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Management of Insect and Mite Pests of Greenhouse Floral Crops

Eric J. Rebek

Extension Entomologist and Professor
Oklahoma State University

Raymond A. Cloyd

Extension Specialist and Professor
Kansas State University

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

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>IRAC Class*</i>	<i>REI**</i>	<i>Comments</i>
Aphids	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties.
	Acephate	Orthene	1B	24	Has translaminar properties. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. May be more effective when tank mixed with other insecticides.
	<i>Beauveria bassiana</i>	BotaniGard/ Mycotrol	n/a	4/4	Beneficial fungus. Requires three to five applications per cropping cycle. Maintain relative humidity around 80% to maximize effectiveness.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties.
	Bifenthrin	Attain/Talstar [†]	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorpyrifos	DuraGuard	1B	24	Microencapsulated formulation.
	Chlorpyrifos + Cyfluthrin	Duraplex	1B + 3A	24	Aerosol formulation.
	Cyantraniliprole	Mainspring	28	4	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Cyfluthrin	Decathlon	3A	12	Thorough coverage of all plant parts is important.
	Dinotefuran	Safari	4A	12	Has translaminar and systemic properties with long residual activity. Very water soluble.
	Fonicamid	Aria	29	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	Flupyradifurone	Altus	4D	4	Has systemic properties. Do not rotate with Marathon, Safari, or Flagship. May be used on greenhouse-grown vegetable transplants.
	Fluvalinate	Mavrik	3A	12	Thorough coverage of all plant parts is important.
	Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Has translaminar and systemic properties with long residual activity.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Ancora/Preferal	n/a	4/4	Beneficial fungus. Maintain relative humidity around 80% to maximize effectiveness.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications will be required.
	Methiocarb	Mesuroil	1A	24	Thorough coverage of all plant parts is important.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	n/a	4/4	Has short residual activity. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	n/a	4	Has short residual activity. See note 2 below.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Thorough coverage of all plant parts is important.
	Permethrin	Astro	3A	12	Thorough coverage of all plant parts is important.
	Pymetrozine	Endeavor	9B	12	Has translaminar and systemic properties with movement both up and down the plant. Prevents insects from feeding by blocking mouthparts.

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Aphids (cont'd)	Pyrethrins	Pyreth-It/ Pyrethrum	3A	12/12	Thorough coverage of all plant parts is important.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyrifluquinazon	Rycar	9B	12	Has contact, ingestion, and translaminar properties. Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Pyriproxyfen	Distance/Fulcrum	7C	12/12	Only directly active on immature life stages.
	Spirotetramat	Kontos	23	24	Has systemic properties with movement both up and down the plant.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic properties.
	Thiamethoxam	Flagship	4A	12	Has translaminar and systemic properties with long residual activity. Do not make more than two applications per cropping cycle.
	Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
Caterpillars	Acephate	Orthene	1B	24	Check label for phytotoxicity information.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. Some formulations may be used on greenhouse-grown vegetables.
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel	11A	4	Insects must consume material to be affected. May be used on greenhouse-grown vegetables.
	<i>Beauveria bassiana</i>	BotaniGard/Mycotrol	n/a	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. Requires three to five applications per cropping cycle.
	Bifenthrin	Attain/Talstar†	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorfenapyr	Pylon	13	12	Has translaminar properties. Do not make more than two applications in a sequence, or more than three applications per cropping cycle. Check label for phytotoxicity information.
	Chlorpyrifos	DuraGuard	1B	24	Microencapsulated formulation.
	Chlorpyrifos + Cyfluthrin	Duraplex	1B + 3A	24	Aerosol formulation.
	Cyantraniliprole	Mainspring	28	4	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Cyfluthrin	Decathlon	3A	12	Thorough coverage of all plant parts is important.
	Fenpropathrin	Tame†	3A	12	Thorough coverage of all plant parts is important.
	Fluvalinate	Mavrik	3A	12	Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Methoxyfenozide	Intrepid	18	4	Slow acting. Works best when caterpillars are small.
	Novaluron	Pedestal	15	12	Slow acting, but has translaminar properties. Thorough coverage of all plant parts is important. Apply when caterpillars are small.

