INTEGRATED PEST MANAGEMENT
MU Guide
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Integrated Pest Management in Greenhouses and Herbaceous Nurseries

For more than 30 years the U.S. Department of Agriculture has promoted integrated pest management (IPM) as a way of dealing with arthropod (insect and mite) pests in greenhouses and herbaceous nurseries. IPM strategies include the use of cultural, biological and physical (or mechanical) methods as well as pesticides to manage pests. IPM relies on routine inspection, scouting and monitoring of arthropod populations followed by the use of insecticides or miticides only when pest populations are capable of causing plant damage. If the use of these pesticides is warranted, then it is important to choose those products that are less harmful to the environment and to beneficial insects and mites (Figure 1).

This publication is designed to assist greenhouse and nursery managers in selecting the appropriate pesticides to control or regulate the multitude of arthropod pests encountered in greenhouses and nurseries. The primary arthropod pests encountered in greenhouses and herbaceous nurseries in both Missouri and Kansas are aphids, thrips, fungus gnats, shore flies, spider mites, mealybugs, plant bugs, whiteflies, leafhoppers, leafminers, leaf-feeding beetles and caterpillars.

Alternative or "reduced-risk" pesticides

Use of pesticides has changed dramatically since 1985. Before that time, pesticides in three chemical classes — organophosphates, carbamates and chlorinated hydrocarbons — were relied upon to manage plant-feeding insects and mites. Use of materials in these older chemical classes was reduced somewhat with the availability of products in a fourth chemical class, pyrethroids. Since 1985, the Environmental Protection Agency (EPA) has reevaluated the registration of older pesticides and has encouraged the development of alternative pesticides that reduce risk to human health, toxicity to nontarget organisms, and the potential for groundwater contamination. These materials are preferred for use in greenhouses and herbaceous nurseries because they are (1) less persistent (shorter residual activity) in the environment, (2) less directly harmful to natural enemies, including parasitoids and predators, and (3) effective in controlling arthropod pests at reduced application rates when compared with other pesticides.

In 1993, the EPA defined alternative or "reduced-risk" pesticides as those that present less risk to human health and the environment than conventional alternatives. Although EPA does not permit manufacturers to use the term "reduced-risk" on product labels, the term is commonly used in promotional and marketing materials. In addition to chemical pesticides, some reduced-risk pesticides contain microorganisms. Examples include spinosad (Conserve), abamectin

Figure 1. Ladybird beetles, known for their appetite for aphids, occur naturally in Missouri but also can be introduced as biocontrol agents in greenhouses and nurseries.

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Ways to reduce use of pesticides

Although pest control materials are generally effective in killing arthropod pests, overreliance on this control method increases the likelihood that resistance will develop in arthropod pest populations. Therefore, it is important to use cultural, physical and biological control strategies as well as using pest control materials. The following practices will reduce the use of pest control materials in greenhouses and nurseries:

- Start the growing season with clean greenhouses and nurseries; remove weeds and all other plant material and eliminate debris, such as growing medium.
- Maintain adequate sanitation and use proper cultural practices (watering and fertility) throughout the growing season.
- Scout plants weekly, especially indicator plants, those that typically affected by arthropod pest problems.
- Use colored sticky cards (yellow or blue) and visually inspect plants. Record insect and mite pest observations, such as abundance (number of pests per plant or row) and life stages (eggs, nymphs or larvae, pupae and adults).
- Inspect transplants or propagation material carefully. Isolate newly introduced plants and inspect for any arthropod pest problems. If arthropod pests are present, then treat with an appropriate pest control material.
- Treat only those plants directly affected by arthropod pests or localized infestations.
- If possible, install insect screening over greenhouse openings such as ridge vents, sidewalls and intake vents. Be sure to compensate for the resulting reduction in airflow by increasing the screening surface area.

(Avid), *Bacillus thuringienisis* spp. *kurstaki* (Dipel), and *Bacillus thuringiensis* spp. *israelensis* (Gnatrol). Pesticides derived from plants, often called botanicals or plant-derived essential oils, are also available for use in greenhouses and herbaceous nurseries. Examples are the clarified hydrophobic extract from neem seed (Triact) and the product GC-Mite, which contains cottonseed, clove and garlic oil.

