



Insect Management Suggestions for Commercial Orchid Production ¹

James F. Price, Curtis Nagle and Elzie McCord, Jr.²

Florida orchids are produced in greenhouses and shade houses as potted florist plants and cut flowers. There were 3.3 million pots of orchids, with a wholesale value of \$26.8 million, produced in 2001 mostly for sales within the southeastern U.S. There are no public records of production or sales for the smaller orchid cut flower markets. Major arthropod pests include mealybugs, spider mites and thrips; other less important arthropods also damage orchids.

Tables 1-9 list chemicals that are presently available to commercial orchid producers in Florida and are organized alphabetically by the following major pest groups:

Aphids

Black Twig Borer (“Dendrobium Beetle”)

Fungus Gnats

Mealybugs

Mites

Scales

Shore Flies

Slugs & Snails

Thrips

The tables include beneficial nematode and microbial insecticides, which are components of biological control. For each pest group listed, products available for control are presented by active ingredient. Usually only one example of each formulation is given; however, there may be other formulations or products as effective as those listed. Notes taken from labels are provided to qualify some uses.

Precautionary statements, re-entry intervals, restricted use status, and registrants are provided in a separate publication, *Insecticides, Miticides & Molluscicides Available to Florida's Floricultural*

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2. James F. Price, associate professor, Curtis Nagle, biologist and Elzie McCord, Jr., adjunct professor, University of Florida Entomology and Nematology Department, Gulf Coast Research and Education Center, Cooperative Extension Service, Institute of Food and Agricultural Sciences, Bradenton, FL 34203. The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. Use pesticides safely. Read and follow directions on the manufacturer's label.

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Industry (ENY-679), to aid in the selection and safe use of the pesticides. When available, label hyperlinks are provided in the electronic version of that paper. Hyperlinks point to respective business Websites, not to any source maintained by the University of Florida. Please be aware that hyperlinks and Websites may change without notice.

Many pesticides decompose in the spray tank when mixed with water above pH 7. Growers should test the pH of their water and when above 7, should add a buffering solution to maintain pH between 6.5 and 7.

This summary is only a guide to aid in selection of pesticides. Care has been given to provide accurate and up-to-date information, but it is possible that, through label changes, error, etc., improper uses may be indicated. In all cases it is the responsibility of the applicator to read, understand, and comply with the label that accompanies each pesticide container.

As an additional precaution, keep the telephone number and address of the nearest county poison control center in a convenient location in case of an accidental poisoning. Also, keep clean copies of labels of all pesticides on your premises. In the event of a poisoning, the label of the pesticide involved should be taken to the poison control center or hospital.

Table 1. Aphid (Homoptera: Aphididae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Abamectin	Avid 0.15 EC	F, G	
Acephate	1300 Orthene TR Acephate Pro 75, WSP Address T/O Sedagri Acephate 75 SP Orthene Turf, Tree & Ornamental Spray 75, 97	G	
Azadirachtin	Ornazin 3% EC Azatin XL	F, G	
Azinphos-Methyl	Guthion Solupak	F	Nursery stock
<i>Beauveria bassiana</i>	Botanigard 22WP	F, G	Nursery & shade house (F)
	Botanigard ES	F, G	Nursery (F)
		F, G	
Bifenthrin	Attain TR Talstar GH Prescription Talstar Flowable	G	
	Talstar N	F, G	Shade House & Nursery (F)
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
Chlorpyrifos	Chlorpyrifos Pro 2	F	Nursery stock in nurseries; Do not exceed 1 lb. a.i. per acre.
	Chlorpyrifos Pro 4	F, G	Nursery (F)
	Duraguard ME	F,G	Nursery (F); Potted and cut flowers; Direct spray to some open blooms may cause petal drop.
	Dursban 50W	F	Nursery
Chlorpyrifos & Cyfluthrin	Duraplex TR	G	
Clarified Hydrophobic Extract of Neem Oil	Triact 70	F, G	Most effective when applied early to mid-morning or late afternoon.
Cyfluthrin	Decathlon 20 WP	F, G	
Deltamethrin	Deltagard GC 5 SC	F	Nursery
Diazinon	Diazinon 50W Diazinon AG 500 (Micro Flo)	F	
	KnoxOut NL	F	Nursery
Endosulfan	Endosulfan 50WP Phaser 50WSB, 3EC Thiodan 3EC	F, G	Do not exceed a maximum of 3 lbs. a.i. (6 lbs. product) per acre per year.
Fenoxycarb	Preclude TR	G	
Fenpropathrin	Tame 2.4EC	F, G	Nursery & Shade house (F); Do not use less than a 7-day retreatment interval.