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Caterpillars (cont'd)	Permethrin	Astro	3A	12	Thorough coverage of all plant parts is important.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyridalyl	Overture	UN	12	Has translaminar properties. Do not make more than three applications per cropping cycle. Apply when caterpillars are small.
	Spinosad	Conserve	5	4	Has contact, ingestion, and translaminar properties. More effective on small caterpillars.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Apply when caterpillars are small. Has similar mode of action as Conserve.
	Tolfenpyrad	Hachi-Hachi	21A	12	More effective on small caterpillars.
Fungus Gnats (Adults)	Bifenthrin	Attain/Talstar†	3A	12/12	Target sprays at the surface of the growing medium.
	Cyfluthrin	Decathlon	3A	12	Target sprays at the surface of the growing medium.
	Fenpropathrin	Tame†	3A	12	Target sprays at the surface of the growing medium.
	Fluvalinate	Mavrik	3A	12	Do not make more than two applications per cropping cycle. Do not apply to poinsettia.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Target sprays at the surface of the growing medium.
	Permethrin	Astro	3A	12	Target sprays at the surface of the growing medium.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Target sprays at the surface of the growing medium.
Fungus Gnats (Larvae)	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties. Apply as a light spray to the growing medium.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. Some formulations may be used on greenhouse-grown vegetables.
	<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i>	Gnatrol	11A	4	Slow acting. May be used on greenhouse-grown vegetables. Apply early in the cropping cycle.
	Chlorfenapyr	Pylon	13	12	Do not make more than two applications in a sequence, or more than three applications per cropping cycle. Check label for phytotoxicity information.
	Chlorpyrifos	DuraGuard	1B	24	Microencapsulated formulation.
	Cyromazine	Citation	17	12	Slow acting. Repeat applications are required.
	Diflubenzuron	Adept	15	12	Slow acting, but has long residual activity. Do not use on poinsettia, hibiscus, or Reiger begonia.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications are required.
	Pyriproxyfen	Distance/ Fulcrum	7C	12/12	Slow acting. Read label for precautions when using on poinsettia.
	<i>Steinernema feltiae</i>	Nemasys	n/a	0	Beneficial nematode that attacks fungus gnat larvae. Apply early in the cropping cycle before fungus gnat populations are high and causing plant damage.

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Leafminers	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties.
	Acephate	Orthene	1B	24	Has translaminar and systemic properties. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. Some formulations may be used on greenhouse-grown vegetables.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties.
	Cyromazine	Citation	17	12	Has translaminar properties.
	Dinotefuran	Safari	4A	12	Has translaminar and systemic properties with long residual activity. Very water soluble.
	Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Has translaminar and systemic properties with long residual activity.
	Novaluron	Pedestal	15	12	Slow acting, but has translaminar properties.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Spinosad	Conserve	5	4	Has translaminar properties.
	Thiamethoxam	Flagship	4A	12	Has translaminar and systemic properties with long residual activity. Do not make more than two applications per cropping cycle.
Mealybugs	Acephate	Orthene	1B	24	Has translaminar and systemic properties. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. Some formulations may be used on greenhouse-grown vegetables.
	<i>Beauveria bassiana</i>	BotaniGard/ Mycotrol	n/a	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. Requires three to five applications per cropping cycle.
	Bifenthrin	Attain/Talstar [†]	3A	12/12	Works best on nymphs.
	Buprofezin	Talus	16	12	Slow acting. Works best on nymphs.
	Cyfluthrin	Decathlon	3A	12	Works best on nymphs.
	Dinotefuran	Safari	4A	12	Has translaminar and systemic properties with long residual activity. Very water soluble.
	Fenpropathrin	Tame [†]	3A	24	Works best on nymphs.
	Flonicamid	Aria	29	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	Flupyradifurone	Altus	4D	4	Has systemic properties. Do not rotate with Marathon, Safari, or Flagship. May be used on greenhouse-grown vegetable transplants.
	Fluvalinate	Mavrik	3A	12	Works best on nymphs.
	Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Has translaminar and systemic properties. Slow acting with long residual activity.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.

