By Lane Greer  
NCAT Agriculture Specialist  
June 2000

Introduction

Whiteflies began showing resistance to synthetic insecticides early on, and by the 1980s they were a very serious greenhouse pest. Not only do they feed on plants, but they also produce honeydew, which detracts from the plants' appearance and attracts other insects and sooty mold. Whiteflies can also transmit plant viruses. The mere presence of whiteflies in a greenhouse will stop customers from buying your product.

Abstract: This publication focuses on integrated pest management for greenhouse whitefly on both vegetable and ornamental crops. It is designed to complement the ATTRA publication *Integrated Pest Management for Greenhouse Crops*, which discusses techniques for good greenhouse supervision. Monitoring of whiteflies, biological controls, biopesticides, and insect growth regulators are discussed below. The appendices include information on the newest biopesticides and biological control organisms.

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Several species of whiteflies attack greenhouse plants, and they typically have a wide host range and resist insecticides. Greenhouse tomatoes and poinsettias are especially plagued by whiteflies. The most common whiteflies on greenhouse crops are the greenhouse whitefly (*Trialeurodes vaporariorum*), sweetpotato whitefly (*Bemisia tabaci*) and the silverleaf whitefly (*Bemisia argentifolii*).

The various whitefly species and biotypes look very much alike, but they have subtle physiological differences. These differences can
cause them to respond differently to control strategies. Because control measures must be selected according to the type of whitefly present, accurate identification is critical to successful control. The Cooperative Extension Service is an excellent resource for assistance with pest identification. There are also several web sites that provide pictures of the various whiteflies. See the Web Sites section for more information.

**Crop Scouting and Trapping**

Plants should be visually inspected for signs of a whitefly infestation—e.g., off-color or stunted plants. A hand lens is useful for systematically inspecting a number of individual plants for the presence of eggs, nymphs or adults. Both the upper and lower leaf surfaces should be inspected. It is important to check the greenhouse in the same pattern on each scouting trip. Locations where whiteflies are found should be flagged so that population development and control efforts can be evaluated. Scouting frequency should be increased during warm weather as whitefly populations multiply faster then.

Trapping with yellow sticky cards, both inside and outside the greenhouse, is essential for a successful whitefly management program. The cards are used to detect and monitor population levels. As a general rule, 1 to 4 cards spaced evenly throughout 1000 square feet of greenhouse are sufficient (1). A generally acceptable threshold for whiteflies is 0.5 per card per day when the crop is young, and 2 per card per day as the crop reaches maturity (2). Traps should be hung level with the tops of the plants since whiteflies are most attracted to young foliage. Doors, vents and other openings where whiteflies can enter the greenhouse are other good sites to hang yellow sticky cards.

Researchers in California have successfully used silver-painted pot spaces and silver polyethylene mulch to control whiteflies on greenhouse poinsettias (3). The reflective materials were used in conjunction with yellow sticky cards or tape and resulted in significantly enhanced trapping of whiteflies, relative to controls with sticky traps only.

Greenhouse plastics themselves may have significant influence on the initial attraction of insects into greenhouses. A study from the late 1990s showed that silverleaf whiteflies preferred to enter greenhouses covered with film that transmitted higher levels of ultraviolet light (4).

**Biological Control**

Several types of beneficial organisms are available for biological control of whiteflies. The parasitic wasp *Encarsia formosa* preys on immature whiteflies and is commonly used for greenhouse whitefly. *Encarsia* wasps kill whitefly nymphs in one of two ways: they either lay an egg inside the nymph, providing food for their young, or they kill the nymph right away and feed on the fluids inside of it (2). Greenhouse whitefly pupae that have been parasitized by *Encarsia formosa* turn black; silverleaf whitefly pupae turn amber-brown (2). The cost of *E. formosa* is comparable to foliar pesticides (2).

Sweetpotato and silverleaf whiteflies are not well controlled by *Encarsia formosa*. Two other wasp parasites, *Encarsia luteola* and *Eretmocerus californicus* are commercially available for control of these species, but *E. formosa* remains the mainstay of most whitefly biological control programs due to the expense and intermittent availability of these other beneficials (5). Researchers are also examining different strains of *E. formosa* to determine their effectiveness against sweetpotato and silverleaf whiteflies.