Table 1. Aphid (Homoptera: Aphididae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Imidacloprid	Marathon 1% Granular	F, G	Nursery (F); On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon 60 WP	F, G	Nursery (F); Soil treatment only; On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon II	F, G	On outdoor ornamentals do not apply more than 1.6 pt. (0.4 lbs. a.i.) per acre per year.
Lambda-Cyhalothrin	Scimitar SC	F, G	Nursery & Shade house (F); Do not apply more than 0.36 lbs. a.i. (52.4 fl. oz. of concentrate) per acre per year.
Malathion	Atrapa 5E Gowan Malathion 8F Malathion 5EC Prozap 57EC	F	
Naled	Dibrom 8 E	G	Vapor treatment; Avoid over-treatment and direct application to plants as injury may result.
Oxydemeton-Methyl	Metasystox-R	F	Nursery stock
Permethrin	Astro	F, G	Container grown nursery stock (F); Do not apply more than 2.0 lb. a.i. per acre per year.
Potassium Salts of Fatty Acids	Insecticidal Soap 49.52 CF	F, G	Caution: Some varieties have shown sensitivity. Do not use on new transplants, newly rooted cuttings, or plants stressed by drought.
	M-Pede	F, G	Must combine with other pesticides; Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Pymetrozine	Endeavor	F, G	Do not apply more than 10 oz. per acre per application. For outdoor use, do not apply more than 48 oz. per acre per year. For indoor use, do not apply more than 100 oz. per acre per year.
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum	G	
	Pyreth-It Pyrenone Crop Spray	F, G	
Pyrethrins, Piperonyl Butoxide & Silicon Dioxide	Dialect Multipurpose Insecticide II	F	
Pyrethrins, Rotenone & Other Cube Resins	Pyrellin EC	F, G	Apply in intervals of 7-days or less.

Table 1. Aphid (Homoptera: Aphididae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Pyriproxyfen	Distance	F, G	Suppression; Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	F, G	Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Early morning applications are recommended. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, and any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
S-Kinoprene	Enstar II	G	Slight to moderate injury has occurred on some blooms under certain conditions, suggest application be made in pre-bloom stage.
Tau-Fluvalinate	Mavrik Aquaflo	F, G	
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 2. Black Twig Borer (“Dendrobium beetle”) (Coleoptera: Scolytidae: *Xylosandrus compactus* (Eichhoff)) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Azadirachtin	Ornazin 3% EC	F, G	Bark beetles
Bifenthrin	Talstar Flowable Talstar GH	G	Twig borers

Table 2. Black Twig Borer (“Dendrobium beetle”) (Coleoptera: Scolytidae: *Xylosandrus compactus* (Eichhoff)) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Chlorpyrifos	Chlorpyrifos Pro 2	F	Beetles, such as ambrosia beetle; Nursery stock in nurseries; Do not exceed 1 lb. a.i. per acre.
	Chlorpyrifos Pro 4	F, G	Beetles, such as ambrosia beetle; Nursery (F)
	Dursban 50W	F	Beetles, such as ambrosia beetle; Nursery
Permethrin	Astro	F, G	Borers; Container grown nursery stock (F); Do not apply more than 2.0 lb. a.i. per acre per year.

¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.
²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.