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Mealybugs cont'd)	<i>Isaria fumosoroseus</i> Apopka Strain 97	Ancora/Preferal	n/a	4/4	Beneficial fungus. Maintain relative humidity around 80% to maximize effectiveness.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications are required.
	Mineral oil	Ultra-Pure Oil/ Suffoil-X	n/a	4/4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyrifluquinazon	Rycar	9B	12	Has contact, ingestion, and translaminar properties. Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Spirotetramat	Kontos	23	24	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic properties.
Thiamethoxam	Flagship	4A	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.	
Mites (Twospotted Spider)	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties.
	Acequinocyl	Shuttle O	20B	12	Has contact activity only.
	<i>Beauveria bassiana</i>	BotaniGard/ Mycotrol	n/a	4/4	Beneficial fungus. Requires three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate	Floramite	20D	4	Has contact activity only. Do not make more than two applications per cropping cycle per year.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties. Do not make more than two applications per cropping cycle per year.
	Bifenthrin	Attain/Talstar [†]	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorfenapyr	Pylon	13	12	Has translaminar properties. Do not make more than two applications in a sequence, or more than three applications per cropping cycle.
	Clofentezine	Ovation	10A	12	Has activity on mite eggs.
	Cyflumetofen	Sultan	25	12	Has activity on mite eggs, larvae, and nymphs.
	Etoxazole	TetraSan	10B	12	Has activity on mite eggs, larvae, and nymphs. Do not apply more than two times per cropping cycle.
	Fenazaquin	Magus	21A	12	Do not make more than one application per cropping cycle. Do not rotate with Akari, Sanmite, Shuttle, or Floramite.
	Fenpropathrin	Tame [†]	3A	24	Thorough coverage of all plant parts is important.
	Fenpyroximate	Akari	21A	12	Has contact activity only. Do not rotate with Sanmite, Magus, Shuttle, or Floramite.

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Mites (Twospotted Spider) (cont'd)	Fluvalinate	Mavrik	3A	12	Thorough coverage of all plant parts is important.
	Hexythiazox	Hexygon	10A	12	Has activity on mite eggs, larvae, and nymphs.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Metarhizium brunneum</i> (<i>anisopliae</i>) Strain F52	Met52	n/a	4	Beneficial fungus. Apply as a foliar spray and thoroughly cover all plant parts, especially leaf undersides. Repeat applications are required.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	n/a	4/4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyridaben	Sanmite	21A	12	Do not rotate with Akari, Magus, Shuttle, or Floramite.
	Spiromesifen	Judo/Savate	23	12/12	Has translaminar properties with long residual activity.
Spirotetramat	Kontos	23	24	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.	
Mites (Broad)	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties. Do not make more than two applications per cropping cycle per year.
	Bifenthrin	Attain/Talstar [†]	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorfenapyr	Pylon	13	12	Has translaminar properties. Do not make more than two applications in a sequence, or more than three applications per cropping cycle. Check label for phytotoxicity information.
	Fenpyroximate	Akari	21A	12	Do not rotate with Sanmite.
	Pyridaben	Sanmite	21A	12	Do not rotate with Akari.
	Spiromesifin	Judo/Savate	23	12/12	Has translaminar properties with long residual activity.
	Mites (Cyclamen)	Abamectin	Avid/Minx 2	6	12/12
Bifenazate + Abamectin		Sirocco	20D + 6	12	Has translaminar properties. Do not make more than two applications per cropping cycle per year.
Chlorfenapyr		Pylon	13	12	Has translaminar properties. Do not make more than two applications in a sequence, or more than three applications per cropping cycle. Check label for phytotoxicity information.
Fenpyroximate		Akari	21A	12	Thorough coverage of all plant parts is important.
Spiromesifin		Judo/Savate	23	12/12	Has translaminar properties with long residual activity.

