



Current Report

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Management of Insects and Mites in Greenhouse Floral Crops

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Management of insect and mite pests in greenhouses provides unique challenges. Plants are frequently moved in and out of the greenhouse, creating opportunities for repeated introduction of pests. The crops are grown virtually year-around in a protected environment that is favorable for pest development. The greenhouse provides a contained, protected environment in which the pests can often exist in the absence of their natural enemies unless they are purposefully introduced.

Many greenhouse pest populations can be reduced by implementing and following a comprehensive IPM plan. Such a plan should include at a minimum:

- 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 pests,
- introduction/conservation of biological control agents when appropriate.

Chemical pesticides can be a part of a comprehensive IPM plan, but should not be used as a substitute for good horticultural practices or as “preventative insurance.” It is rarely economically or environmentally justifiable, and provides 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 were 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 publications:

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

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
Aphids	Acephate	Orthene	1B	24	Has translaminar-systemic activity as a spray.
	Acetamiprid	Tristar	4A	12	Has translaminar-systemic activity as a spray.
	Azadirachtin	Azatin/Ornazin	18B	4/12	Slow-acting. Works best when tank-mixed with other insecticides.
	<i>Beauveria bassiana</i>	Botanigard/Naturalis	M	4	Three to five applications may be needed.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
	Bifenthrin	Talstar	3	12	
	Chlorpyrifos + Cyfluthrin	Duraplex	1B + 3	24	Aerosol formulation.
	Clothianidin	Celero	4A	12	Has translaminar-systemic activity. Apply as a foliar or drench.
	Cyfluthrin	Decathlon	3	12	
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Endosulfan	Thiodan	2A	24	
	Fenpropathrin	Tame	3	24	May be combined with Orthene.
	Flonicamid	Aria	9B	12	Has translaminar-systemic activity. Apply as a foliar or drench.
	Fluvalinate	Mavrik	3	12	
	Imidacloprid	Marathon	4A	12	Systemic insecticide with long residual activity.
	Insecticidal soap	M-Pede/Olympic Insecticidal Soap	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.
	Kinoprene	Enstar II	7A	4	Slow acting. Only works on young aphids.
	Neem oil	Triact Oil	UN	4	Short residual activity. See note 2.
	Paraffinic oil	UltraFine Oil	UN	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Permethrin	Astro	3	12	
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Applied as a foliar or drench.
Caterpillars	Acephate	Orthene	1B	24	
	Azadirachtin	Azatin/Ornazin	18B	4/12	Azatin may be used on greenhouse-grown vegetables.
	<i>Bacillus thuringiensis kurstaki</i>	Dipel	11B2	4	May be used on greenhouse- grown vegetables. Insects must consume material.
	<i>Beauveria bassiana</i>	Naturalis	M	4	Works best when tank-mixed with other insecticides.
	Bifenthrin	Talstar	3	12	

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	Chlorfenapyr	Pylon	13	12	Has translaminar-systemic activity.
	Cyfluthrin	Decathlon	3	12	
	Diflubenzuron	Adept	15	12	Prevents insects from molting. Cannot be used on poinsettias, hibiscus, or Reiger begonia. Long residual activity.
	Fenpropathrin	Tame	3	12	Has beet armyworm activity only.
	Fluvalinate	Mavrik	3	12	
	Permethrin	Astro	3	12	
	Spinosad	Conserve	5	4	
	Tebufenozide	Confirm	18	4	Disrupts molting of caterpillars.
Fungus Gnats (Adults)	Bifenthrin	Talstar	3	12	
	Chlorpyrifos + Cyfluthrin	Duraplex	1B + 3	24	Aerosol formulation.
	Cyfluthrin	Decathlon	3	12	
	Paraffinic oil	UltraFine Oil	UN	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Permethrin	Astro	3	12	
Fungus Gnats (Larvae)	Azadirachtin	Azatin/Ornazin	18B	4/12	Azatin may be used on greenhouse-grown vegetables.
	<i>Bacillus thuringiensis israelensis</i>	Gnatrol	11A1	4	Slow-acting. May be used on greenhouse-grown vegetables.
	Chlorpyrifos	Duraguard	1B	24	Microencapsulated formulation.
	Chlorfenapyr	Pylon	13	12	
	Cyromazine	Citation	17	12	Slow-acting.
	Diflubenzuron	Adept	15	12	Cannot be used on poinsettias, hibiscus, or Reiger begonia. Long residual activity.
	Kinoprene	Enstar II	7A	4	Slow-acting.
	Pyriproxyfen	Distance	7C	12	Read label for precautions when using on poinsettias.
	<i>Steinernema feltiae</i>	Nemasys/Scanmask/ Entoneem/NemaShield	BLO	0	Beneficial nematode that attacks fungus gnat larvae. Apply before fungus gnat populations are high.
Leafminers	Abamectin	Avid	6	12	Active on larvae. Has translaminar-systemic activity.