Table 3. Fungus Gnat (Diptera: Sciaridae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Acephate	1300 Orthene TR	G	
Azadirachtin	Ornazin 3% EC Azatin XL	F, G	
<i>Bacillus thuringiensis israelensis</i>	Gnatrol	F, G	Larvae; In potting soil mixtures only (F).
<i>Beauveria bassiana</i>	Naturalis L	F, G	
Bifenthrin	Attain TR Talstar GH Prescription Talstar Flowable	G	
	Talstar N	F, G	Shade House & Nursery (F)
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
	Talstar Nursery Granular	F	Containerized plants; Larvae
Chlorpyrifos	Duraguard ME	F, G	Nursery (F); Potted & cut flowers (G); Direct spray to some open blooms may cause petal drop.
Chlorpyrifos & Cyfluthrin	Duraplex TR	G	
Cyfluthrin	Decathlon 20 WP	F, G	
Cyromazine	Citation	F, G	Will not control adult stage. Do not make more than six applications to one crop.
Deltamethrin	Deltagard GC 5 SC	F	Nursery

Table 3. Fungus Gnat (Diptera: Sciaridae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Diazinon	KnoxOut NL	F	Larvae; Nursery
Diflubenzuron	Adept	F, G	Shade house (F); Do not make more than four applications per crop. Do not reuse potting media that has been treated with Adept. Do not apply to plants grown on capillary water mats.
Fenoxycarb	Precision	F, G	Container & shade house grown (F); Will not control the adult stage. Do not exceed a maximum of 30 applications per year for greenhouse use.
Permethrin	Astro	F, G	Container grown nursery stock (F); Do not apply more than 2.0 lb. a.i. per acre per year.
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum TR	G	
	Pyrenone Crop Spray	F, G	
Pyriproxyfen	Distance	F, G	Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
	Pyrigro	F, G	Larvae; Shade house & garden centers (F); Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	G	Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, and any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
S-Kinoprene	Enstar II	G	Slight to moderate injury has occurred on some blooms under certain conditions, suggest application be made in pre-bloom stage.
<i>Steinernema carpocapsae</i>	Millenium	F, G	Nursery (F)

Table 3. Fungus Gnat (Diptera: Sciaridae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
<i>Steinernema feltiae</i>	Nemasys	F, G	Larvae; Nursery (F); If fungus gnats are established it may take 2 to 3 weeks before the number of adults is noticeably reduced.
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 4. Mealybug (Homoptera: Pseudococcidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Acephate	1300 Orthene TR Acephate Pro 75, WSP Address T/O Sedagri Acephate 75 SP Orthene Turf, Tree & Ornamental Spray 75, 97	G	
Azadirachtin	Ornazin 3% EC Azatin XL	F, G	
<i>Beauveria bassiana</i>	Botanigard 22WP	F, G	Nursery & shade house (F)
	Botanigard ES	F, G	Nursery (F)
	Naturalis L	F, G	
Bifenthrin	Attain TR Talstar GH Prescription Talstar Flowable	G	
	Talstar N	F, G	Shade House & Nursery (F)
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
	Talstar Nursery Granular	F	Containerized plants
Carbaryl	Sevin SL	F	
Chlorpyrifos	Chlorpyrifos Pro 2	F	Nursery stock in nurseries; Do not exceed 1 lb. a.i. per acre.
	Chlorpyrifos Pro 4	F, G	Nursery (F); Do not use more than 2 pints per acre (F).
	Duraguard ME	F, G	Including root mealybugs; Nursery (F); Potted & cut flowers (G); Direct spray to some open blooms may cause petal drop.
	Dursban 50W	F	Nursery
Chlorpyrifos & Cyfluthrin	Duraplex TR	G	