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Scales (Soft and Armored)	Acephate	Orthene	1B	24	Has systemic and translaminar properties. Works best on crawlers (nymphs). Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Works best on crawlers (nymphs).
	Bifenthrin	Attain/Talstar†	3A	12/12	Works best on crawlers (nymphs).
	Buprofezin	Talus	16	12	Works best on crawlers (nymphs).
	Cyantraniliprole	Mainspring	28	4	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Cyfluthrin	Decathlon	3A	12	Works best on crawlers (nymphs).
	Dinotefuran	Safari	4A	12	Has translaminar and systemic properties. May be effective against both soft and armored scales.
	Flupyradifurone	Altus	4D	4	Has systemic properties. Do not rotate with Marathon, Safari, or Flagship. May be used on greenhouse-grown vegetable transplants.
	Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Has translaminar and systemic properties. Only effective against soft scales.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Kinoprene	Enstar	7A	4	Slow acting. Works best on crawlers (nymphs). Repeat applications are required.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	n/a	4/4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	n/a	4	Has short residual properties. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyriproxyfen	Distance/ Fulcrum	7C	12/12	Slow acting. Only active on crawlers (nymphs).
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic properties. Thorough coverage of all plant parts is important.
	Thiamethoxam	Flagship	4A	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
Slugs	Iron phosphate	Sluggo	n/a	0	Bait formulation.
	Metaldehyde	Deadline	n/a	12	Bait formulation.
	Methiocarb	Mesuroil	1A	24	Bait formulation.

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Thrips	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties. Use in rotation programs with Pylon, Overture, and Conserve.
	Acephate	Orthene	1B	24	Has translaminar properties. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties. Mix with a surfactant to enhance effectiveness.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	More effective when mixed with other insecticides. Some formulations may be used on greenhouse-grown vegetables.
	<i>Beauveria bassiana</i>	BotaniGard/ Mycotrol	n/a	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. Requires three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties.
	Bifenthrin	Attain/Talstar†	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorfenapyr	Pylon	13	12	Has translaminar properties. Effective against both western flower thrips and chilli thrips.
	Chlorpyrifos	DuraGuard	1B	24	Microencapsulated formulation.
	Cyantraniliprole	Mainspring	28	4	Has translaminar and systemic properties. Apply as a foliar spray or soil drench. Only effective against thrips feeding on foliage, not flowers.
	Cyfluthrin	Decathlon	3A	12	Thorough coverage of all plant parts is important.
	Fonicamid	Aria	29	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Fluvalinate	Mavrik	3A	12	Thorough coverage of all plant parts is important.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Ancora/Preferal	n/a	4/4	Beneficial fungus. Maintain relative humidity around 80% to maximize effectiveness. Apply early in the cropping cycle.
	Kinoprene	Enstar	7A	4	Slow acting. Only active on larval stages.
	<i>Metarhizium brunneum</i> (<i>anisopliae</i>) Strain F52	Met52	n/a	4	Beneficial fungus. Maintain relative humidity around 80% to maximize effectiveness. Apply early in the cropping cycle.
	Methiocarb	MesuroI	1A	24	Use in rotation programs with Conserve, Overture, Pylon, and Avid.
	Novaluron	Pedestal	15	12	Slow acting, but has translaminar properties. Only active on larval stages.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Has short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. See note 2 below.
	Pyrethrins	Pyreth-It/Pyrethrum	3A	12/12	Thorough coverage of all plant parts is important.
	Pyrethrins + canola oil	Pycana	3A+n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyridalyl	Overture	UN	12	Slow acting, but has translaminar properties. Do not make more than three applications per cropping cycle.
	Pyrifluquinazon	Rycar	9B	12	Labeled for chilli thrips only. Do not make more than two applications per cropping cycle.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>IRAC Class*</i>	<i>REI**</i>	<i>Comments</i>
Thrips (cont'd)	Spinosad	Conserve	5	4	Avoid making frequent applications. Use in rotation programs with Mesurol, Overture, Pylon, and Avid.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar properties and a similar mode of action as Conserve.
	Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
Whiteflies	Abamectin	Avid/Minx 2	6	12/12	Has translaminar properties.
	Acephate	Orthene	1B	24	Has translaminar and systemic properties. Effective against nymphs and adults. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic properties.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	May be more effective when mixed with other insecticides. Only active on nymphs. Some formulations may be used on greenhouse-grown vegetables.
	<i>Beauveria bassiana</i>	BotaniGard/ Mycotrol	n/a	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. Active on both nymphs and adults. Requires three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Has translaminar properties.
	Bifenthrin	Attain/Talstar†	3A	12/12	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Buprofezin	Talus	16	12	Slow acting. Only active on nymphs.
	Cyantraniliprole	Mainspring	28	4	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Cyfluthrin	Decathlon	3A	12	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Diflubenzuron	Adept	15	12	Slow acting. Only active on nymphs. Do not use on poinsettia, hibiscus, or Reiger begonia.
	Dinotefuran	Safari	4A	12	Has translaminar and systemic properties with long residual activity. Very water soluble.
	Fenazaquin	Magus	21A	12	Do not make more than one application per cropping cycle. Thorough coverage of all plant parts is important.
	Fenpropathrin	Tame†	3A	24	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Fonicamid	Aria	29	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	Flupyradifurone	Altus	4D	4	Has systemic properties. Do not rotate with Marathon, Safari, or Flagship. May be used on greenhouse-grown vegetable transplants.
	Fluvalinate	Mavrik	3A	12	Active on nymphs and adults. Thorough coverage of all plant parts is important.
Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Slow acting, but has translaminar and systemic properties.	

