



# Current Report

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## Management of Insects and Mites in Greenhouse Floral Crops

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Insect and mite pests of greenhouse crops present unique challenges with respect to their management and control. Plants are frequently moved in and out of the greenhouse, creating opportunities for repeated introduction of pests. Crops are grown year-round in a protected environment that is favorable for pest development. Additionally, greenhouse pests often exist in the absence of their natural enemies unless predators and parasitoids are intentionally introduced.

Many greenhouse pest populations can be reduced by implementing and following a comprehensive integrated pest management (IPM) plan. At a minimum, such a plan should include the following:

- a regular pest monitoring program coupled with careful recordkeeping
- implementation of exclusion techniques and careful sanitation practices when handling new plants and growing media
- thoroughly cleaning the greenhouse after each production cycle
- keeping all openings into the greenhouse (doors, screens, ventilators) in good repair
- cultural practices such as mowing grass around the greenhouse to reduce pest harborages
- introduction and/or conservation of biological control agents when appropriate

Chemical pesticides can be part of a comprehensive IPM plan, but should not substitute for good horticultural practices, or be used as “preventative insurance” against pests. Such practices are rarely economically or environmentally justifiable, and provide a recipe for the selection of pests that are resistant to the pesticide. Pesticides should be applied using specified application methods to assure optimal control. It is especially important to follow all safety precautions when applying pesticides in a greenhouse due to its enclosed environment. Follow ALL label directions, especially all Worker Protection Standards. Pesticide recommendations in this publication are correct as of the “Modified Date.” Always check the label that came with the purchased pesticide for the most current application directions and restrictions. More information on greenhouse pest management can be found in the following Oklahoma Cooperative Extension Service publications:

- HLA-6707, Pesticide Use and Safety in the Nursery and Greenhouse
- HLA-6710, Integrated Pest Management in Commercial Greenhouses: An Overview of Principles and Practices
- HLA-6711, IPM- Scouting and Monitoring for Pests in Commercial Greenhouses
- E-1011, Arthropod Pest Management in Greenhouses and Interiorscapes

| Pest         | Pesticide Common Name     | Pesticide Trade Name              | Pesticide Class* | REI**    | Comments  |
|--------------|---------------------------|-----------------------------------|------------------|----------|---|
| Aphids       | Abamectin                 | Avid                              | 6                | 12       | Has translaminar-systemic activity as a spray.  |
|              | Acephate                  | Orthene/Precise                   | 1B               | 24/12    | Has translaminar-systemic activity as a spray. Check label for phytotoxicity information. |
|              | Acetamiprid               | Tristar                           | 4A               | 12       | Has translaminar-systemic activity as a spray.  |
|              | Azadirachtin              | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B              | 4/12/4/4 | Slow-acting. Works best when tank mixed with other insecticides.                          |
|              | <i>Beauveria bassiana</i> | Botanigard/Naturalis/<br>Mycotrol | M                | 4/4/4    | 3 to 5 applications may be needed.  |
|              | Bifenazate + Abamectin    | Sirocco                           | 25 + 6           | 12       | Suppression only.   |
|              | Bifenthrin                | Attain/Talstar†                   | 3                | 12/12    |   |
| Chlorpyrifos | Duraguard                 | 1B                                | 24               |          |   |

