

Leaf area (mm$^2$) damaged

- Agropest
- Thyme Guard
- Control
- Ultrafine
- Sierra Natural
- M-Pede
- Nuke
- Stylet
- Arte-Guard
- Bee-safe
- Bushdoctor
- Sufoil-X

Treatment

a, ab, ab, abc, abc, abcd, bcd, cd, cd, d
Feeding Damage - First-instar Larvae (Indirect)

Agropest (Thyme + Rosemary)

Thyme Guard

Control

Suffoil- X
Second-instar Larval Mortality (Indirect)
Feeding Damage - Second-instar Larvae (Indirect)

Leaf area (mm²) damaged

- Agropest
- Control
- Sufol-X
- Nuke
- Sierra Natural
- Bushdoctor
- Arte-Guard
- M-Pede
- Thyme Guard
- Stylet
- Bee-safe
- Ultrafine

Treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Leaf Area (mm²)</th>
<th>Damage Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropest</td>
<td>120</td>
<td>a</td>
</tr>
<tr>
<td>Control</td>
<td>100</td>
<td>a</td>
</tr>
<tr>
<td>Sufol-X</td>
<td>80</td>
<td>ab</td>
</tr>
<tr>
<td>Nuke</td>
<td>60</td>
<td>abc</td>
</tr>
<tr>
<td>Sierra Natural</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Bushdoctor</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Arte-Guard</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>M-Pede</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Thyme Guard</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Stylet</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Bee-safe</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ultrafine</td>
<td>0</td>
<td>c</td>
</tr>
</tbody>
</table>

Note: The damage categories indicate significantly different treatments.
Feeding Damage - Second-instar Larvae (Indirect)

- **Agropest**
  (Thyme + Rosemary)

- **Control**

- **Ultrafine**
Adult Mortality (Indirect)

![Graph showing adult mortality proportions for different treatments.]

- **Ultrafine**: Higher proportion of dead adults compared to others.
- **Bee safe**, **Thyme Guard**, **M-Pede**, **Agropest**, **Nuke**, **Bushdoctor**, **Sylet**, **Suffol-X**, **Control**, **Arte-Guard**, **Sierra Natural**: Low proportion of dead adults.

**Proportion of dead adults**

**Treatment**

- Ultrafine
- Bee safe
- Thyme Guard
- M-Pede
- Agropest
- Nuke
- Bushdoctor
- Sylet
- Suffol-X
- Control
- Arte-Guard
- Sierra Natural
Feeding Damage – Adults (Indirect)

Leaf area (mm²) damaged

Treatment

- Agropest
- Thyme Guard
- Control
- Sierra Natural
- Nuke
- Arte-Guard
- Suffoil-X
- Stylet
- M.Pede
- Bee-safe
- Bushdoctor
- Ultrafine

Legend:

- a
- ab
- b
Feeding Damage – Adults (Indirect)

Agropest
(Thyme + Rosemary)

Control

Ultrafine
<table>
<thead>
<tr>
<th>#</th>
<th>Product Name</th>
<th>Active Ingredient</th>
<th>Rate</th>
<th>Site</th>
<th>EPA Registration #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bioceres WP</td>
<td><em>Beauveria bassiana</em> Strain ANT-03</td>
<td>3 lbs/100 gal</td>
<td>G, N, L</td>
<td>89600-2</td>
</tr>
<tr>
<td>2</td>
<td>Bioceres EC</td>
<td><em>Beauveria bassiana</em> Strain ANT-03</td>
<td>4 ml/L</td>
<td>G, N, I</td>
<td>334-93</td>
</tr>
<tr>
<td>3</td>
<td>BotaniGard 22 WP</td>
<td><em>Beauveria bassiana</em> Strain GHA</td>
<td>2 lbs/100 gal</td>
<td>G, N, L, I</td>
<td>820774-2</td>
</tr>
<tr>
<td>4</td>
<td>PFR-97 20% WDG</td>
<td><em>Isaria fumosorosea</em> Apopka strain 97</td>
<td>2 lbs/100 gal</td>
<td>G, N</td>
<td>70051-19</td>
</tr>
<tr>
<td>5</td>
<td>Met Master</td>
<td><em>Metarhizium anisopliae</em></td>
<td>32 oz/100 gal</td>
<td>G, N, L</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Grandevo</td>
<td><em>Chromobacterium subtsgae</em> strain PRAA4-1T</td>
<td>0.55 oz/0.2 gal</td>
<td>G, F, L</td>
<td>84059-27</td>
</tr>
</tbody>
</table>

