



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

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class</i>	<i>REI**</i>	<i>Comments</i>
Aphids	Abamectin	Avid	6	12	Has translaminar activity.
	Acephate	Orthene	1B	24	Has translaminar activity. Only provides suppression. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic activity.
	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	M	4/4	Beneficial fungus. May require three to five applications per cropping cycle. To maximize effectiveness, maintain relative humidity around 80%.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. Provides suppression only.
	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.
	Cyfluthrin	Decathlon	3A	12	Thorough coverage of all plant parts is important.
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Fonicamid	Aria	9C	12	Has translaminar and systemic activity. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	Fluvalinate	Mavrik	3A	12	Thorough coverage of all plant parts is important.
	Imidacloprid	Marathon/Benefit/ Mantra	4A	12/12/12	Systemic insecticide with long residual activity.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Preferal	M	4	Beneficial fungus. To maximize effectiveness, maintain relative humidity around 80%.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications are required.
	Methiocarb	Mesurool	1A	24	Thorough coverage of all plant parts is important.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently. See note 2 below.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class</i>	<i>REI**</i>	<i>Comments</i>
Aphids (cont.)	Neem oil (clarified hydrophobic extract of neem oil)	Triact	UN	4	Short residual activity. See note 2 below.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Short residual activity. Avoid applying too frequently. See note 2 below.
	Permethrin	Astro	3A	12	Thorough coverage of all plant parts is important.
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Pyrethrins	Pyreth-It/Pyrethrum	3A	12/12	Thorough coverage of all plant parts is important.
	Pyriproxyfen	Distance/Fulcrum	7C	12/12	Provides suppression only. Does not control adults.
	Pyrifluquinazon	Rycar	UN	12	Has contact, ingestion, and translaminar activity. Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Spirotetramat	Kontos	23	24	Has systemic activity with movement both up and down the plant.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic activity.
	Thiamethoxam	Flagship	4A	12	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.	
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	May be used on greenhouse-grown vegetables. Insects must consume material.
	<i>Beauveria bassiana</i>	Botanigard/ Mycotrol	M	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. May require three to five applications per cropping cycle.
	Bifenthrin	Attain/Talstar†	3A	12/12	Thorough coverage of all plant parts is important.

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Caterpillars (cont.)	Chlorfenapyr	Pylon	13	12	Has translaminar activity. 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.
	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.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Novaluron	Pedestal	15	12	Slow acting. Thorough coverage of all plant parts is important.
	Permethrin	Astro	3A	12	Thorough coverage of all plant parts is important.
	Pyridalyl	Overture	UN	12	Has translaminar activity. Do not make more than three applications per cropping cycle. Apply when caterpillars are small.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Apply when caterpillars are small. Has similar mode of action as Conserve.
	Spinosad	Conserve	5	4	Has contact, translaminar, and ingestion activity.
	Tolfenpyrad	Hachi-Hachi	21A	12	More active 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	NS	12	Target sprays at the surface of the growing medium.
	Permethrin	Astro	3A	12	Target sprays at the surface of the growing medium.

Pest	Pesticide	Pesticide	Pesticide		Comments
	Common Name	Trade Name	Class	REI**	
Fungus Gnats (Larvae)	Acetamiprid	TriStar	4A	12	Has translaminar and systemic activity.
	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.
	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.
	Diflubenzuron	Adept	15	12	Slow acting but has long residual activity. Do not use on poinsettia, hibiscus, and/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/ NemaShield/ Scanmask/Entonem	BLO	0/0/0/0	Beneficial nematode that attacks fungus gnat larvae. Apply before fungus gnat populations are high and causing plant damage. May be used with many insecticides; however, some may reduce efficacy.	
Leafminers	Abamectin	Avid	6	12	Has translaminar activity.
	Acephate	Orthene	1B	24	Has translaminar and systemic activity. Check label for phytotoxicity information.
	Acetamiprid	TriSta	4A	12	Has translaminar and systemic activity.
	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	UN + 6	12	Has translaminar activity.
	Cyromazine	Citation	17	12	Has translaminar activity.
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Imidacloprid	Marathon/Benefit/ Mantra	4A	12/12/12	Systemic insecticide with long residual activity.
	Novaluron	Pedestal	15	12	Provides suppression only.