| <i>Pest</i>         | <i>Pesticide<br/>Common Name</i>                        | <i>Pesticide<br/>Trade Name</i>   | <i>Pesticide<br/>Class*</i> | <i>REI**</i> | <i>Comments</i>  |
|---------------------|---|-----------------------------------|-----------------------------|--------------|--|
|                     | Chlorpyrifos + Cyfluthrin                               | Duraplex                          | 1B + 3                      | 24           | Aerosol formulation.   |
|                     | Cyfluthrin  | Decathlon                         | 3                           | 12           |  |
|                     | Dinotefuran   | Safari                            | 4A                          | 12           | Systemic insecticide with long residual activity. Highly water soluble.  |
|                     | Fenoxycarb  | Preclude                          | 7B                          | 12           |  |
|                     | Flonicamid  | Aria                              | 9B                          | 12           | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|                     | Fluvalinate   | Mavrik                            | 3                           | 12           |  |
|                     | Imidacloprid  | Marathon/Benefit/Mantra           | 4A                          | 12/12/12     | Systemic insecticide with long residual activity.  |
|                     | Insecticidal soap<br>(potassium salts of fatty acids)   | M-Pede                            | NS                          | 12           | Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.  |
|                     | Kinoprene   | Enstar AQ                         | 7A                          | 4            | Slow acting. Only works on young aphids.   |
|                     | Methiocarb  | Mesuroil                          | 1A                          | 24           |  |
|                     | Neem oil<br>(clarified hydrophobic extract of neem oil) | Triact Oil                        | UN                          | 4            | Short residual activity. See note 2.   |
|                     | Paraffinic oil  | Sunspray Ultra-Fine Oil           | UN                          | 4            | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|                     | Permethrin  | Astro                             | 3                           | 12           |  |
|                     | Petroleum oil   | Ultra-Pure Oil/SuffOil-X          | NS                          | 4/4          | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|                     | Pymetrozine   | Endeavor                          | 9B                          | 12           | Has systemic activity. Prevents insects from feeding by blocking mouthparts.   |
|                     | Pyrethrins  | Pyreth-It/Pyrethrum               | 3                           | 12/12        |  |
|                     | Spirotetramat   | Kontos                            | 23                          | 24           | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|                     | Thiamethoxam  | Flagship                          | 4A                          | 12           | Systemic insecticide. Applied as a foliar or drench.   |
|                     | Tolfenpyrad   | Hachi-Hachi                       | 21                          | 12           | Do not make more than two applications per crop cycle.   |
| <b>Caterpillars</b> | Acephate  | Orthene/Precise                   | 1B                          | 24/12        | Check label for phytotoxicity information.   |
|                     | Azadirachtin  | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B                         | 4/12/4/4     | Azatin may be used on greenhouse-grown vegetables.   |
|                     | <i>Bacillus thuringiensis</i><br>var. <i>kurstaki</i>   | Dipel                             | 11B2                        | 4            | May be used on greenhouse-grown vegetables. Insects must consume material.   |
|                     | <i>Beauveria bassiana</i>                               | Botanigard/Naturalis/<br>Mycotrol | M                           | 4/4/4        | Works best when tank mixed with other insecticides. 3 to 5 applications may be needed.   |
|                     | Bifenthrin  | Attain/Talstar <sup>1</sup>       | 3                           | 12/12        |  |
|                     | Chlorfenapyr  | Pylon                             | 13                          | 12           | Has translaminar-systemic activity. Do not make more than 2 applications in a sequence, or more than 3 times total per growing cycle. Check label for phytotoxicity information. |
|                     | Chlorpyrifos  | DuraGuard                         | 1B                          | 24           |  |
|                     | Chlorpyrifos + Cyfluthrin                               | Duraplex                          | 1B + 3                      | 24           | Aerosol formulation.   |
|                     | Cyfluthrin  | Decathlon                         | 3                           | 12           |  |
|                     | Fenpropathrin   | Tame <sup>†</sup>                 | 3                           | 12           |  |
|                     | Fluvalinate   | Mavrik                            | 3                           | 12           | Do not make more than 2 applications per growing cycle. Do not apply to poinsettias.   |
|                     | Insecticidal soap<br>(potassium salts of fatty acids)   | M-Pede                            | NS                          | 12           | Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.  |
|                     | Novaluron   | Pedestal                          | 15                          | 12           |  |
|                     | Permethrin  | Astro                             | 3                           | 12           |  |
|                     | Pyridalyl   | Overture                          | UN                          | 12           | Has translaminar activity. Do not make more than 3 applications per growing cycle. Apply when larvae are small and actively feeding.   |