Tables 1 and 3 list pesticides registered for use in greenhouses and herbaceous nurseries. Table 2 lists those specifically designated for use in organic cropping systems. More information on reduced-risk materials is available online at ***epa.gov/opprd001/workplan/completionsportrait.pdf.***

New pesticides are generally registered more rapidly for use on ornamental plants than on food crops because they are not edible and do not require extensive food safety testing. However, registration for greenhouse-grown vegetables is usually delayed or may not occur. This may be confusing especially with regard to vegetable bedding plants. Several of the pesticides listed in Table 1 may be used on vegetable bedding plants. However, it is critical to read the label to obtain this information. Higher infestation levels of arthropod pests are more tolerable in vegetable production systems than in ornamental crops because plants such as tomatoes and cucumbers are primarily grown for fruit production, and may even be saleable if the plants exhibit damage from insect or mite pest feeding. Overall, it is important to read the product label before applying any pesticide to make sure that the insect or mite pests as well as the treatment site are designated.

Biological control

Biological control agents, or natural enemies such as parasitoids and predators, can be purchased from commercial suppliers or distributors and released into greenhouses (see "Biological control suppliers" on page 6). This practice is referred to as augmentative biological control, for which there are two control strategies: inoculation and inundation. Inoculation consists of releasing small numbers of natural enemies early in the growing season or cropping cycle so that a population of natural enemies will establish and reproduce in the greenhouse, providing long-term control. Inundation is the introduction of much larger numbers of natural enemies into a greenhouse to provide control in the short term. Additional releases may be required during the growing season or cropping cycle to keep arthropod pest populations at low levels.

Consult biological control suppliers and distributors for additional information on the use of natural enemies in greenhouses and herbaceous nurseries. Biological control programs tend to be more effective when crops are grown for extended periods (e.g., cut flowers and vegetables) and when environmental conditions (e.g., temperature and relative humidity) are constant. Preventive releases of natural enemies are more efficient and easier in a monoculture (e.g., single

Figure 2. The Aphidius wasp, left, stings the aphid and lays an egg in the aphid's body, which mummifies, right, as the egg develops. Photo: Marion Herbert, Alberta Research Station, Vegreville.

Guidelines for implementing a biological control program

- Scout the crop regularly to detect early infestations of arthropod pests before they reach damaging levels.
- Order natural enemies early (at least three weeks before they are needed) and release them immediately or as soon as possible after arrival. Follow the supplier's instruction for release.
- Install insect screening over greenhouse openings such as ridge vents, sidewalls and air intake vents to reduce the migration of winged aphids, adult whiteflies, thrips, and leafminers into greenhouses. Be sure to compensate for any reduction in airflow by increasing the screening surface area.
- Avoid overfertilizing plants, particularly with nitrogen-based fertilizers, because this results in the production of soft, succulent growth that is more susceptible to aphids and the twospotted spider mite (Tetranychus urticae).
- Remove yellow sticky cards before applying parasitoids, because sticky cards can attract and capture parasitoids. Yellow sticky cards can be replaced one week after making releases.
- Reduce the use of pesticide when bumblebees are used as pollinators, and avoid applying pest control materials with extended residual activity, such as products in the organophosphate, carbamate and pyrethroid chemical classes. Drenching applications of systemic insecticides to the growing medium will be less harmful than foliar applications.

crop) cropping system when there is only one arthropod pest than in a polyculture (e.g., multiple crops) cropping systems where there may be more than three different arthropod pests. For example, in the production of spring bedding plants, various insect pests may be present simultaneously, including aphids, thrips, whiteflies and fungus gnats.