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Leafminers (cont.)	Spinosad	Conserve	5	4	Has translaminar activity.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.
Mealybugs	Acephate	Orthene	1B	24	Has translaminar and systemic activity. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic activity.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Slow acting. Some formulations may be used on greenhouse-grown vegetables. Tends to be more effective against young crawlers than adults.
	<i>Beauveria bassiana</i>	Botanigard/Mycotrol	M	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. May require three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenthrin	Attain/Talstar†	3A	12/12	Works best on crawlers.
	Buprofezin	Talus	16	12	Works best on crawlers.
	Cyfluthrin	Decathlon	3A	12	Works best on crawlers.
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Fenpropathrin	Tame†	3A	24	Works best on crawlers.
	Fonicamid	Aria	9C	12	Has translaminar and systemic activity. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	Fluvalinate	Mavrik	3A	12	Works best on crawlers.
	Imidacloprid	Marathon/ Benefit/Mantra	4A	12/12/12	Slow acting with long residual systemic activity.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Preferal	M	4	Beneficial fungus. To maximize effectiveness, maintain relative humidity around 80%.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications are required.
Mineral oil	Ultra-Pure Oil/ Suffoil-X	HO	4/4	Short residual activity. Avoid applying too frequently. See note 2 below.	

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Mealybugs (cont.)	Neem oil (clarified hydrophobic extract of neem oil)	Triact	UN	4	Short residual activity. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Short residual activity. Avoid applying too frequently. See note 2 below.
	Plant-derived essential oils	Captiva	UN	4	Botanical insecticide. May be used on greenhouse-grown vegetables.
	Pyrifluquinazon	Rycar	UN	12	Has contact, translaminar, and ingestion activity. 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 activity. Apply as a foliar spray or soil drench.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic activity.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.
Mites (Twospotted Spider)	Abamectin	Avid	6	12	Has translaminar activity.
	Acequinocyl	Shuttle O	20B	12	May be used with certain predatory mites.
	<i>Beauveria bassiana</i>	Botanigard/ Mycotrol	M	4/4	Beneficial fungus. May require three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate	Floramite	UN	4	Do not make more than two applications per cropping cycle per year. Can use with certain predatory mites.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. 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 activity. 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. May be used with certain predatory mites.
	Cyflumetofen	Sultan	25	12	Has activity on mite eggs, larvae, and nymphs.

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Mites (Twospotted Spider) (cont.)	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.
	Fenbutatin-oxide	Promite [†]	12B	48	Works best at temperatures above 70 F.
	Fenpropathrin	Tame [†]	3A	24	Thorough coverage of all plant parts is important.
	Fenpyroximate	Akari	21A	12	Do not rotate with Sanmite, Magus, Shuttle, or Floramite.
	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	NS	4	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	<i>Metarhizium anisopliae</i> Strain F52	Met52	M	4	Beneficial fungus. Apply as a foliar spray and be sure to thoroughly cover all plant parts, especially leaf undersides.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently. See note 2 below.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	UN	4	Short residual activity. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Short residual activity. Avoid applying too frequently. See note 2 below.
	Plant-derived essential oils	Captiva	UN	4	Botanical miticide. May be used on greenhouse-grown vegetables.
	Pyridaben	Sanmite	21A	12	Do not rotate with Akari, Magus, Shuttle, or Floramite.
	Spiromesifen	Judo	23	12	Has translaminar properties with long residual activity.
	Spirotetramat	Kontos	23	24	Has translaminar and systemic activity. Apply as a foliar spray or soil drench.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar activity. Thorough coverage of all plant parts is important.