| <i>Pest</i>                      | <i>Pesticide<br/>Common Name</i>                         | <i>Pesticide<br/>Trade Name</i>          | <i>Pesticide<br/>Class*</i> | <i>REI**</i> | <i>Comments</i>  |
|----------------------------------|--|--|-----------------------------|--------------|--|
|                                  | Spinosad   | Conserve                                 | 5                           | 4            |  |
|                                  | Tolfenpyrad  | Hachi-Hachi                              | 21A                         | 12           | Works best on early instars.   |
| <b>Fungus Gnats<br/>(Adults)</b> | Bifenthrin   | Attain/Talstar†                          | 3                           | 12/12        |  |
|                                  | Cyfluthrin   | Decathlon                                | 3                           | 12           |  |
|                                  | Fenpropathrin  | Tame†                                    | 3                           | 12           |  |
|                                  | Fluvalinate  | Mavrik                                   | 3                           | 12           | Do not make more than 2 applications per growing cycle. Do not apply to poinsettias.   |
|                                  | Insecticidal soap<br>(potassium salts of fatty acids)    | M-Pede                                   | NS                          | 12           |  |
|                                  | Permethrin   | Astro                                    | 3                           | 12           |  |
| <b>Fungus Gnats<br/>(Larvae)</b> | Acetamiprid  | Tristar                                  | 4A                          | 12           | Has translaminar-systemic activity as a spray.   |
|                                  | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol        | 18B                         | 4/12/4/4     | Azatin may be used on greenhouse-grown vegetables.   |
|                                  | <i>Bacillus thuringiensis</i><br>var. <i>israelensis</i> | Gnatrol                                  | 11A1                        | 4            | Slow-acting. May be used on greenhouse-grown vegetables.   |
|                                  | Chlorfenapyr   | Pylon                                    | 13                          | 12           | Do not make more than 2 applications in a sequence, or more than 3 times total per growing cycle. Check label for phytotoxicity information.   |
|                                  | Chlorpyrifos   | Duraguard                                | 1B                          | 24           | Microencapsulated formulation.   |
|                                  | Cyromazine   | Citation                                 | 17                          | 12           | Slow-acting.   |
|                                  | Diflubenzuron  | Adept                                    | 15                          | 12           | Prevents insects from molting. Cannot be used on poinsettias, hibiscus, or Reiger begonia. Long residual activity.   |
|                                  | Kinoprene  | Enstar AQ                                | 7A                          | 4            | Slow-acting.   |
|                                  | Phytoseiid mites   |  | BLO                         | 0            | Certain species of these predatory mites are active in the soil. Check label for specific site requirements.   |
|                                  | Pyriproxyfen   | Distance                                 | 7C                          | 12           | Read label for precautions when using on poinsettias.  |
|                                  | Steinernema feltiae                                      | Nemasys/NemaShield/<br>Scanmask/Entoneem | BLO                         | 0/0/0/0      | Beneficial nematode that attacks fungus gnat larvae. Apply before fungus gnat populations are high. Compatible with many pesticides, but some products may reduce efficacy of nematodes. |
| <b>Leafminers</b>                | Abamectin  | Avid                                     | 6                           | 12           | Active on larvae. Has translaminar-systemic activity.  |
|                                  | Acephate   | Orthene/Precise                          | 1B                          | 24/12        | Active on larvae. Has translaminar-systemic activity as a spray. Check label for phytotoxicity information.  |
|                                  | Acetamiprid  | Tristar                                  | 4A                          | 12           | Has translaminar-systemic activity as a spray.   |
|                                  | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol        | 18B                         | 4/12/4/4     | Active on larvae. May be used on greenhouse-grown vegetables.  |
|                                  | Bifenazate + Abamectin                                   | Sirocco                                  | 25 + 6                      | 12           | Effective against boxwood leafminer.   |
|                                  | Cyromazine   | Citation                                 | 17                          | 12           | Active on larvae.  |
|                                  | Dinotefuran  | Safari                                   | 4A                          | 12           | Systemic insecticide with long residual activity. Highly water soluble.  |
|                                  | Fenoxycarb   | Preclude                                 | 7B                          | 12           |  |
|                                  | Imidacloprid   | Marathon/Benefit/Mantra                  | 4A                          | 12/12/12     | Systemic insecticide with long residual activity.  |
|                                  | Novaluron  | Pedestal                                 | 15                          | 12           | Suppression only. Do not apply to poinsettias.   |
|                                  | Spinosad   | Conserve                                 | 5                           | 4            | Has translaminar-systemic activity.  |
|                                  | Thiamethoxam   | Flagship                                 | 4A                          | 12           | Systemic insecticide. Applied as a foliar or drench.   |