The greenhouse environment does not contain the abundance and diversity of natural enemies found in outdoor settings or nurseries. This is mainly because of the extensive use of pesticides and because natural enemies typically do not migrate into greenhouses. The survival of natural enemies in a greenhouse is influenced by the abundance and types of prey that are present. However, certain parasitoids and predators sometimes occur naturally in greenhouses. For example, parasitoids in the genus *Aphidius*, which prey upon many different types of aphids, can inadvertently enter greenhouses through doors, vents or sidewalls. Adult females lay eggs into aphids, and these eggs hatch into larvae that consume the internal organs of the aphids, leaving only their hardened, brown exteriors, or "aphid mummies" (Figure 2). Eventually, a new adult parasitoid creates an exit hole and emerges from the dead aphid. Minute pirate bugs, *Orius* spp., are predatory anthocorid bugs that feed on thrips. These black and white bugs may also enter greenhouses through openings, particularly when weeds and field crops start desiccating.

Natural enemies that may be present in outdoor nurseries include ladybird beetles, green lacewings, ground beetles, soldier beetles, assassin/ambush bugs, damsel bugs, hover (syrphid) flies, tachinid flies, predatory mites and spiders.

Table 1. Pesticides (insecticides and miticides) registered for use on ornamental plants or greenhouse-grown vegetables. (Always read the label to determine if a pesticide can be used in a particular facility and on a specific crop.)

Common name or active ingredient (Trade name)	Class	Mode of action	Reentry interval	Labeled pests	Additional products
abamectin (Avid)	Macrocyclic lactone	Gamma-aminobutyric acid (GABA) chloride channel activator [6]	12 hours	spider mites, thrips, leafminers	
acephate (Orthene/Precise)	Organophosphate	Acetylcholine esterase inhibitor [1B]	24 / 12 hours	aphids, whiteflies, scales, mealybugs, thrips	
acequinocyl (Shuttle)	Napththoquinone	Mitochondria electron transport inhibitor [20B]	12 hours	spider mites	
acetamiprid (TriStar)	Neonicotinoid	Nicotinic acetylcholine receptor disruptor [4A]	12 hours	aphids, whiteflies, mealybugs, scales	
azadirachtin (Azatin/Ornazin)	Botanical (insect growth regulator)	Ecdysone antagonist [18B]	4 / 12 hours	aphids, fungus gnat larvae, thrips, whiteflies, caterpillars	Aza-Direct and Neemix
Bacillus thuringiensis spp. *israelensis* (Gnatrol)	Microbial	Midgut membrane disruptor [11A1]	4 hours	fungus gnat larvae	

Note: Numbers and letters in brackets [xx] indicate the IRAC (Insecticide Resistance Action Committee) mode of action designation found on the label.

Table 1. Pest control materials (insecticides and miticides) registered for use on ornamental plants or greenhouse-grown vegetables. *(continued)*
(Always read the label to determine if a pesticide can be used in a particular facility and on a specific crop.)