Direct spray on *Thrips parvispinus*

1. Bean leaf discs 24mm diameter

2. Five L1, L2 or adults

3. Treatment application → Potter Tower

4. Mortality at 24h, 48h, 72h, 96h and 144h (6 days) post treatment

5. Feeding damage at 144h → Image J
First-instar Larval Mortality (Direct)

![Graph showing Proportion of dead larvae vs Treatment]

- Treatment: Bioceres EC, BotaniGard, Bioceres WP, Control, PFR-97, Met Master, Grandevo
- Proportion of dead larvae: 0.0, 0.2, 0.4, 0.6, 0.8, 1.0

Note: All treatments except Met Master and Grandevo have similar values indicated by 'a'.
Feeding Damage - First-instar Larvae (Direct)

![Graph showing leaf area damaged by different treatments]

- Grandevo
- Control
- Met Master
- BotaniGard
- Bioceres WP
- Bioceres EC
- PFR-97

Leaf area (mm\(^2\)) damaged

- Grandevo: a
- Control: ab
- Met Master: b

Treatment

[Image of a leaf with feeding damage]
Feeding Damage - First-instar Larvae (Direct)

Grandevo

Control

PFR-97
Second-instar Larval Mortality (Direct)

Proportion of dead larvae

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioceres EC</td>
<td>a</td>
</tr>
<tr>
<td>Bioceres WP</td>
<td>b</td>
</tr>
<tr>
<td>Control</td>
<td>b</td>
</tr>
<tr>
<td>BotaniGard</td>
<td>b</td>
</tr>
<tr>
<td>Met Master</td>
<td>b</td>
</tr>
<tr>
<td>PFR-97</td>
<td>b</td>
</tr>
<tr>
<td>Grandevo</td>
<td>b</td>
</tr>
</tbody>
</table>
Feeding Damage - Second-instar Larvae (Direct)

Leaf area (mm$^2$) damaged

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Leaf Area (mm$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFR-97</td>
<td>75 a</td>
</tr>
<tr>
<td>Control</td>
<td>75 a</td>
</tr>
<tr>
<td>Bioceres WP</td>
<td>75 a</td>
</tr>
<tr>
<td>BotaniGard</td>
<td>75 a</td>
</tr>
<tr>
<td>Grandevo</td>
<td>75 a</td>
</tr>
<tr>
<td>Bioceres EC</td>
<td>75 a</td>
</tr>
<tr>
<td>Met Master</td>
<td>75 a</td>
</tr>
</tbody>
</table>

*Note: The treatments with the same letter are not significantly different.*
Feeding Damage - Second-instar Larvae (Direct)

PFR-97

Control

Met Master
Adult Mortality (Direct)

**Proportion of dead adults**

- **Bioceres EC**
- **Control**
- **Grandevo**
- **Bioceres WP**
- **BotaniGard**
- **Met Master**
- **PFR-97**

The graph shows the proportion of dead adults across different treatments. Bioceres EC has the highest proportion of dead adults, indicated by the red box and letter 'a'. Other treatments are labeled with 'b'.
Feeding Damage – Adults (Direct)

Leaf area (mm$^2$) damaged

- Met Master
- BotaniGard
- PFR-97
- Bioceres WP
- Control
- Grandevo
- Bioceres EC

Treatment
Feeding Damage – Adults (Direct)

Met Matser

Control

Bioceres EC
Spray on Plants – Indirect Spray

1. Treatment application → bean plants

2. Bean leaf discs 24mm diameter

3. Five L1, L2 or adults

4. Mortality at 24h, 48h, 72h, 96h and 144h (6 days) post treatment

5. Feeding damage at 144h → Image J
First-instar Larval Mortality (Indirect)

Proportion of dead larvae

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioceres EC</td>
<td>a</td>
</tr>
<tr>
<td>Grandevo</td>
<td>ab</td>
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<tr>
<td>BotaniGard</td>
<td>ab</td>
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<tr>
<td>Bioceres WP</td>
<td>b</td>
</tr>
<tr>
<td>PFR-97</td>
<td>c</td>
</tr>
<tr>
<td>Control</td>
<td>c</td>
</tr>
<tr>
<td>Met Master</td>
<td>c</td>
</tr>
</tbody>
</table>

Abilities with different letters (a, b, c) are statistically different.
Feeding Damage - First-instar Larvae (Indirect)