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Mites (Broad)	Abamectin	Avid	6	12	Has translaminar activity.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. 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 activity. 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.
	Plant-derived essential oils	Captiva	UN	4	Botanical miticide. May be used on greenhouse-grown vegetables.
	Pyridaben	Sanmite	21A	12	Do not rotate with Akari.
	Spiromesifin	Judo	23	12	Has translaminar properties with long residual activity.
Mites (Cyclamen)	Abamectin	Avid	6	12	Has translaminar activity.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. Do not make more than two applications per cropping cycle per year.
	Chlorfenapyr	Pylon	13	12	Has translaminar activity. 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.
	Plant-derived essential oils	Captiva	UN	4	Botanical miticide. May be used on greenhouse-grown vegetables.
	Spiromesifin	Judo	23	12	Has translaminar properties with long residual activity.
Scales (Soft and Armored)	Acephate	Orthene	1B	24	Has systemic and translaminar activity. Works best on crawlers. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic activity.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	Works best on crawlers.
	Bifenthrin	Attain/Talstar†	3A	12/12	Works best on crawlers.
	Buprofezin	Talus	16	12	Works best on crawlers.

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Scales (Soft and Armored)	Cyfluthrin	Decathlon	3A	12	Works best on crawlers.
	Dinotefuran	Safari	4A	12	May be active on both soft and armored scales.
	Imidacloprid	Marathon/Benefit/ Mantra	4A	12/12/12	Active only on soft scales.
	Insecticidal soap (potassium salts of fatty acids)	M-Pede	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Kinoprene	Enstar	7A	4	Slowacting. Repeat applications are required.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently. See note 2.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	UN	4	Short residual activity. Thorough coverage of all plant parts is important.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Short residual activity. Avoid applying too frequently. See note 2.
	Plant-derived essential oils	Captiva	UN	4	Botanical insecticide. May be used on greenhouse-grown vegetables.
	Pyriproxyfen	Distance/Fulcrum	7C	12/12	Slow acting. Active only on crawlers.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar activity. Thorough coverage of all plant parts is important.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.
Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle.	
Slugs	Iron phosphate	Sluggo	UN	0	Bait formulation.
	Metaldehyde	Deadline	UN	12	Bait formulation.
	Methiocarb	Mesurol	1A	24	Bait formulation.
Thrips	Abamectin	Avid	6	12	Has translaminar activity. Use in rotation programs with Pylon, Overture, and Conserve.
	Acephate	Orthene	1B	24	Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	To maximize effectiveness, mix with a surfactant.
	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.

Pest	Pesticide	Pesticide	Pesticide		Comments
	Common Name	Trade Name	Class	REI**	
Thrips (cont.)	<i>Beauveria bassiana</i>	Botanigard/ Mycotrol	M	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. May require three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. Provides suppression only.
	Bifenthrin	Attain/Talstar†	3A	12/12	Thorough coverage of all plant parts is important.
	Chlorfenapyr	Pylon	13	12	Has translaminar activity. Effective against western flower thrips and chilli thrips.
	Chlorpyrifos	DuraGuard	1B	24	Microencapsulated formulation.
	Cyfluthrin	Decathlon	3A	12	Thorough coverage of all plant parts is important.
	Fonicamid	Aria	9C	12	Has translaminar and systemic activity. 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	Preferal	M	4	Beneficial fungus. To maximize effectiveness, maintain relative humidity around 80%.
	Kinoprene	Enstar	7A	4	Slow acting. Active only on larval stages.
	<i>Metarhizium anisopliae</i> Strain F52	Met52	M	4	Beneficial fungus that is reported to have activity on the pupal stage. Apply as a foliar spray or soil drench.
	Methiocarb	MesuroI	1A	24	Use in rotation programs with Conserve, Overture, Pylon, and Avid.
	Novaluron	Pedestal	15	12	Active only on larval stages.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Short residual activity. Avoid applying too frequently. See note 2.
	Plant-derived essential oils	Captiva	UN	4	Botanical insecticide. May be used on greenhouse-grown vegetables.
	Pyrethrins	Pyreth-I/Pyrethrum	3A	12/12	Thorough coverage of all plant parts is important.
	Pyridalyl	Overture	UN	12	Has translaminar activity. Do not make more than three applications per cropping cycle.
	Pyrifluquinazon	Rycar	UN	12	Labeled for chilli thrips only. Do not make more than two applications per cropping cycle.
	Spinosad	Conserve	5	4	Avoid using too frequently. Use in rotation programs with MesuroI, Overture, Pylon, and Avid.