Mark Hoddle, University of California, Riverside, has done some recent research dealing with *Eretmocerus eremicus*. *E. eremicus* was effective for silverleaf whitefly control and is best used in combination with the insect growth regulators Precision™ or Applaud™. Enstar™ was not compatible with natural enemies he tested. Biological control should be used only at low whitefly levels (less than one nymph per 10 cuttings) and must be regularly evaluated (6).
Mark has also compared the effectiveness of *Encarsia formosa* and *Eretmocerus californicus* on silverleaf whitefly. In a 1996 study, both parasitoids controlled whiteflies at a 99% control rate. However, fewer numbers of *E. californicus* had to be released, which would result in cost savings for growers. Another benefit: Fewer parasitoids meant more food for each, so the reproduction rate was much higher (7).

*Delphastus pusillus*, sometimes called the whitefly destroyer, is a very small, black ladybird beetle that attacks all stages of whiteflies, but prefers eggs and nymphs. The females lay their eggs within clusters of whitefly eggs. Adults can consume 160 eggs or 12 large nymphs every day. A larva consumes 1000 whitefly eggs during its development. These beetles perform best at temperatures between 65 and 90°F, with relative humidity above 70%. These predators can be used in combination with *Encarsia* species (8).

See Appendix I for a complete listing of biological controls for whiteflies.

## Biopesticides and Biorational Pesticides

Some microorganisms also control whiteflies. For instance, the fungus *Beauveria bassiana* (trade names Naturalis-O™ and BotaniGard™), is effective against eggs, immature and adult whiteflies. Thorough coverage of leaf undersides and correct timing of applications result in best control.

Another fungus, *Paecilomyces fumosoroseus* (trade name PFR-97™), is now commercially available. It controls whiteflies, aphids, and spider mites. Both *B. bassiana* and *P. fumosoroseus* need high humidity for best results.

Several least-toxic, or biorational, pesticides have been evaluated for their effectiveness against the different whitefly species. These include neem-based formulations (Neemazad™ and Azatin™ are two registered products), insecticidal soap (M-Pede™), and horticultural oil. Enhanced whitefly control is achieved with thorough spray coverage. Wider plant spacing and removal of dead lower leaves improve pesticide coverage and pest control.

A 1995 study conducted in Florida compared the effectiveness of Sunspray Ultra-Fine Spray Oil™, M-Pede insecticidal soap, a sucrose ester extract surfactant derived from tobacco, and Garlic Barrier™, for killing and repelling silverleaf whiteflies (*Bemisia argentifolii*) on tomatoes. Sunspray provided the best control, followed by M-Pede and the tobacco surfactant. The Garlic Barrier did not provide any control (9).

Researchers at Ohio State University showed that mortality rates of silverleaf whitefly were higher when BotaniGard was used together with Adept™ (an insect growth regulator), insecticidal soaps, horticultural oil, Fulex SO-2000, glycerol and a yeast extract (10). In most cases, the rate of infection and kill was faster than with BotaniGard alone. This is important because it would allow more biopesticides and biorationals to be used retroactively. When several substances are used together, they are applied at lower-than-recommended rates (one-tenth to one-half were used in this study). The researchers are trying to "develop management guidelines on spray-tank mixes that would enhance fungal efficacy" (10).

See Appendix II for a complete listing of biopesticides and biorational pesticides available for whitefly management.

## Insect Growth Regulators

Insect growth regulators (IGRs) are another least-toxic pesticide control option. IGRs typically kill insects by disrupting their development. They have a complex mode of action that precludes insects from rapidly developing resistance. IGRs can work in one of several ways: 1) they can mimic juvenile hormones, so that insects never enter the reproductive stage of development; 2) they can interfere with the production of chitin, which makes up the shell of most insects; or 3) they can interfere with the molting process.
IGRs usually work through ingestion, so good spray coverage is essential. They generally don’t affect non-target species—such as humans, birds, fish or other vertebrates. For most IGRs there are minimal re-entry restrictions. IGRs typically take several days to have an effect on pest populations. Because IGRs do not affect mature insects, adultbeneficialsecreted into the greenhouse after an IGR application are not likely to be affected. Use of IGRs is generally prohibited by organic certification organizations because the products are synthetic.