Common name or active ingredient (Trade name)	Class	Mode of action	Reentry interval	Labeled pests	Additional products
Bacillus thuringiensis spp. *kurstaki* (Dipel)	Microbial	Midgut membrane disruptor [11B2]	4 hours	caterpillars	
Beauveria bassiana (BotaniGard)	Microbial (entomopathogenic fungi)	Direct infection of host by hyphae	4 hours	aphids, mealybugs, whiteflies	Naturalis and Mycotrol
bifenazate (Floramite)	Carbazate	Gamma-aminobutyric acid (GABA) gated antagonist [25]	4 hours	spider mites	
bifenthrin (Talstar/Attain)	Pyrethroid	Sodium channel blocker [3]	12 hours	aphids, caterpillars, fungus gnat adults, mealybugs, scales, plant bugs, thrips, leafhoppers, whiteflies	
buprofezin (Talus)	Benzoylurea (insect growth regulator)	Chitin synthesis inhibitor [16]	12 hours	whiteflies, mealybugs, scales and leafhoppers	
chlorfenapyr (Pylon)	Pyrrole	Oxidative phosphorylation uncoupler [13]	12 hours	spider mites, broad mite, cyclamen mite, fungus gnat larvae, thrips	
chlorpyrifos (DuraGuard)	Organophosphate	Acetylcholine esterase inhibitor [1B]	24 hours	aphids, caterpillars, fungus gnat larvae, leafhoppers, mealybugs, shore fly larvae, thrips	
clarified hydrophobic extract of neem oil (Triact)	Botanical	Suffocation or membrane disruptor	12 hours	aphids, whiteflies, spider mites, scales	
clofentezine (Ovation)	Tetrazine	Growth and embryogenesis inhibitor [10A]	12 hours	spider mites	
cyfluthrin (Decathlon/Tempo)	Pyrethroid	Sodium channel blocker [3]	12 hours	aphids, caterpillars, fungus gnat adults, mealybugs, scales, thrips, whiteflies	
cyromazine (Citation)	Triazine (insect growth regulator)	Chitin synthesis inhibitor [17]	12 hours	fungus gnat larvae, shore fly larvae, leafminers	
diflubenzuron (Adept)	Benzoylurea (insect growth regulator)	Chitin synthesis inhibitor [15]	12 hours	fungus gnat and shore fly larvae	
dinotefuran (Safari)	Neonicotinoid	Nicotinic acetylcholine receptor disruptor [4A]	12 hours	aphids, whiteflies, scales, leafminers, thrips, leafhoppers, mealybugs	
etoxazole (TetraSan)	Diphenyloxizoline derivative (mite growth regulator)	Chitin synthesis inhibitor [10B]	12 hours	spider mites	
fenbutatin-oxide (ProMite)	Organotin	Oxidative phosphorylation inhibitor [12B]	48 hours	spider mites	
fenoxycarb (Preclude)	Carbamate (insect growth regulator)	Juvenile hormone mimic [7B]	12 hours	aphids, caterpillars, leafminers, mealybugs, scales, thrips, whiteflies	
fenpropathrin (Tame)	Pyrethroid	Sodium channel blocker [3]	24 hours	caterpillars, fungus gnat adults, mealybugs, whiteflies	
fenpyroximate (Akari)	Phenoxypyrazole	Mitochondria electron transport inhibitor [21]	12 hours	spider mites	
flonicamid (Aria)	Trifluoromethyl-nicotinamide	Selective feeding blocker [9C]	12 hours	aphids, thrips, whiteflies	

Note: Numbers and letters in brackets [xx] indicate the IRAC (Insecticide Resistance Action Committee) mode of action designation found on the label.

Table 1. Pest control materials (insecticides and miticides) registered for use on ornamental plants or greenhouse-grown vegetables. *(continued)*
(Always read the label to determine if a pesticide can be used in a particular facility and on a specific crop.)