| <i>Pest</i>                              | <i>Pesticide<br/>Common Name</i>                         | <i>Pesticide<br/>Trade Name</i>   | <i>Pesticide<br/>Class*</i> | <i>REI**</i>   | <i>Comments</i>  |
|--|--|-----------------------------------|-----------------------------|--|--|
| <b>Mealybugs</b>                         | Acephate   | Orthene/Precise                   | 1B                          | 24/12  | Has translaminar-systemic activity as a spray. Check label for phytotoxicity information.  |
|  | Acetamiprid  | Tristar                           | 4A                          | 12   | Has translaminar-systemic activity as a spray.   |
|  | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B                         | 4/12/4/4   |  |
|  | <i>Beauveria bassiana</i>                                | Botanigard/Naturalis/<br>Mycotrol | M                           | 4/4/4  | Works best when tank mixed with other insecticides. 3 to 5 applications may be needed.   |
|  | Bifenthrin   | Attain/Talstar†                   | 3                           | 12/12  | Works best on the crawler stages.  |
|  | Buprofezin   | Talus                             | 16                          | 12   | Works best on the crawler stages.  |
|  | Cyfluthrin   | Decathlon                         | 3                           | 12   | Works best on the crawler stages.  |
|  | Dinotefuran  | Safari                            | 4A                          | 12   | Systemic insecticide with long residual activity. Highly water soluble.  |
|  | Fenpropathrin  | Tame†                             | 3                           | 24   | Works best on the crawler stages.  |
|  | Flonicamid   | Aria                              | 9B                          | 12   | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|  | Fluvalinate  | Mavrik                            | 3                           | 12   | Works best on the crawler stages.  |
|  | Imidacloprid   | Marathon/Benefit/<br>Mantra       | 4A                          | 12/12/12   | Slow-acting, long residual systemic insecticide.   |
|  | Insecticidal soap<br>(potassium salts<br>of fatty acids) | M-Pede                            | NS                          | 12   | Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.  |
|  | Kinoprene  | Enstar AQ                         | 7A                          | 4  | May be used as a drench for control of root mealybug.  |
|  | Neem oil   | Triact Oil                        | HO                          | 4  | Short residual activity.   |
|  | Paraffinic oil   | Sunspray Ultra-Fine Oil           | HO                          | 4  | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|  | Petroleum oil  | Ultra-Pure Oil/SuffOil-X          | NS                          | 4/4  | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
| Spirotetramat                            | Kontos   | 23                                | 24                          | Has translaminar-systemic activity. Apply as a foliar or drench. |  |
| Thiamethoxam                             | Flagship   | 4A                                | 12                          | Systemic insecticide. Applied as a foliar or drench.             |  |
| <b>Mites<br/>(Twospotted<br/>Spider)</b> | Abamectin  | Avid                              | 6                           | 12   | Has translaminar-systemic activity.  |
|  | Acequinocyl  | Shuttle                           | 20B                         | 12   | Compatible with use of predatory mites.  |
|  | <i>Beauveria bassiana</i>                                | Botanigard/Naturalis/<br>Mycotrol | M                           | 4/4/4  | 3 to 5 applications may be needed.   |
|  | Bifenazate   | Floramite                         | 25                          | 4  | Do not make more than two applications per crop per year. Compatible with use of predatory mites.  |
|  | Bifenazate + Abamectin                                   | Sirocco                           | 25 + 6                      | 12   | Do not make more than two application per crop per year.   |
|  | Bifenthrin   | Attain/Talstar†                   | 3                           | 12/12  |  |
|  | Chlorfenapyr   | Pylon                             | 13                          | 12   | Has translaminar-systemic activity. Do not make more than 2 applications in a sequence, or more than 3 times total per growing cycle. Check label for phytotoxicity information. |
|  | Clofentezine   | Ovation                           | 10A                         | 12   | Works on mite eggs. Compatible with use of predatory mites.  |
|  | Etoxazole  | TetraSan                          | 10B                         | 12   | Works on mite eggs, larvae and nymphs. Do not apply more than 2 times per growing cycle.   |
|  | Fenazaquin   | Magus                             | 21                          | 12   | Do not make more than one application per cropping cycle.  |
|  | Fenbutatin-oxide   | Promite/Vendex†                   | 12B                         | 48/48  | Works best at temperatures above 70°F.   |
|  | Fenpropathrin  | Tame†                             | 3                           | 24   |  |
|  | Fenpyroximate  | Akari                             | 21                          | 12   | Do not rotate with Sanmite.  |