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>IRAC Class*</i>	<i>REI**</i>	<i>Comments</i>
Whiteflies (cont'd)	Insecticidal soap (potassium salts of fatty acids)	M-Pede	n/a	12	Has short residual activity. Active on nymphs and adults. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Ancora/Preferal	n/a	4	Beneficial fungus. Maintain relative humidity around 80% to maximize effectiveness. Thorough coverage of leaf undersides is important.
	Kinoprene	Enstar	7A	4	Slow acting. Only active on nymphs. Repeat applications are required.
	<i>Metarhizium brunneum</i> (<i>anisopliae</i>) Strain F52	Met52	n/a	4	Beneficial fungus. Thoroughly cover all plant parts, especially leaf undersides.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	n/a	4/4	Has short residual activity. Thoroughly cover all plant parts, especially leaf undersides. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	n/a	4	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Novaluron	Pedestal	15	12	Slow acting, but has translaminar properties. Active on nymphs. May indirectly reduce egg laying by adult females.
	Paraffinic oil	Sunspray Ultra-Fine Oil	n/a	4	Active on eggs, nymphs, and adults. Thoroughly cover all plant parts, especially leaf undersides. Avoid applying too frequently. See note 2 below.
	Permethrin	Astro	3A	12	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Pymetrozine	Endeavor	9B	12	Has translaminar and systemic properties. Active on nymphs and adults. Prevents insects from feeding by blocking mouthparts.
	Pyrethrins + canola oil	Pycana	3A + n/a	12	Has short residual activity. Thorough coverage of all plant parts is important.
	Pyridaben	Sanmite	21A	12	Active on nymphs and adults.
	Pyriproxyfen	Rycar	9B	12	Has contact, ingestion, and translaminar properties. Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Pyriproxyfen	Distance/Fulcrum	7C	12/12	Only active on nymphs.
	Spiromesifin	Savate	23	12	Has translaminar properties with long residual activity.
	Spirotetramat	Kontos	23	24	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic properties.
	Thiamethoxam	Flagship	4A	12	Has translaminar and systemic properties. Apply as a foliar spray or soil drench.
Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.	

† Restricted Use Pesticide; you must be a certified (licensed) pesticide applicator to purchase and apply this product.

* The numbers associated with the IRAC class column were developed by the Insecticide Resistance Action Committee (IRAC). 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. See "MF-2905: Resistance Management" for further information. This publication can be found at <http://www.ksre.ksu.edu/bookstore/pubs/mf2905.pdf>.

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

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 with a broad spectrum of properties in the chemical classes pyrethroids, organophosphates, carbamates, and neonicotinoids may be harmful to natural enemies (parasitoids and predators). 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 the use of insecticides with natural enemies.

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs and has been prepared and distributed at a cost of 20 cents per copy. Revised 0918 GH.