Common name or active ingredient (Trade name)	Class	Mode of action	Reentry interval	Labeled pests	Additional products
fluvalinate (Mavrik)	Pyrethroid	Sodium channel blocker [3]	12 hours	aphids, fungus gnat adults, thrips, leafhoppers, caterpillars, plant bugs, whiteflies	
hexythiazox (Hexygon)	Carboxamide	Growth and embryogenesis inhibitor [10A]	12 hours	spider mites	
imidacloprid (Marathon/Merit)	Neonicotinoid	Nicotinic acetylcholine receptor disruptor [4A]	12 hours	aphids, whiteflies, scales, mealybugs	Admire, Benefit, Mantra
kinoprene (Enstar II)	Insect growth regulator	Juvenile hormone mimic [7A]	4 hours	aphids, fungus gnat larvae, mealybugs, scales, thrips, whiteflies	
methiocarb (Mesurol)	Carbamate	Acetylcholine esterase inhibitor [1A]	24 hours	aphids, thrips, snails/slugs	
milbemectin (Ultiflora)	Macrocyclic lactone	Gamma-aminobutyric acid (GABA) chloride channel activator [6]	12 hours	spider mites	
novaluron (Pedestal)	Benzoylurea (insect growth regulator)	Chitin synthesis inhibitor [15]	12 hours	thrips, whiteflies, caterpillars, leafminers	
paraffinic oil (Ultra-Fine Oil)	Refined petroleum distillate	Suffocation or membrane disruptor	4 hours	aphids, mealybugs, scales, spider mites, whiteflies	
petroleum oil (PureSpray Green)	Refined petroleum distillate	Suffocation or membrane disruptor	4 hours	aphids, mealybugs, scales, spider mites, whiteflies	
potassium salts of fatty acids (insecticidal soap/ M-Pede)	Insecticidal soap	Desiccation or membrane disruptor	12 hours	aphids, caterpillars, fungus gnat adults, leafhoppers, mealybugs, scales, spider mites, whiteflies	
pymetrozine (Endeavor)	Pyridine (Azomethine)	Selective feeding blocker [9B]	12 hours	aphids and whiteflies	
pyridaben (Sanmite)	Pyridazinone	Mitochondria electron transport inhibitor [21]	12 hours	spider mites and whiteflies	
pyriproxyfen (Distance)	Pyridine (insect growth regulator)	Juvenile hormone mimic [7C]	12 hours	fungus gnat and shore fly larvae, scales, whiteflies	
pyrethrin (Pyganic)	Botanical	Sodium channel blocker [3]	12 hours	aphids, caterpillars, beetles, mealybugs, thrips, whiteflies	Pyreth-It and Pyrethrum
pyrethrin and silicon dioxide (Diatect V)	Botanical	Central nervous system disruptor and desiccant [3]	12 hours	labeled pests: aphids, caterpillars, whiteflies	
spinosad (Conserve/Entrust)	Spinosyn	Nicotinic acetylcholine receptor agonist [5]	4 hours	caterpillars, thrips, leafminers	
spiromesifen (Judo)	Tetronic acid	Lipid biosynthesis inhibitor [23]	12 hours	spider mites, broad mite, whiteflies	
Steinernema feltiae (Nemasys)	Biological control (entomopathogenic nematode)	Penetrant through insect cuticle and degrades internal contents	0 hours	fungus gnat larvae	NemaShield, Scanmask, Entonem
thiamethoxam (Flagship)	Neonicotinoid	Nicotinic acetylcholine receptor disruptor [4A]	12 hours	aphids, whiteflies, mealybugs, scales	

Note: Numbers and letters in brackets [xx] indicate the IRAC (Insecticide Resistance Action Committee) mode of action designation found on the label.

Table 2. Pesticides (insecticides and miticides) registered for use in organic production systems (ornamental plants, vegetables and herbs).

Common name or active ingredient (Trade name)	Class	Mode of action	Reentry interval	Labeled pests
azadirachtin (Azatrol/Neemix)	Botanical (insect growth regulator)	Ecdysone antagonist [18B]	4 / 12 hours	aphids, fungus gnat larvae, thrips, whiteflies, caterpillars
Bacillus thuringiensis spp. *israelensis* (Gnatrol)	Microbial	Midgut membrane disruptor [11A1]	4 hours	fungus gnat larvae
Bacillus thuringiensis spp. *kurstaki* (Dipel)	Microbial	Midgut membrane disruptor [11B2]	4 hours	caterpillars
clarified hydrophobic extract of neem oil (Triact)	Botanical	Suffocation or membrane disruptor	12 hours	aphids, whiteflies, spider mites, scales
horticultural oils: petroleum oils (PureSpray Green), plant-based oils (GC-Mite/ Golden Pest Spray Oil), fish-based oils (Organocide)	Refined petroleum distillate and botanical	Suffocation or membrane disruptor (some products have multiple modes of action; refer to label).	4 hours	aphids, mealybugs, scales, spider mites, whiteflies
kaolin clay (Surround)	Protectant	Multiple modes of action (refer to label)	4 hours	caterpillars, beetles, tarnished plant bug, stink bug, thrips
potassium salts of fatty acids (insecticidal soap/M-Pede)	Insecticidal soap	Desiccation or membrane disruptor	12 hours	aphids, caterpillars, fungus gnat adults, leafhoppers, mealybugs, scales, spider mites, whiteflies
pyrethrin (Pyganic)	Botanical	Sodium channel blocker [3]	12 hours	aphids, caterpillars, beetles, mealybugs, thrips, whiteflies
spinosad (Entrust)	Spinosyn	Nicotinic acetylcholine receptor agonist and GABA chloride channel activator [5]	4 hours	caterpillars, thrips, leafminers

Note: Numbers and letters in brackets [xx] indicate the IRAC (Insecticide Resistance Action Committee) mode of action designation found on the label.