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	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar activity. Has a similar mode of action as Conserve.
	Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping cycle.
Whiteflies	Abamectin	Avid	6	12	Has translaminar activity.
	Acephate	Orthene	1B	24	Has translaminar and systemic activity. Effective against nymphs and adults. Check label for phytotoxicity information.
	Acetamiprid	TriStar	4A	12	Has translaminar and systemic activity.
	Azadirachtin	Azatin/Ornazin/ Molt-X/Azatrol	UN	4/12/4/4	May be more effective when mixed with other insecticides. Active only on nymphs. Some formulations may be used on greenhouse-grown vegetables.
	<i>Beauveria bassiana</i>	Botanigard/ Mycotrol	M	4/4	Beneficial fungus. May be more effective when mixed with other insecticides. Active on both nymphs and adults. May require three to five applications per cropping cycle. Thorough coverage of all plant parts is important.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Has translaminar activity. Provides suppression only.
	Bifenthrin	Attain/Talstar [†]	3A	12/12	Active on nymphs and adults.
	Buprofezin	Talus	16	12	Active on nymphs.
	Cyfluthrin	Decathlon	3A	12	Active on nymphs and adults.
	Diflubenzuron	Adept	15	12	Slow acting but has long residual activity. Active only on nymphs. Do not use on poinsettia, hibiscus, and/or Reiger begonia.
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Fenazaquin	Magus	21A	12	Do not make more than one application per cropping cycle.
	Fenpropathrin	Tame [†]	3A	24	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Flonicamid	Aria	9C	12	Has translaminar and systemic activity. Apply as a foliar spray or soil drench. Prevents insects from feeding by blocking mouthparts.
	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 long residual activity.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class</i>	<i>REI**</i>	<i>Comments</i>
Whiteflies (cont.)	Insecticidal soap (potassium salts of fatty acids)	M-Pede	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently. Active on nymphs and adults.
	<i>Isaria fumosoroseus</i> Apopka Strain 97	Preferal	M	4	Beneficial fungus. To maximize effectiveness, maintain relative humidity around 80%.
	Kinoprene	Enstar	7A	4	Slow acting. Repeat applications are required. Active only on nymphs.
	<i>Metarhizium anisopliae</i> Strain F52	Met52	M	4	Beneficial fungus. Apply as a foliar spray and be sure to thoroughly cover all plant parts, especially leaf undersides.
	Mineral oil	Ultra-Pure Oil/ SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently. See note 2.
	Neem oil (clarified hydrophobic extract of neem oil)	Triact	UN	4	Active on nymphs and adults. Thorough coverage of all plant parts is important.
	Novaluron	Pedestal	15	12	Active on nymphs. May indirectly reduce egg laying by adult females.
	Paraffinic oil	Sunspray Ultra-Fine Oil	HO	4	Active on eggs, nymphs, and adults. Avoid applying too frequently. See note 2.
	Permethrin	Astro	3A	12	Active on nymphs and adults.
	Plant-derived essential oils	Captiva	UN	4	Botanical insecticide. May be used on greenhouse-grown vegetables.
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Works on nymphs and adults. Prevents insects from feeding by blocking mouthparts.
	Pyridaben	Sanmite	21A	12	Active on nymphs and adults.
	Pyriproxyfen	Rycar	UN	12	Has contact, translaminar, and ingestion activity. Do not make more than two applications per cropping cycle. Thorough coverage of all plant parts is important.
	Pyriproxyfen	Distance/Fulcrum	7C	12/12	Active only on nymphs.
	Spirotetramat	Kontos	23	24	Has translaminar and systemic activity. Apply as a foliar spray or soil drench.
	Sulfoxaflor + Spinetoram	XXpire	4C + 5	12	Has translaminar and systemic activity.
Thiamethoxam	Flagship	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.	
Tolfenpyrad	Hachi-Hachi	21A	12	Do not make more than two applications per cropping 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. See “MF-2905: Resistance Management” for further information. This publication can be found on the World Wide Web at <http://www.ksre.ksu.edu/bookstore/pubs/mf2905.pdf>.**

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 activity 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.

The Oklahoma Cooperative Extension Service

Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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