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	Acephate	Orthene	1B	24	Active on larvae. Has translaminar-systemic activity as a spray.
	Azadirachtin	Azatin/Orazin	18B	4/12	Active on larvae. May be used on greenhouse-grown vegetables.
	Cyromazine	Citation	17	12	Active on larvae.
	Permethrin	Astro	3	12	Active on adults.
	Spinosad	Conserve	5	4	Active on larvae. Has translaminar-systemic activity.
Mealybugs	Acephate	Orthene	1B	24	Has translaminar-systemic activity as a spray.
	Acetamiprid	Tristar	4A	12	Has translaminar-systemic activity as a spray.
	<i>Beauveria bassiana</i>	Botanigard/Naturalis	M	4	Works best when tank-mixed with other insecticides. Three to five applications may be needed.
	Bifenthrin	Talstar	3	12	Works best on the crawler stages.
	Buprofezin	Talus	16	12	Works best on the crawler stages.
	Clothianidin	Celero	4A	12	Has translaminar-systemic activity. Apply as a foliar or drench.
	Cyfluthrin	Decathlon	3	12	Works best on the crawler stages.
	Fenpropathrin	Tame	3	24	Works best on the crawler stages.
	Fonicamid	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	4A	12	Slow-acting, long residual systemic insecticide.
	Insecticidal soap	M-Pede/Olympic Insecticidal Soap	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.
	Kinoprene	Enstar II	7A	4	May be used as a drench for control of root mealybug.
	Neem oil	Triact Oil	HO	4	Short residual activity.
	Paraffinic oil	UltraFine Oil	HO	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Applied as a foliar or drench.
Mites (Twospotted)	Abamectin	Avid	6	12	Has translaminar-systemic activity.
	Acequinocyl or Akari	Shuttle	21	12	Do not rotate with Sanmite.

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	<i>Beauveria bassiana</i>	Botanigard/Naturalis	M	4	Three to five applications may be needed.
	Bifenazate	Floramite	25	4	Do not make more that two applications in sequence.
	Bifenthrin	Talstar	3	12	
	Chlorfenapyr	Pylon	PY	12	Has translaminar-systemic activity. Do not make more than two applications in a sequence.
	Clofentezine	Ovation	10A	12	Works on mite eggs.
	Etoxazole	TetraSan	10B	12	Works on mite larvae and nymphs. Mite growth regulator.
	Fenbutatin-oxide	Vendex	12B	48	Works best at temperatures above 70°F.
	Fenpropathrin	Tame	3	24	
	Fenpyroximate	Akari	21	12	Do not rotate with Sanmite.
	Fluvalinate	Mavrik	3	12	
	Hexythiazox	Hexygon	10A	12	Works on mite eggs.
	Insecticidal soap	M-Pede/Olympic Insecticidal Soap	NS	4	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.
	Neem oil	Triact Oil	HO	4	Short residual activity.
	Paraffinic oil	UltraFine Oil	HO	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Pyridaben	Sanmite	21	12	Do not rotate with Akari.
	Spiromesifen	Judo	23	12	Has translaminar properties. Long residual activity.
Mites (Cyclamen)	Abamectin	Avid	6	12	Has translaminar-systemic activity.
	Chlorfenapyr	Pylon	13	12	Has translaminar-systemic activity.
	Endosulfan	Thiodan	2A	24	
Mites (Broad)	Abamectin	Avid	6	12	Has translaminar-systemic activity.
	Bifenthrin	Talstar	3	12	
	Chlorfenapyr	Pylon	13	12	Has translaminar-systemic activity.
	Pyridaben	Sanmite	21	12	
Scales (Soft and Hard)	Acephate	Orthene	1B	24	Works best on the crawler stages.
	Bifenthrin	Talstar	3	12	Works best on the crawler stages.
	Buprofezin	Talus	16	12	Works best on the crawler stages.