| <i>Pest</i>                              | <i>Pesticide<br/>Common Name</i>                           | <i>Pesticide<br/>Trade Name</i>   | <i>Pesticide<br/>Class*</i> | <i>REI**</i> | <i>Comments</i>  |
|--|--|-----------------------------------|-----------------------------|--------------|--|
|  | Fluvalinate  | Mavrik                            | 3                           | 12           |  |
|  | Hexythiazox  | Hexygon                           | 10B                         | 12           | Works on mite eggs, larvae and nymphs.   |
|  | Insecticidal soap<br>(potassium salts of<br>fatty acids)   | M-Pede                            | NS                          | 4            | Short residual activity. Thorough<br>coverage of all plant parts is important.<br>Avoid applying at frequent intervals.  |
|  | Neem oil<br>(clarified hydrophobic<br>extract of neem oil) | Triact Oil                        | HO                          | 4            | Short residual activity.   |
|  | Paraffinic oil   | Sunspray Ultra-Fine Oil           | HO                          | 4            | Short residual activity. Avoid applying<br>at frequent intervals. See note 2.  |
|  | Petroleum oil  | Ultra-Pure Oil/SuffOil-X          | NS                          | 4/4          | Short residual activity. Avoid applying<br>at frequent intervals. See note 2.  |
|  | Phytoseiid mites   |                                   | BLO                         | 0            | Widely used predatory mites of spider<br>mites, including two-spotted spider<br>mite. Check label for specific site<br>requirements for each species.  |
|  | Pyridaben  | Sanmite                           | 21                          | 12           | Do not rotate with Akari.  |
|  | Spiromesifen   | Judo                              | 23                          | 12           | Has translaminar properties. Long<br>residual activity.  |
|  | Spirotetramat  | Kontos                            | 23                          | 24           | Has translaminar-systemic activity.<br>Apply as a foliar or drench.  |
| <b>Mites (Broad)</b>                     | Abamectin  | Avid                              | 6                           | 12           | Has translaminar-systemic activity.  |
|  | Bifenazate + Abamectin                                     | Sirocco                           | 25 + 6                      | 12           | Do not make more than two<br>applications per crop per year.   |
|  | Bifenthrin   | Attain/Talstar <sup>†</sup>       | 3                           | 12/12        |  |
|  | Chlorfenapyr   | Pylon                             | 13                          | 12           | Has translaminar-systemic activity. Do<br>not make more than 2 applications in a<br>sequence, or more than 3 times total<br>per growing cycle. Check label for<br>phytotoxicity information. |
|  | Fenpyroximate  | Akari                             | 21                          | 12           | Do not rotate with Sanmite.  |
|  | Phytoseiid mites   |                                   | BLO                         | 0            | Widely used predatory mites of mite<br>pests. Check label for specific site<br>requirements for each species.  |
|  | Pyridaben  | Sanmite                           | 21                          | 12           | Do not rotate with Akari.  |
|  | Spiromesifin   | Judo                              | 23                          | 12           | Has translaminar properties. Long<br>residual activity.  |
| <b>Mites (Cyclamen)</b>                  | Abamectin  | Avid                              | 6                           | 12           | Has translaminar-systemic activity.  |
|  | Bifenazate + Abamectin                                     | Sirocco                           | 25 + 6                      | 12           | Do not make more than two<br>applications per crop per year.   |
|  | Chlorfenapyr   | Pylon                             | 13                          | 12           | Has translaminar-systemic activity. Do<br>not make more than 2 applications in a<br>sequence, or more than 3 times total<br>per growing cycle. Check label for<br>phytotoxicity information. |
|  | Fenpyroximate  | Akari                             | 21                          | 12           | Do not rotate with Sanmite.  |
|  | Phytoseiid mites   |                                   | BLO                         | 0            | Widely used predatory mites of mite<br>pests. Check label for specific site<br>requirements for each species.  |
|  | Spiromesifin   | Judo                              | 23                          | 12           | Has translaminar properties. Long<br>residual activity.  |
| <b>Scales<br/>(Soft and<br/>Armored)</b> | Acephate   | Orthene/Precise                   | 1B                          | 24/12        | Works best on the crawler stages.<br>Check label for phytotoxicity information.  |
|  | Acetamiprid  | Tristar                           | 4A                          | 12           | Has translaminar-systemic activity as<br>a spray.  |
|  | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B                         | 4/12/4/4     | Works only on crawler stages.  |
|  | Bifenthrin   | Attain/Talstar <sup>†</sup>       | 3                           | 12/12        | Works best on the crawler stages.  |
|  | Buprofezin   | Talus                             | 16                          | 12           | Works best on the crawler stages.  |
|  | Cyfluthrin   | Decathlon                         | 3                           | 12           | Works best on the crawler stages.  |
|  | Dinotefuran  | Safari                            | 4A                          | 12           |  |