Table 4. Mealybug (Homoptera: Pseudococcidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Clarified Hydrophobic Extract of Neem Oil	Triact 70	F, G	
Cyfluthrin	Decathlon 20 WP	F, G	
Deltamethrin	Deltagard GC 5 SC	F	Nursery
Diazinon	KnoxOut NL	F	Citrus, stem and root mealybugs; Nursery
Fenpropathrin	Tame 2.4EC	F, G	Nursery & Shade house (F); Do not use less than a 7-day retreatment interval.
Imidacloprid	Marathon 1% Granular	F, G	Nursery (F). On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon 60WP	F, G	Nursery (F); Soil treatment only; On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon II	F, G	On outdoor ornamentals do not apply more than 1.6 pt. (0.4 lbs. a.i.) per acre per year.
Lambda-Cyhalothrin	Scimitar GC	F, G	Nursery & Shade house (F); Do not apply more than 0.36 lbs. a.i. (52.4 fl. oz. of concentrate) per acre per year.
Malathion	Atrapa 5E Gowan Malathion 8F Malathion 5EC Prozap 57EC	F	
Methidathion	Supracide 25-W	F	Nursery stock
Naled	Dibrom 8 Emulsive	G	Vapor treatment; Avoid over-treatment and direct application to plants as injury may result.
Permethrin	Astro	F, G	Container grown nursery stock (F); Do not apply more than 2.0 lb. a.i. per acre per year.
Potassium Salts of Fatty Acids	Insecticidal Soap 49.52 CF	F, G	Caution: Do not use on new transplants, newly rooted cuttings, or plants stressed by drought. Some varieties have shown sensitivity. Do not apply to open blooms.
	M-Pede	F, G	Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum TR	G	
	Pyrenone Crop Spray	F, G	
Pyrethrins, Piperonyl Butoxide & Silicon Dioxide	Diatect Multipurpose Insecticide II	F	

Table 4. Mealybug (Homoptera: Pseudococcidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Pyrethrins, Rotenone & Other Cube Resins	Pyrellin EC	F, G	Apply in intervals of 7-days or less.
Pyriproxyfen	Distance	F, G	Suppression; Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	F, G	Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Early morning applications are recommended. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, and any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
S-Kinoprene	Enstar II	G	Including root mealybug; Slight to moderate injury has occurred on some blooms under certain conditions, suggest application be made in pre-bloom stage.
Tau-Fluvalinate	Mavrik Aquaflo	F, G	
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 5. Mite (Acari) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Abamectin	Avid 0.15EC	F, G	Eriophyid mites (bud mites, rust mites); Southern red mite, twospotted spider mite; Carmine spider mite, European red mite; Tarsonemid mites (broad mite, cyclamen mites)

Table 5. Mite (Acari) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
<i>Beauveria bassiana</i>	Naturalis L	F, G	
Bifenazate	Floramite	F, G	Red mites, southern red mite, spider mites, twospotted spider mite; Do not make more than two applications per crop per year. Do not apply more than 16 oz. per acre per year. Apply only one application of Floramite before rotating to products of an alternative chemical class and use at least two alternative products between treatments of Floramite.
	Floramite SC	F, G	Twospotted spider mite, southern red mite, European red mite; Do not use in successive applications. Apply only one application before rotating to products of an alternative chemical class. Use at least two alternative products between treatments of Floramite SC. Do not make more than two applications per crop per year. Do not apply more than 32 fl. oz. per acre per year.
Bifenthrin ³	Attain TR	G	
	Talstar GH Prescription Talstar Flowable	G	
	Talstar N	F, G	Shade House & Nursery (F)
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
Carbaryl	Sevin SL	F	Eriophyid mites
Chlorfenapyr	Pylon	G	Spider mites, broad mite, cyclamen mite, rust mite; Do not apply more than three applications (not more than 41 fl. oz. of product or 0.64 lbs. of a.i.) during a crop cycle. Do not apply more than two times consecutively and do not apply to consecutive crops in a greenhouse structure.
Chlorpyrifos & Cyfluthrin ³	Duraplex TR	G	
Clarified Hydrophobic Extract of Neem Oil	Triact 70	F, G	
Clofentezine	Ovation SC	F, G	European red mite; Twospotted spider mite; nursery stock, shade house & container grown (F); Recommended application frequency is once per crop cycle in greenhouse, saran house, and shade house culture, and once per each crop cycle occurring within a year for outdoor ornamentals.