IGRs can sometimes be used in conjunction with biological control efforts and may provide growers with a “safety net” should beneficiafail to keep the pests below economically damaging levels. The table below lists some well-known insect growth regulators. (See the Resources section for suppliers’ contact information.)

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
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</thead>
<tbody>
<tr>
<td>Adept, Dimlin</td>
<td>Uniroyal Chemicals</td>
</tr>
<tr>
<td>Azatin</td>
<td>Hydro-Gardens, Olympic Horticultural Products</td>
</tr>
<tr>
<td>Citation, Precision</td>
<td>Novartis</td>
</tr>
<tr>
<td>Distance</td>
<td>Valent</td>
</tr>
<tr>
<td>Enstar II</td>
<td>Wellmark Intl.</td>
</tr>
<tr>
<td>Neemazad, Neemix</td>
<td>Thermo Trilogy</td>
</tr>
<tr>
<td>Preclude, Pyrigro</td>
<td>Whitmire Micro-Gen</td>
</tr>
</tbody>
</table>

### Controlled Atmosphere

Changing the composition of the atmosphere in the greenhouse by either reducing oxygen or increasing carbon dioxide appears to provide some control of greenhouse whiteflies, especially adults. Reduced-oxygen experiments by Dr. Susan Han at the University of Massachusetts resulted in 100% adult mortality after less than two hours of exposure, though eight-hour treatments were needed to control most (about 80%) of the eggs and pupae (11).

Horticulturists at North Carolina State University reported that whitefly population levels were lower in greenhouses where carbon dioxide enrichment occurred daily for about eight hours. The likely reason for the population reductions is that plants grown in atmospheres with high carbon dioxide levels tend to have higher concentrations of carbohydrates in the plant tissue relative to nitrogen, resulting in a nitrogen-dilute diet for the whiteflies. Lower dietary nitrogen would slow the growth and reproduction of the pests, without adversely affecting crop yields or quality (12).

### References


Web Sites

http://www.ifas.ufl.edu/~ent2/wfly/index.html
USDA's Whitefly Knowledgebase

http://www.imok.ufl.edu/entlab/projects/whitefly.htm
Information on silverleaf whitefly from the University of Florida

http://pwa.ars.usda.gov/wcrl/wwwghome.html
Whitefly Working Group's site on whitefly research at the University of Arizona

Suppliers

A-1 Unique Insect Control
5504 Sperry Dr.
Citrus Heights, CA 95621
916-961-7945
916-967-7082 fax
Email: ladybugs@a-1unique.com
http://www.a-1unique.com

ARBICO Inc.
PO Box 4247 CRB
Tucson, AZ 85738
800-SOS-BUGS
520-825-2038 fax
Email: arbico@aol.com
http://www.arbico.com

Beneficial Insectary
14751 Oak Run Rd.
Oak Run, CA 96069
800-477-3715
530-472-3523 fax
Email: bi@insectary.com
http://www.insectary.com

BioLogic Co.
PO Box 177
Willow Hill, PA 17271
Email: pyealber@epix.net
717-349-2789/292

Caltec Agri-Marketing Services
PO Box 576155
Modesto, CA 95357
209-575-1295
209-575-0366 fax
http://www.caltecag.com

Florikan ESA Corp.
1523 Edger Place
Sarasota, FL 34240
800-322-8666
941-377-3633 fax
Email: buglady@aol.com

The Green Spot, Ltd.
93 Priest Rd.
Nottingham, NH 03290-6204
603-942-8925
603-942-8932
603-942-5027 voice mail
Email: GrnSpt@internetMCI.com

Harmony Farm Supply
3244 Hwy. 116 No. F
Sebastopol, CA 95472
707-823-9125
707-823-1734 fax
Email: kate@harmonyfarm.com
http://www.harmonyfarm.com
Hot Pepper Wax, Inc.
305 Third St.
Greenville, PA 16125
888-667-3785
724-646-2302 fax
Email: lindag@hotpepperwax.com
http://www.hotpepperwax.com