| <i>Pest</i>   | <i>Pesticide<br/>Common Name</i>                           | <i>Pesticide<br/>Trade Name</i>   | <i>Pesticide<br/>Class*</i> | <i>REI**</i> | <i>Comments</i>  |
|---------------|--|-----------------------------------|-----------------------------|--------------|--|
|               | Fenoxycarb   | Preclude                          | 7B                          | 12           |  |
|               | Imidacloprid   | Marathon                          | 4A                          | 12           | Only active on soft scales.  |
|               | Insecticidal soap<br>(potassium salts<br>of fatty acids)   | M-Pede                            | NS                          | 12           | Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.                    |
|               | Kinoprene  | Enstar AQ                         | 7A                          | 4            | Slow-acting. Only active on the crawler stages.  |
|               | Neem oil<br>(clarified hydrophobic<br>extract of neem oil) | Triact Oil                        | HO                          | 4            | Short residual activity.   |
|               | Paraffinic oil   | Sunspray Ultra-Fine Oil           | HO                          | 4            | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|               | Petroleum oil  | Ultra-Pure Oil/SuffOil-X          | NS                          | 4/4          | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|               | Pyriproxyfen   | Distance                          | 7C                          | 12           | Slow-acting. Only active on the crawler stages.  |
|               | Thiamethoxam   | Flagship                          | 4A                          | 12           | Systemic insecticide. Applied as a foliar or drench.   |
|               | Tolfenpyrad  | Hachi-Hachi                       | 21A                         | 12           | Do not make more than two applications per crop cycle.   |
| <b>Slugs</b>  | Iron phosphate   | Sluggo                            | UN                          | 0            | Bait formulation.  |
|               | Metaldehyde  | Deadline                          | UN                          | 12           | Bait formulation.  |
|               | Methiocarb   | Mesurool                          | 1A                          | 24           | Bait formulation.  |
| <b>Thrips</b> | Abamectin  | Avid                              | 6                           | 12           | Rotate with Conserve and Mesurool.   |
|               | Acephate   | Orthene/Precise                   | 1B                          | 24/12        | Works best when tank mixed with Tame. Check label for phytotoxicity information.   |
|               | Acetamiprid  | Tristar                           | 4A                          | 12           | Works best when tank mixed with a surfactant.  |
|               | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B                         | 4/12/4/4     | Works best when tank mixed with other insecticides.  |
|               | <i>Beauveria bassiana</i>                                  | Botanigard/Naturalis/<br>Mycotrol | M                           | 4/4/4        | Works best when tank mixed with other insecticides. 3 to 5 applications may be needed.   |
|               | Bifenazate + Abamectin                                     | Sirocco                           | 25 + 6                      | 12           | Suppression only.  |
|               | Bifenthrin   | Attain/Talstar <sup>†</sup>       | 3                           | 12/12        |  |
|               | Chlorfenapyr   | Pylon                             | 13                          | 12           | Has translaminar-systemic activity. Effective against western flower thrips and chili thrips.  |
|               | Chlorpyrifos   | Duraguard                         | 1B                          | 24           |  |
|               | Cyfluthrin   | Decathlon                         | 3                           | 12           |  |
|               | Fenoxycarb   | Preclude                          | 7B                          | 12           |  |
|               | Fonicamid  | Aria                              | 9B                          | 12           | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|               | Fluvalinate  | Mavrik                            | 3                           | 12           |  |
|               | Kinoprene  | Enstar AQ                         | 7A                          | 4            | Slow-acting. Only active on the nymphal stages.  |
|               | Methiocarb   | Mesurool                          | 1A                          | 24           | Rotate with Conserve and Avid.   |
|               | Novaluron  | Pedestal                          | 15                          | 12           | Only active on the nymphal stages. Do not apply to poinsettias.  |
|               | Paraffinic oil   | Sunspray Ultra-Fine Oil           | HO                          | 4            | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|               | Phytoseiid mites   |                                   | BLO                         | 0            | Widely used predatory mites of thrips, including western flower thrips. Check label for specific site requirements for each species. |
|               | Pyrethrins   | Pyreth-It/Pyrethrum               | 3                           | 12/12        |  |
|               | Pyridalyl  | Overture                          | UN                          | 12           | Has translaminar activity. Do not make more than 3 applications per growing cycle.   |