Table 5. Mite (Acari) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Diazinon	Diazinon 50W Diazinon AG 500 (Micro Flo)	F	Bermudagrass mites, carnation bud mites, carnation shoot mites, cyclamen mites, European red mites, privet mites, twospotted spider mites
	KnoxOut NL	F	Nursery
Endosulfan	Endosulfan 50WP Phaser 50WSB, 3EC Thiodan 3EC	F, G	Cyclamen mite; Taxus bud mite (F); Do not exceed a maximum of 3 lbs. a.i. (6 lbs. product) per acre per year.
Etoxazol	Tetrasan 5 WDG	F, G	Shade house (F); spider mites
Fenbutatin-oxide	Vendex 50WP	F, G	Twospotted spider mite
Fenpropathrin ³	Tame 2.4EC	F, G	Southern red mite, twospotted spider mite; Nursery & Shade house (F); Do not use less than a 7-day retreatment interval.
Fenpyroximate	Akari 5SC	G	Spider mites; Do not apply more than 48 fl. oz. per crop cycle or per growing season, whichever is longer. For best results make no more than two applications per growing season or crop cycle, whichever is longer.
Hexythiazox	Hexygon DF (See orchid supplemental label)	F	Southern red mite, twospotted spider mite, European red mite; Do not use Plyac or household detergents in tank mix combinations with Hexygon DF. Apply prior to bloom formation. Apply only once per crop cycle.
	Hexygon (See orchid supplemental label)	F	Southern red mite, twospotted spider mite, European red mite; Apply prior to bloom formation. Make only one application per crop cycle or once per year.
Lambda-Cyhalothrin ³	Scimitar GC	F, G	Broad mite, spider mites; Nursery & Shade house (F); Do not apply more than 0.36 lbs. a.i. (52.4 fl. oz. of concentrate) per acre per year.
Methiocarb	Mesurool 75-W	F, G	Nursery & mature ornamental plantings (F); Do not apply with oil.
Potassium Salts of Fatty Acids	Insecticidal Soap 49.52 CF	F, G	Spider mites; Caution: Do not use on new transplants, newly rooted cuttings, or plants stressed by drought. Some varieties have shown sensitivity. Do not apply to open blooms.
	M-Pede	F, G	Spider mites; Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Propargite	Ornamite	F	Spider mites; Do not apply with oil.

Table 5. Mite (Acari) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum TR	G	
	Pyrenone Crop Spray	F, G	Clover mites, strawberry mites
Pyrethrins, Piperonyl Butoxide & Silicon Dioxide	Diatect Multipurpose Insecticide II	F	
Pyrethrins, Rotenone & Other Cube Resins	Pyrellin EC	F, G	Apply in intervals of 7-days or less.
Pyridaben	Sanmite 75W	F, G	Broad mite, European red mite, Southern red mite, tumid mite, twospotted spider mite; Do not exceed 21.34 ounces per acre per year.
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	F, G	Eriophyid mites (F), gall mites (F), spider mites; Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Early morning applications are recommended. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
Tau-Fluvalinate ³	Mavrik Aquaflow	F, G	

¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.

²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.

³Some spider mite populations have become resistant to pyrethroid insecticides. Infrequent use may be effective but repeated use may be ineffective, depending on the history of the target population.

Table 6. Scale (Homoptera: Diaspididae; Coccidae; and others) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Acephate	1300 Orthene TR	G	
	Acephate Pro 75, WSP Address T/O Sedagri Acephate 75 SP Orthene Turf, Tree & Ornamental Spray 75, 97	G	Crawlers
Azadirachtin	Ornazin 3% EC	F, G	Soft scales (G)
Azinphos-Methyl	Guthion Solupak	F	Nursery stock; cerococcus scale, euonymus scale, juniper scale, olive scale, oystershell scale, pulvinaria scale, brown soft scale, putnam scale
Bifenthrin	Attain TR	G	
	Talstar GH Prescription	G	Brown soft scale, California red scale crawlers, San Jose scale crawlers
	Talstar Flowable	G	Brown soft scale, California red scale crawlers, San Jose scales crawlers
	Talstar N	F, G	Shade House & Nursery (F); Brown soft scale, California red scale crawlers, San Jose scale crawlers
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Brown soft scale, California red scale crawlers, San Jose scale crawlers; Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
Carbaryl	Sevin SL	F	Crawlers
Chlorpyrifos	Chlorpyrifos Pro 2	F	Nursery stock in nurseries; Do not exceed 1 lb. a.i. per acre.
	Chlorpyrifos Pro 4	F, G	Nursery (F); Do not use more than 2 pints per acre (F).
	Duraguard ME	F, G	Nursery (F); Potted & cut flowers (G); Direct spray to some open blooms may cause petal drop.
	Dursban 50W	F	Nursery
Chlorpyrifos & Cyfluthrin	Duraplex TR	G	
Clarified Hydrophobic Extract of Neem Oil	Triact 70	F, G	
Cyfluthrin	Decathlon 20 WP	F, G	Crawlers
Deltamethrin	Deltagard GC 5 SC	F	Nursery; Crawlers