Hydro-Gardens, Inc.
PO Box 25845
Colorado Springs, CO 80932
719-495-2266
719-531-0506 fax
http://www.hydro-gardens.com

International Technology Services Inc.
PO Box 19227
Boulder, CO 80308-2227
303-473-9141
303-473-9143 fax
Email: intertechserv@worldnet.att.net

IPM Laboratories
PO Box 300
Locke, NY 13092-0099
315-497-2063
315-497-3129 Fax
http://www.ipmlabs.com

M&R Durango, Inc.
PO Box 886
Bayfield, CO 81122
970-259-3521
970-259-3857 fax
http://www.goodbug.co

Mycogen Crop Protection
5501 Oberlin Dr.
San Diego, CA 92121
800-745-7476
619-453-9089 fax
Email: soares@mycogen.com

Mycotech Corp.
PO Box 4109
Butte, MT 59702-4109
800-383-4310
406-782-9912 fax
Email: mycotech@montana.com

Natural Pest Controls
8864 Little Creek Dr.
Orangeville, CA 95662
916-726-0855
916-726-0855 fax
Email: natpestc@cwnet.com
http://www.natural-pest-control.com

Nature’s Control
PO Box 35
Medford, OR 97501
800-698-6250
541-899-9121 fax
Email: bugsnc@teleport.com

Novartis Crop Protection, Inc.
PO Box 18300
Greensboro, NC 27419-8300
800-395-8873
http://www.cp.us.novartis.com

Olympic Horticultural Products
PO Box 1885
Bradenton, FL 34206-1885
800-659-6745
http://www.hortnet.com/olympic/

Plant Health Care
440 William Pitt Way
Pittsburgh, PA 15238
800-421-9051
http://www.planthealthcare.com/

Praxis
2723 116th Ave.
Allegan, MI 49010
616-673-2793
616-673-2793 fax
Email: praxis-ibc@datawise.net
http://www.praxis-ibc.com

Rincon-Vitova Insectaries, Inc.
PO Box 1555
Ventura, CA 93002
800-248-2847
805-643-6267 fax
Email: bugnet@west.net
http://www.rinconvitova.com
The ATTRA Project is operated by the National Center for Appropriate Technology under a grant from the Rural Business-Cooperative Service, U.S. Department of Agriculture. These organizations do not recommend or endorse products, companies, or individuals. ATTRA is located in the Ozark Mountains at the University of Arkansas in Fayetteville at P.O. Box 3657, Fayetteville, AR 72702. ATTRA staff members prefer to receive requests for information about sustainable agriculture via the toll-free number 800-346-9140.
## Appendix I: Beneficial Organisms