| <i>Pest</i>       | <i>Pesticide<br/>Common Name</i>                           | <i>Pesticide<br/>Trade Name</i>   | <i>Pesticide<br/>Class*</i> | <i>REI**</i> | <i>Comments</i>  |
|-------------------|--|-----------------------------------|-----------------------------|--------------|--|
|                   | Spinosad   | Conserve                          | 5                           | 4            | Avoid using at frequent intervals. Rotate with Mesurol and Avid.   |
|                   | Tolfenpyrad  | Hachi-Hachi                       | 21A                         | 12           | Do not make more than two applications per growing cycle.  |
| <b>Whiteflies</b> | Abamectin  | Avid                              | 6                           | 12           | Has translaminar-systemic activity.  |
|                   | Acephate   | Orthene/Precise                   | 1B                          | 24/12        | Has translaminar-systemic as a spray. Works on nymphs and adults. Check label for phytotoxicity information.                                   |
|                   | Acetamiprid  | Tristar                           | 4A                          | 12           | Has translaminar-systemic activity as a spray.   |
|                   | Azadirachtin   | Azatin/Ornazin/<br>Molt-X/Azatrol | 18B                         | 4/12/4/4     | Works best when tank mixed with other insecticides. Active on nymphs.  |
|                   | <i>Beauveria bassiana</i>                                  | Botanigard/Naturalis/<br>Mycotrol | M                           | 4/4/4        | Works best when tank mixed with other insecticides. Active on nymphs and adults. 3 to 5 applications may be needed.                            |
|                   | Bifenazate + Abamectin                                     | Sirocco                           | 25 + 6                      | 12           | Suppression only.  |
|                   | Bifenthrin   | Attain/Talstar <sup>†</sup>       | 3                           | 12/12        | Active on nymphs and adults.   |
|                   | Buprofezin   | Talus                             | 16                          | 12           | Active on nymphs.  |
|                   | Cyfluthrin   | Decathlon                         | 3                           | 12           | Active on nymphs and adults.   |
|                   | Diflubenzuron  | Adept                             | 15                          | 12           | Prevents insects from molting. Cannot be used on poinsettias, hibiscus, or Reiger begonia. Long residual activity.                             |
|                   | Dinotefuran  | Safari                            | 4A                          | 12           | Systemic insecticide with long residual activity. Highly water soluble.  |
|                   | <i>Encarsia formosa</i>                                    |                                   | BLO                         | 0            | Parasitic wasp of greenhouse whitefly.   |
|                   | Fenzaquin  | Magus                             | 21                          | 12           | Do not make more than one application per cropping cycle.  |
|                   | Fenoxycarb   | Preclude                          | 7B                          | 12           |  |
|                   | Fenpropathrin  | Tame <sup>†</sup>                 | 3                           | 24           | Active on nymphs and adults.   |
|                   | Fonicamid  | Aria                              | 9B                          | 12           | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|                   | Fluvalinate  | Mavrik                            | 3                           | 12           | Active on nymphs and adults.   |
|                   | Imidacloprid   | Marathon                          | 4A                          | 12           | Slow-acting, long residual systemic insecticide.   |
|                   | Insecticidal soap<br>(potassium salts<br>of fatty acids)   | M-Pede                            | NS                          | 12           | Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals. Active on nymphs and adults. |
|                   | Kinoprene  | Enstar AQ                         | 7                           | 4            | Slow-acting. Only active on nymphs.  |
|                   | Neem oil<br>(clarified hydrophobic<br>extract of neem oil) | Tract Oil                         | HO                          | 4            | Active on nymphs and adults.   |
|                   | Novaluron  | Pedestal                          | 15                          | 12           | Active on nymphs. Do not apply to poinsettias.   |
|                   | Paraffinic oil   | Sunspray Ultra-Fine Oil           | HO                          | 4            | Active on eggs, pupae, nymphs, and adults. Avoid applying at frequent intervals. See note 2.   |
|                   | Petroleum oil  | Ultra-Pure Oil/SuffOil-X          | NS                          | 4/4          | Short residual activity. Avoid applying at frequent intervals. See note 2.   |
|                   | Permethrin   | Astro                             | 3                           | 12           | Active on nymphs and adults.   |
|                   | Pymetrozine  | Endeavor                          | 9B                          | 12           | Has systemic activity. Works on nymphs and adults. Prevents insects from feeding by blocking mouthparts.                                       |
|                   | Pyridaben  | Sanmite                           | 21                          | 12           | Works on nymphs and adults.  |
|                   | Pyriproxyfen   | Distance                          | 7C                          | 12           | Only works on nymphs.  |
|                   | Spirotetramat  | Kontos                            | 23                          | 24           | Has translaminar-systemic activity. Apply as a foliar or drench.   |
|                   | Thiamethoxam   | Flagship                          | 4A                          | 12           | Systemic insecticide. Applied as a foliar or drench.   |
|                   | Tolfenpyrad  | Hachi-Hachi                       | 21A                         | 12           | Do not make more than two applications per crop cycle.   |