More information about the National Organic Program, online at *usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1OB?navid=ORGANIC_CERTIFICATIO&navtype=RT&parentnav=AGRICULTURE*

Biological control suppliers

- Green Spot
  93 Priest Road
  Nottingham, NH 03290-6204
  Phone: 603-942-8925
  Online: *greenmethods.com*
  E-mail: *info@greenmethods.com*
- IPM Laboratories
  P.O. Box 300
  Locke, NY 13092-0300
  Phone: 315-497-2063
  Online: *ipmlabs.com*
  E-mail: *ipminfo@Ipmlabs.com*
- Koppert Inc.
  Romulus, Mich.
  Phone: 734-641-3763
  E-mail: *info@koppertline.com*
- Syngenta Bioline
  Oxnard, Calif.
  Phone: 805-986-8255
  E-mail: *info@syngentabioline.com*
- BioBest Biological Systems
  Online: *biobest.be*
  E-mail: *info@biobest.ca*

Sources of biological control agents are listed in the publication *Suppliers of Beneficial Organisms in North America* by Charles Hunter, which is available from the California Environmental Protection Agency (CEPA) online at *cdpr.ca.gov/docs/pestmgt/ipminov/bensuppl.htm* or from reputable suppliers.

Be sure to consult your biological control supplier to determine the availability and shipping requirements for the natural enemy species you are interested in.

Table 3. Common greenhouse and nursery pests and pesticides registered for their control. (Always read the label to determine if a pesticide can be used in a particular facility and on a specific crop.)