Table 6. Scale (Homoptera: Diaspididae; Coccidae; and others) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Diazinon	Diazinon 50W Diazinon AG 500 (Micro Flo)	F	Rhodesgrass scales; crawlers of: cottonycushion, lecanium, soft & San Jose scale
	KnoxOut NL	F	Nursery
Disulfoton	Di-Syston 15% G	F	Soft scale (<i>Coccus hesperidum</i>); Tea scale
Fenoxycarb	Precision	F, G	Container & shade house grown (F); Will not control the adult stage. Soft scale; Sprays for control of scale should be directed to the crawler stage. Do not exceed a maximum of 30 applications per year for greenhouse use.
	Preclude TR	G	
Fenpropathrin	Tame 2.4EC	F, G	San Jose scale crawlers; Nursery & Shade house (F); Do not use less than a 7-day retreatment interval.
Imidacloprid	Marathon 1% Granular	F, G	Soft scale; Nursery (F). On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon 60WP	F, G	Nursery (F); Soil treatment only; On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
Lambda-Cyhalothrin	Scimitar GC	F, G	Crawlers; Nursery & Shade house (F); Do not apply more than 0.36 lbs. a.i. (52.4 fl. oz. of concentrate) per acre per year.

Table 6. Scale (Homoptera: Diaspididae; Coccidae; and others) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Malathion	Atrapa 5E	F	Oystershell scale, euonymus scale, scurfy scale, magnolia scale, fletcher scale, Florida red scale, black scale crawler, soft scale, wax scale
	Gowan Malathion 8F	F	Black scale crawler, euonymus scale, fletcher scale, Florida red scale, juniper scale, lace scale, magnolia scale, oystershell scale, scurfy scale, wax scale; For oystershell, fletcher, juniper, scale, apply when scale crawlers have settled on foliage.
	Malathion 5EC	F	Black scale crawlers; euonymus scale, fletcher scale, Florida red scale, juniper scale & oystershell scale crawlers settled on foliage; magnolia scale, wax scale crawlers, scurfy scale, soft brown scale
	Prozap 57EC	F	Scales: oystershell crawlers, euonymus, scurfy, magnolia, fletcher crawlers, Florida red crawlers, juniper crawlers, soft, wax crawlers
Methidathion	Supracide 15-W	F	Nursery stock
Potassium Salts of Fatty Acids	Insecticidal Soap 49.52 CF	F, G	Caution: Do not use on new transplants, newly rooted cuttings, or plants stressed by drought. Some varieties have shown sensitivity. Do not apply to open blooms.
	M-Pede	F, G	Euonymus scale; Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum TR	G	
Pyriproxyfen	Distance	F, G	Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
	Pyrigro	F, G	Shade house & garden centers (F); Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.

Table 6. Scale (Homoptera: Diaspididae; Coccidae; and others) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Armored and soft scales; Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	F, G	Scales, immature (hard and soft); Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Early morning applications are recommended. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, and any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
S-Kinoprene	Enstar II	G	Armored scales, soft-bodied scales; Slight to moderate injury has occurred on some blooms under certain conditions, suggest application be made in pre-bloom stage.
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 7. Shore fly (Diptera: Ephydriidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Azadirachtin	Ornazin 3% EC Azatin XL	F, G	
<i>Beauveria bassiana</i>	Naturalis L	F, G	
Chlorpyrifos	Duraguard ME	F, G	Nursery (F); Potted & cut flowers (G); Direct spray to some open blooms may cause petal drop.
Chlorpyrifos & Cyfluthrin	Duraplex TR	G	