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	Cyfluthrin	Decathlon	3	12	Works best on the crawler stages.
	Imidacloprid	Marathon	4A	12	Only active on soft scales.
	Insecticidal soap	M-Pede/Olympic Insecticidal Soap	NS	12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying at frequent intervals.
	Kinoprene	Enstar II	7A	4	Slow-acting. Only active on the crawler stages.
	Neem oil	Triact Oil	HO	4	Short residual activity.
	Paraffinic oil	UltraFine Oil	HO	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Pyriproxyfen	Distance	7C	12	Slow-acting. Only active on the crawler stages.
Slugs	Iron phosphate	Sluggo	UN	0	Bait formulation
	Metaldehyde	Deadline	UN	12	Bait formulation.
	Methiocarb	Mesurool	C	24	Bait formulation.
Thrips	Abamectin	Avid	6	12	Rotate with Conserve and Mesurool.
	Acephate	Orthene	1B	24	Works best when tank-mixed with Tame.
	Azadirachtin	Azatin/Ornazin	18B	4/12	Works best when tank-mixed with other insecticides.
	<i>Beauveria bassiana</i>	Botanigard/Naturalis	M	4	Works best when tank-mixed with other insecticides. Three to five applications may be needed.
	Bifenthrin	Talstar	3	12	
	Cyfluthrin	Decathlon	3	12	
	Fenpropathrin	Tame	3	24	Works best when tank-mixed with Orthene.
	Fluvalinate	Mavrik	3	12	
	Kinoprene	Enstar II	7A	4	Slow-acting. Only active on the nymphal stages.
	Novaluron	Pedestal	15	12	Only active on the nymphal stages.
	Methiocarb	Mesurool	C	24	Rotate with Conserve and Avid.
	Paraffinic oil	UltraFine Oil	HO	4	Short residual activity. Avoid applying at frequent intervals. See note 2.
	Spinosad	Conserve	5	4	Avoid using at frequent intervals. Rotate with Mesurool and Avid.

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Whiteflies	Acephate	Orthene	1B	24	Has translaminar-systemic as a spray. Works on nymphs and adults.
	Acetamiprid	Tristar	4A	12	Has translaminar-systemic activity as a spray.
	Azadirachtin	Azatin/Ornazin	18B	4/12	Works best when tank-mixed with other insecticides. Active on nymphs.
	<i>Beauveria bassiana</i>	Botanigard/Naturalis	M	4	Works best when tank-mixed with other insecticides. Active on nymphs and adults. Three to five applications may be needed.
	Bifenthrin	Talstar	3	12	Active on nymphs and adults.
	Buprofezin	Talus	16	12	Active on nymphs.
	Clothianidin	Celero	4A	12	Has translaminar-systemic activity. Apply as a foliar or drench.
	Cyfluthrin	Decathlon	3	12	Active on nymphs and adults.
	Dinotefuran	Safari	4A	12	Systemic insecticide with long residual activity. Highly water soluble.
	Endosulfan	Thiodan	2A	24	May be used on greenhouse-grown tomatoes. Active on nymphs and adults.
	Fenpropathrin	Tame	3	24	Active on nymphs and adults.
	Flonicamid	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	M-Pede/Olympic Insecticidal Soap	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 II	7	4	Slow-acting. Only active on the nymphs.
	Neem oil	Triact Oil	HO	4	Active on nymphs and adults.
	Novaluron	Pedestal	15	12	Active on nymphs.
	Paraffinic oil	UltraFine Oil	HO	4	Active on eggs, pupae, nymphs, and adults. 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.	

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
	Pyridaben	Sanmite	21	12	Works on nymphs and adults.
	Pyriproxyfen	Distance	7C	12	Only works on the nymphs.
	Thiamethoxam	Flagship	4A	12	Systemic insecticide. Applied as a foliar or drench.

* 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 there 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.

1A = Carbamate	12A = Diafenthiuron
1B = Organophosphate	12A = Organotin miticide
2A = Cyclo diene organochlorine	12C = Propargite
2B = Phenylpyrazole	13 = Chlorfenapyr, DNOC
3 = Pyrethroid	14 =
4A = Neonicotinoid	15 = Benzoylureas
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 = Tetric 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 = Flubendiamide
BLO = Biological Organism	NS = Non-specific, multi-site
HO = Horticultural Oil	UN = Unknown MOA
M = Microbial	

** REI=Restricted Entry Interval

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.

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