<table>
<thead>
<tr>
<th>Organism</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Chrysopa carnea</em></td>
<td>Natural Pest Controls, Beneficial Insectary, Caltec, Arbico, A-1 Unique Insect Control, Praxis, Rincon-Vitova, Hydro-Gardens</td>
<td>aphids, caterpillars, mealybugs, scales, spider mites, thrips, <strong>whiteflies</strong></td>
<td>1 lacewing/5-30 aphids; 1000 eggs/200 sq. ft. Apply every 1-3 as needed. May arrive as eggs, immatures, or adults.</td>
</tr>
<tr>
<td><em>Chrysoperla rufilabris</em></td>
<td>Arbico, Beneficial Insectary, IPM Labs., A-1 Unique Insect Control, Nature’s Control, Praxis, Rincon-Vitova</td>
<td>see above</td>
<td></td>
</tr>
<tr>
<td><em>Chrysoperla spp.</em></td>
<td>M&amp;R Durango, Florikan, Green Spot</td>
<td>see above</td>
<td></td>
</tr>
<tr>
<td><em>Coleomegilla imaculata</em></td>
<td>Arbico</td>
<td>aphids, caterpillars, mites, scales, thrips, <strong>whiteflies</strong></td>
<td>1/sq. ft.; shipped as larvae and eggs.</td>
</tr>
<tr>
<td><em>Deraeocoris brevis</em></td>
<td>Green Spot</td>
<td>aphids, <strong>whiteflies</strong>, thrips</td>
<td></td>
</tr>
<tr>
<td><em>Delphastus pusillus</em></td>
<td>Arbico, IPM Laboratories, Nature’s Control, Harmony Farm Supply, Hydro-Gardens, Rincon-Vitova, Praxis, Green Spot</td>
<td><strong>greenhouse whitefly</strong>, <strong>sweetpotato whitefly</strong></td>
<td>2000/3000 sq. ft.; temperature should be 60-85°F. Will feed on spider mites if no whiteflies are available. Should be used along with <em>Encarsia formosa</em> and traps.</td>
</tr>
<tr>
<td>Organism</td>
<td>Supplier</td>
<td>Pests Controlled</td>
<td>Application/Comments</td>
</tr>
<tr>
<td>-----------------------------------</td>
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</tr>
<tr>
<td><strong>Encarsia formosa</strong></td>
<td>Arbico, Nature’s Control, IPM Laboratories, Intl. Technology Services, Florikan, Harmony Farm Supply, Hydro-Gardens, Natural Pest Controls, A-1 Unique Insect Control, Praxis, Rincon-Vitova, Green Spot</td>
<td>greenhouse whitefly, sweetpotato whitefly, silverleaf whitefly</td>
<td>Release 1/sq. ft. weekly for 3 weeks when pest numbers are low. Release 2-4/sq. ft. when pest numbers are high. Apply when pests are first observed. Should be used in conjunction with traps. May be used along with other beneficials. <em>E. formosa</em> is very susceptible to chemicals. Temps. should be at least 64°F. Re-apply every two weeks.</td>
</tr>
<tr>
<td><strong>Encarsia luteola</strong> or <strong>E. deserti</strong></td>
<td>Hydro-Gardens</td>
<td>whiteflies</td>
<td></td>
</tr>
<tr>
<td><strong>Eretmocerus californicus</strong> or <strong>E. eremicus</strong> (parasitic wasp)</td>
<td>Beneficial Insectary, Hydro-Gardens, IPM Labs., Arbico, Praxis, Green Spot</td>
<td>greenhouse whitefly, silverleaf whitefly, sweetpotato whitefly</td>
<td>Capable of handling hot, dry temperatures. Introduce when whiteflies are first observed. May be used in combination with other beneficials such as green lacewings. <em>Eretmocerus</em> is more tolerant of pesticides than <em>Encarsia formosa</em>.</td>
</tr>
<tr>
<td><strong>Harmonia axyridis</strong> (Asian lady beetle)</td>
<td>Green Spot</td>
<td>scale, whiteflies, mealybugs, aphids</td>
<td>Temps. should be 70-85°F; humidity around 70%.</td>
</tr>
<tr>
<td><strong>Hippodamia convergens</strong> (lady beetle) (predator)</td>
<td>A-1 Unique Insect Control, Arbico, Caltec, IPM Laboratories, Natural Pest Controls, Harmony Farm Supply, Green Spot, Nature's Control, Hydro-Gardens, Praxis</td>
<td>aphids, mites, whiteflies</td>
<td>Release at dusk near an immediate food source. Spray plants with water prior to release.</td>
</tr>
</tbody>
</table>
Appendix II: Biorational Pesticides

Azadirachtin – extract of neem seed; IGR that works through contact or ingestion

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azatin</td>
<td>Green Spot</td>
<td>aphids, caterpillars, fungus gnats, leafhoppers, leafminers, Western flower thrips, whiteflies, psyllids</td>
<td>4 hours</td>
<td>Apply when pests first appear.</td>
</tr>
<tr>
<td>Neemazad Thermo Trilogy</td>
<td></td>
<td>aphids, caterpillars, thrips, greenhouse whitefly, leafminers, sweetpotato whitefly, psyllids, leafhoppers</td>
<td>12 hours</td>
<td>Cannot be applied through irrigation. Low rate can be used as a preventative.</td>
</tr>
</tbody>
</table>

*Beauveria bassiana* – fungus that works through contact; exposure to non-target insects should be avoided