Table 7. Shore fly (Diptera: Ephydriidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Cyromazine	Citation	G	Will not control adult stage. Do not make more than six applications to one crop.
Diazinon	KnoxOut NL	G	Larvae; Nursery
Diflubenzuron	Adept	F, G	Shade house (F); Do not make more than four applications per crop. Do not reuse potting media that has been treated with Adept. Do not apply to plants grown on capillary water mats.
Fenoxycarb	Precision	F, G	Container & shade house grown (F); Will not control the adult stage. Do not exceed a maximum of 30 applications per year for greenhouse use.
Potassium Salts of Fatty Acids	M-Pede	F, G	Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Pyriproxyfen	Distance	F, G	Apply Distance or Pyrigro no more than two times per cropping cycle or no more than two times per 6 months.
<i>Steinernema carpocapsae</i>	Millenium	F, G	Nursery (F)
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 8. Slug & Snail (Mollusca: Gastropoda: Pulmonata: Limacidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Iron Phosphate	Monterey Sluggo-Ag	F, G	
Metaldehyde	Deadline Bullets, M-PS	F, G	Nursery (F)
	Durham Metaldehyde Granules 3.5, 7.5 Trails End 3.5, LG	G	Do not apply directly to plants; A bait; Do not re-water for 48 hours; For heavily infested greenhouses a second application is recommended 7 to 10 days after first application.
	Prozap Snail & Slug Ag	F, G	Do not re-water for 48 hours.

Table 8. Slug & Snail (Mollusca: Gastropoda: Pulmonata: Limacidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Methiocarb	Mesurol 75-W	F, G	Nursery & mature plantings (F); Do not apply with oil.
	Mesurol Pro	F, G	Should not be applied more than twice per year. Nursery & mature plantings (F); Do not apply with oil.
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			

Table 9. Thrips (Thysanoptera: Thripidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Abamectin	Avid 0.15EC	F, G	
Acephate	1300 Orthene TR Orthene Turf, Tree & Ornamental Spray 75, 97	G	
	Acephate Pro 75, WSP Address T/O Sedagri Acephate 75 SP	G	Do not apply more than once every 28 days.
Azadirachtin	Ornazin 3% EC	G	
	Azatin XL	F, G	
Azinphos-Methyl	Guthion Solupak	F	Nursery stock
<i>Beauveria bassiana</i>	Botanigard 22WP	F, G	Nursery & shade house (F)
	Botanigard ES	F, G	Nursery (F)
	Naturalis L	F, G	
Bifenthrin	Attain TR Talstar GH Prescription Talstar Flowable	G	
	Talstar N	F, G	Citrus thrips; Shade House & Nursery (F)
	Talstar Nursery Flowable	F, G	Shade House & Nursery (F); Do not apply more than 0.2 lbs. a.i. per acre per year for outdoor applications.
Carbaryl	Sevin SL	F	Exposed thrips
Chlorpyrifos	Duraguard ME	F, G	Nursery (F); Potted & cut flowers (G); Direct spray to some open blooms may cause petal drop.
	Dursban 50W	F	Exposed thrips; Nursery
Chlorpyrifos & Cyfluthrin	Duraplex	G	

Table 9. Thrips (Thysanoptera: Thripidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Cyfluthrin	Decathlon 20 WP	F, G	
Diazinon	Diazinon 50W Diazinon 5WB Diazinon AG 500 (Micro Flo) Diazinon Insecticide	F	
	KnoxOut NL	F	Nursery
Dimethoate	Dimethoate 400	F	Do not use on ornamental plants unless personal experience has shown to be safe. Do not use on any ornamental stock plants grown as a source of propagation material, such as cuttings, layers, rootstocks, or scions for grafting or budding. Do not use in mixtures containing oil.
Disulfoton	Di-Syston 15%	F	
Fenoxycarb	Preclude TR	G	
	Precision	F, G	Container & shade house grown (F); Will not control the adult stage. Do not exceed a maximum of 30 applications per year for greenhouse use.
Fenpropathrin	Tame 2.4EC	F, G	Nursery & Shade house (F); Do not use less than a 7-day retreatment interval.
Imidacloprid	Marathon 1% Granular	F, G	Suppression; Nursery (F); On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon 60WP	F, G	Suppression; Nursery (F); Soil treatment only; On plants with a production cycle of less than 1 year, application is not to exceed a frequency of more than once each 16 weeks for a particular plant.
	Marathon II	F, G	Thrips are suppressed on foliage only, not in buds or flowers. On outdoor ornamentals do not apply more than 1.6 pt. (0.4 lbs. a.i.) per acre per year.
Lambda-Cyhalothrin	Scimitar GC	F, G	Nursery & Shade house (F); Do not apply more than 0.36 lbs. a.i. (52.4 fl. oz. of concentrate) per acre per year.
Malathion	Atrapa 5E Gowan Malathion 8F Malathion 5EC Prozap 57EC	F	
Methiocarb	Mesurol 75-W	F, G	Western flower thrips; Nursery & mature ornamental plantings (F); Do not apply with oil.