Leaf area (mm$^2$) damaged

- Control
- Grandevo
- Bioceres WP
- Bioceres EC
- BotaniGard
- PFR-97
- Met Master

Treatment

- a
- a
- ab
- b
Feeding Damage - First-instar Larvae (Indirect)

Grandevo

Control

Met Master
Second-instar Larval Mortality (Indirect)

Proportion of dead larvae

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioceres EC</td>
<td>a</td>
</tr>
<tr>
<td>BotaniGard</td>
<td>ab</td>
</tr>
<tr>
<td>Grandevo</td>
<td>ab</td>
</tr>
<tr>
<td>Bioceres WP</td>
<td>b</td>
</tr>
<tr>
<td>Met Master</td>
<td>c</td>
</tr>
<tr>
<td>PFR-97</td>
<td>c</td>
</tr>
<tr>
<td>Control</td>
<td>c</td>
</tr>
</tbody>
</table>

Note: Proportions followed by different letters differ significantly (Tukey's HSD test, p < 0.05).
Feeding Damage - Second-instar Larvae (Indirect)

![Graph showing leaf area (mm²) damaged by different treatments]

- **Treatment**
  - Bioceres WP
  - Control
  - Grandevo
  - BotaniGard
  - Bioceres EC
  - PFR-97
  - Met Master

- **Leaf area (mm²) damaged**

  - **Bioceres WP**: a
  - **Control**: a
  - **Grandevo**: ab
  - **BotaniGard**: ab
  - **Bioceres EC**: ab
  - **PFR-97**: a
  - **Met Master**: b
Feeding Damage - Second-instar Larvae (Indirect)

Bioceres WP

Control

Met Master
Adult Mortality (Indirect)

Proportion of dead adults

Treatment

- Grandevo
- BotaniGard
- Bioceres EC
- PFR-97
- Met Master
- Control
- Bioceres WP
Feeding Damage – Adults (Indirect)

Leaf area (mm$^2$) damaged

- Grandevo
- Control
- BotaniGard
- Bioceres EC
- PFR-97
- Met Master
- Bioceres WP

Treatment

- Grandevo (a)
- Control (a)
- BotaniGard (ab)
- Bioceres EC (ab)
- PFR-97 (ab)
- Met Master (b)
- Bioceres WP (b)
Feeding Damage – Adults (Indirect)

Grandevo

Control

Bioceres WP
## Overall Efficacy - Chemical Insecticides

<table>
<thead>
<tr>
<th>Treatment</th>
<th>L1 Direct</th>
<th>L1 Indirect</th>
<th>L1 Feeding</th>
<th>L2 Direct</th>
<th>L2 Indirect</th>
<th>L2 Feeding</th>
<th>Adult Direct</th>
<th>Adult Indirect</th>
<th>Adult Feeding</th>
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</tr>
<tr>
<td>Conserve SC</td>
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<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
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<td>Pedestal</td>
<td>X</td>
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<td>X</td>
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<td>X</td>
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<td>X</td>
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</tr>
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<td>Sarisa</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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# Overall Efficacy - Biorational Insecticides

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Take-home Messages

• Rotation is the key to avoid resistance!

• Horticultural oils, biorational insecticides and insecticidal soaps should be considered for rotation

• 1\textsuperscript{st} instar larvae more susceptible

• Adults cause more feeding damage than larvae

• Microbial insecticides show potential \(\rightarrow\) more research
TROPICAL RESEARCH & EDUCATION CENTER

**Thrips parvispinus**

**THRIPS PARVISPINUS RESOURCES**

The invasive thrips, *Thrips parvispinus*, is a polyphagous pest that causes damage to vegetable, ornamental, and fruit crops. This thrips originates

**MORE INFORMATION**

For questions regarding the Thrips parvispinus, please call the Division of Plant Industry Helpline at
Thank You!

Alexandra Revynthi, PhD
Assistant Professor
Ornamental Entomology & Acarology

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Tropical Research and Education Center
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Homestead, FL 33031
arevynthi@ufl.edu
T: +1 786-217-9244

*Thrips parvispinus* Task Force
Miami-Dade County Agricultural Manager's Office

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*Florida Nursery, Growers, and Landscape Association Miami-Dade Chapter*

*Florida Farm Bureau*

*DADE COUNTY*

*National Horticulture Foundation*

*Florida Department of Agriculture and Consumer Services*