Pest	Common name	Trade name
aphids	acephate	Orthene/Precise
	acetamiprid	TriStar
	azadirachtin	Azatin/Ornazin
	Beauveria bassiana	BotaniGard
	bifenthrin	Talstar/Attain
	chlorpyrifos	Duraguard
	cyfluthrin	Decathalon/Tempo
	dinotefuran	Safari
	fenoxycarb	Preclude
	fenpropathrin	Tame
	flonicamid	Aria
	fluvalinate	Mavrik
	imidacloprid	Marathon/Merit
	kinoprene	Enstar II
	methiocarb	Mesurol
	neem oil extract	Triact
	paraffinic oil	Ultra-Fine oil
	petroleum oil	PureSpray Green
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pymetrozine	Endeavor
	pyrethrin	Pyganic
	pyrethrin and silicon dioxide	Diatect V
	thiamethoxam	Flagship
beetles	pyrethrin	Pyganic
caterpillars	azadirachtin	Azatin/Ornazin
	Bt spp. *kurstaki*	Dipel
	bifenthrin	Talstar/Attain
	cyfluthrin	Decathalon/Tempo
	fenoxycarb	Preclude
	fenpropathrin	Tame
	fenpyroximate	Akari
	fluvalinate	Mavrik
	novaluron	Pedestal
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pyrethrin	Pyganic
	pyrethrin and silicon dioxide	Diatect V
	spinosad	Conserve/Entrust
fungus gnat,		
adult	bifenthrin	Talstar/Attain
	cyfluthrin	Decathalon/Tempo
	fenpropathrin	Tame
	fluvalinate	Mavrik
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
larvae	azadirachtin	Azatin/Ornazin
	Bt spp. *israelensis*	Gnatrol
	chlorfenapyr	Pylon
	chlorpyrifos	Duragard
	cyromazine	Citation
	diflubenzuron	Adept
	kinoprene	Enstar II
	pyriproxyfen	Distance
	Steinernema feltiae	Nemasys
leaf hoppers	bifenthrin	Talstar/Attain
	buprofezin	Talus
	chlorpyrifos	Duraguard
	dinotefuran	Safari
	fluvalinate	Mavrik
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
leaf miners	abamectin	Avid
	cyromazine	Citation
	dinotefuran	Safari
	fenoxycarb	Preclude
	spinosad	Conserve/Entrust
mealybugs	acephate	Orthene/Precise
	acetamiprid	TriStar
	Beauveria bassiana	BotaniGard
	bifenthrin	Talstar/Attain
	chlorpyrifos	Duraguard
	cyfluthrin	Decathalon/Tempo
	fenoxycarb	Preclude
	fenpropathrin	Tame
	imidacloprid	Marathon/Merit
	kinoprene	Enstar II
	paraffinic oil	Ultra-Fine oil
	petroleum oil	PureSpray Green
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pyrethrin	Pyganic
	thiamethoxam	Flagship
mites,		
broad mite	chlorfenapyr	Pylon
	spiromesifen	Judo
cyclamen mite	chlorfenapyr	Pylon
spider mite	abamectin	Avid
	acequinocyl	Shuttle
	bifenazate	Floramite
	chlorfenapyr	Pylon
	clofentezine	Ovation
	etoxazole	TetraSan
	fenbutatin-oxide	ProMite
	fenpyroximate	Akari
	hexythiazox	Hexagon
	milbemectin	Ultraflora
	neem oil extract	Triact
	paraffinic oil	Ultra-Fine oil
	petroleum oil	PureSpray Green
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pyridaben	Sanmite
	spiromesifen	Judo
plant bugs	bifenthrin	Talstar/Attain
	fluvalinate	Mavrik
scales	acephate	Orthene/Precise
	acetamiprid	TriStar
	bifenthrin	Talstar/Attain
	neem oil extract	Triact
	cyfluthrin	Decathalon/Tempo
	fenoxycarb	Preclude
	imidacloprid	Marathon/Merit
	kinoprene	Enstar II
	paraffinic oil	Ultra-Fine oil
	petroleum oil	PureSpray Green
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pyriproxfen	Distance
	thiamethoxam	Flagship
shore fly larvae	cyromazine	Citation
	diflubenzuron	Adept
	pyriproxfen	Distance

Table 3. Common greenhouse and nursery pests and pesticides registered for their control. *(continued)*
(Always read the label to determine if a pesticide can be used in a particular facility and on a specific crop.)

Pest	Common name	Trade name
slugs/snails	methiocarb	Mesurol
thrips	abamectin	Avid
	acephate	Orthene/Precise
	azadirachtin	Azatin/Ornazin
	bifenthrin	Talstar/Attain
	chlorfenapyr	Pylon
	chlorpyrifos	Duraguard
	cyfluthrin	Decathalon/Tempo
	fenoxycarb	Preclude
	flonicamid	Aria
	fluvalinate	Mavrik
	kinoprene	Enstar II
	methiocarb	Mesurol
	novaluron	Pedestal
	pyrethrin	Pyganic
	spinosad	Conserve/Entrust
whiteflies	acephate	Orthene/Precise
	acetamiprid	TriStar
	azadirachtin	Azatin/Ornazin
	Beauveria bassiana	BotaniGard
	bifenthrin	Talstar/Attain
	neem oil extract	Triact
	cyfluthrin	Decathalon/Tempo
	fenoxycarb	Preclude
	fenpropathrin	Tame
	flonicamid	Aria
	fluvalinate	Mavrik
	imidacloprid	Marathon/Merit
	kinoprene	Enstar II
	novaluron	Pedestal
	paraffinic oil	Ultra-Fine oil
	petroleum oil	PureSpray Green
	potassium salts of fatty acids	Insecticidal soap/ M-Pede
	pymetrozine	Endeavor
	pyridaben	Sanmite
	pyriproxfen	Distance
	pyrethrin	Pyganic
	pyrethrin and silicon dioxide	Diatect V
	spiromesifen	Judo
	thiamethoxam	Flagship

Further information

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