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturalis-O SePro</td>
<td></td>
<td>aphids, caterpillars, mites, psyllids, thrips, whiteflies</td>
<td>4 hours</td>
<td>Apply when insects first appear and repeat every 7-10 days. Need good spray coverage. Not compatible with other fungicides.</td>
</tr>
<tr>
<td>BotaniGard Mycotech</td>
<td></td>
<td>giant whitefly, green peach aphid, black vine weevil, other aphids and whiteflies, thrips, leafhoppers, psyllids, white grubs</td>
<td>12 hours</td>
<td>See above.</td>
</tr>
</tbody>
</table>

Garlic extracts

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garlic Gard Soil Technologies</td>
<td></td>
<td>repels many insects</td>
<td></td>
<td>Use late in the day. Can be mixed with fish oil or horticultural oil.</td>
</tr>
</tbody>
</table>
Garlic Barrier Green Spot repels many insects 4 hours Do not use in combination with pollinating bees.

Horticultural oil – includes dormant and summer superior oils

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Seasons Green Spot</td>
<td>aphids, mealybugs, scales, thrips, <strong>whiteflies</strong>, spider mites</td>
<td>4 hours</td>
<td>Use on sunny days to promote rapid drying and decrease chance of phytotoxicity. Not compatible with beneficials.</td>
<td></td>
</tr>
</tbody>
</table>

Hot pepper wax – contains capsaicin, paraffin, and mineral oil

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Pepper Wax</td>
<td>Green Spot</td>
<td>aphids, loopers, beet army-worms, mites, <strong>whiteflies</strong>, thrips, mealybugs, etc.</td>
<td>4 hours</td>
<td>Also contains herbal essential oils. Not compatible with beneficials.</td>
</tr>
<tr>
<td>Hot Pepper Wax</td>
<td>Hot Pepper Wax, Inc.</td>
<td>see above</td>
<td></td>
<td></td>
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Insecticidal soap – contains potassium salts of fatty acids

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<thead>
<tr>
<th>Brand Name</th>
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<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-Pede</td>
<td>Mycogen</td>
<td>aphids, mealybugs, scales, thrips, <strong>whiteflies</strong>, spider mites</td>
<td>12 hours</td>
<td>Phytotoxicity is often a concern, esp. after repeated applications.</td>
</tr>
<tr>
<td>Safer</td>
<td>Green Spot</td>
<td>see above</td>
<td>4 hours</td>
<td>See above.</td>
</tr>
<tr>
<td>Insecticidal soap</td>
<td>Olympic</td>
<td>see above</td>
<td></td>
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</tr>
</tbody>
</table>
Neem oil – multi-purpose organic insecticide/fungicide/miticide; kills eggs, larval and adult stages of insects

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trilogy 90EC</td>
<td>Thermo Trilogy</td>
<td><strong>greenhouse whitefly, silver-leaf whitefly, sweetpotato whitefly</strong>, thrips, whiteflies, leafminers, aphids, mites, psyllids, San Jose scale, scale, spider mites, downy mildew, powdery mildew, <em>Alternaria</em>, <em>Botrytis</em>, etc.</td>
<td>4 hours</td>
<td>Apply at first signs of damage. Repeat every 7-10 days as needed.</td>
</tr>
<tr>
<td>Triact 90EC</td>
<td>Thermo Trilogy</td>
<td>see above</td>
<td>4 hours</td>
<td>For ornamental crops only.</td>
</tr>
</tbody>
</table>

*Paecilomyces fumosoroseus* – fungus

<table>
<thead>
<tr>
<th>Brand Name</th>
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<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFR-97</td>
<td>Olympic</td>
<td><strong>whiteflies</strong>, aphids, spider mites, <em>Western flower thrips</em></td>
<td>4 hours</td>
<td></td>
</tr>
</tbody>
</table>

Soybean oil

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Supplier</th>
<th>Pests Controlled</th>
<th>REI</th>
<th>Application/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Natur'l Spray Oil</td>
<td>Stoller</td>
<td>aphids, fungus gnats, lace bugs, leafminers, scales, mealybugs, spider mites, <strong>whiteflies</strong></td>
<td>12 hours</td>
<td></td>
</tr>
</tbody>
</table>