† Restricted Use Pesticide

\*\* REI = Restricted Entry Interval (in hours); workers not allowed to enter into treated area until the REI has elapsed.

\* The numbers associated with the pesticide class column were developed by the Insecticide Resistance Action Committee, (IRAC) in 2005. It is intended to help in the selection of insecticides for preventative resistance management. If you make multiple applications for a specific pest or group of pests during a growing sequence, simply select a registered insecticide with a different number for each generation (14-21 days). You can rotate within the same number if more than one subgroup is available (Example: 2A and 2B). To further delay resistance from developing, integrate other control methods into your pest management programs.

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|                                  |                                   |
|----------------------------------|-----------------------------------|
| 1A=Carbamate                     | 12A=Diaphenthiuron                |
| 1B=Organophosphate               | 12B=Organotin miticide            |
| 2A=Cyclodiene organochlorine     | 12C=Propargite                    |
| 2B=Phenylpyrazole                | 13=Chlorfenapyr, DNOC             |
| 3=Pyrethroid                     | 14=                               |
| 4A=Neonicotinoid                 | 15=Benzoyleureas                  |
| 4B=Nicotine                      | 16=Buprofezin                     |
| 5=Spinosyns                      | 17=Cyromazine                     |
| 6=Avermectins                    | 18A=Diacylhydrazine               |
| 7A=Juvenile hormone analogues    | 18B=Azadirachtin                  |
| 7B=Fenoxycarb                    | 19=Amitraz                        |
| 7C=Pyriproxyfen                  | 20A=Hydramethylnon                |
| 8A=Methyl bromide (fumigant)     | 20B=Acequinocyl                   |
| 8B=Aluminum phosphide (fumigant) | 20C=Fluacrypyrim                  |
| 8C=Sulfuryl fluoride (fumigant)  | 21=METI acaricides, Rotenone      |
| 9A=Cryolite                      | 22=Indoxacarb                     |
| 9B=Pymetrozine                   | 23=Tetronic acid derivatives      |
| 9C=Flonicamid                    | 24A=Aluminum phosphide            |
| 10A=Clofentezine                 | 24B=Cyanide                       |
| 10B=Hexythiazox                  | 24C=Phosphine                     |
| 11A1=Bt var. israelensis         | 25=Bifenazate                     |
| 11A2=Bt. var. sphaericus         | 26=Fluroacetate                   |
| 11B1=Bt. var. aizawai            | 27A=P450 monooxygenase inhibitors |
| 11B2=Bt. var. kurstaki           | 27B=Esterase inhibitors           |
| 11C=Bt. var. tenebrionensis      | 28=Anthranilic diamides           |
| BLO=Biological Organism          | NS=Non-specific, multi-site       |
| M=Microbial                      | UN=Unknown MOA                    |
| HO=Horticultural Oil             |                                   |

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#### NOTES:

1. Before purchasing and using any pesticide, read the label carefully for registered use(s), rates, and application frequency. Also note toxicity category on the label of each pesticide since toxicity ratings may affect reentry intervals and note any ventilation requirements. Wear protective clothing as recommended on each pesticide label.
2. When using horticultural oils it is important to not use oils with insecticidal soap or any sulfur containing compounds. Also, do not use horticultural oils in sprayers in which fungicides have been used. Frequent agitation is required when using horticultural oil sprays.
3. Insecticides having a broad spectrum of activity (e.g., pyrethroids, organophosphates, carbamates, neonicotinoids), may not be compatible with biological control because they can harm some natural enemies. Some broad-spectrum insecticides are more selective than others, and selectivity further depends on how, when, and where the insecticide is applied. Be sure to check the label for the kinds of insects controlled by the product, or contact your county extension educator for information on compatibility with biological control.

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