Table 9. Thrips (Thysanoptera: Thripidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Novaluron	Pedestal	F, G	Container grown (F, G); Shade house & nursery (F); Use only one application before rotation with other classes of insecticides with different modes of action. Use at least two alternative products between applications. Do not: apply more than once every 30 days, make more than two applications per crop year, apply in successive applications, apply more than 52 fl. oz. per acre per year per crop, use more than once within each generation cycle.
Permethrin	Ambush	F	Citrus thrips; field grown nursery stock
	Ambush 25W	F	Citrus thrips; field grown nursery stock; Do not apply more than 2.0 lbs. a.i. per acre per season. Application to blooming plants may cause browning of petals.
	Astro	F, G	Citrus thrips; Container grown nursery stock (F); Do not apply more than 2.0 lb. a.i. per acre per year.
	Pounce 25WP Pounce 3.2EC Pounce WSB Perm-Up	F	Citrus thrips; Nursery stock
Potassium Salts of Fatty Acids	Insecticidal Soap 49.52 CF	F, G	Caution: Do not use on new transplants, newly rooted cuttings, or plants stressed by drought. Some varieties have shown sensitivity. Do not apply to open blooms.
	M-Pede	F, G	Exposed thrips; Tank mixes with chlorothalonil should be avoided. Potential for injury increases on plants stressed by heat, humidity, drought, or insect, mite or disease pressure. Flowers may be injured when sprayed.
Pyrethrins & Piperonyl Butoxide	1100 Pyrethrum	G	
	Pyreth-It Pyrenone Crop Spray	F, G	
Pyrethrins, Piperonyl Butoxide & Silicon Dioxide	Diatect Multipurpose Insecticide II	F	
Pyrethrins, Rotenone & Other Cube Resins	Pyrellin EC	F, G	Apply in intervals of 7-days or less.

Table 9. Thrips (Thysanoptera: Thripidae) control measures available for commercial orchid production in Florida.

Common Name	Trade Name/ Formulation	Production Site ¹	Notes from Label ²
Refined Petroleum Distillate	Saf-T-Side Spray Oil	G	Do not use in combination with or immediately before or after spraying with fungicides such as oxythioquinox or any product containing sulfur. Also do not use with carbaryl (Sevin) or dimethoate. Do not use with any product whose label indicates that it should not be used with oil. Do not use in combination with NPK foliar fertilizer applications.
	Ultra-Fine Oil	F, G	Caution: Spray no more than four consecutive sprays. The frequency of consecutive sprays should not exceed once every 2 weeks. Early morning applications are recommended. Do not tank mix with insecticide or miticide whose label indicates that it should not be used with oil. Do not use with chlorothalonil, dimethoate, methiocarb, oxythioquinox, propargite, and any product containing sulfur. This list is not exhaustive; therefore, for products not included in this list, consult label for compatibility information.
Spinosad	Conserve SC	F, G	Exposed thrips; When used in greenhouse or areas of commercial production in nurseries (including plant propagation beds): Do not apply more than 10 times in a 12-month period per crop regardless of the pest being treated. Because generations of a specific pest may overlap, rotate control products and never apply more than three consecutive applications of Conserve SC or products containing the same a.i. or products with the same mode of action. Except for greenhouses and structures that can be altered to be closed or open, do not reapply within less than 7-days.
Tau-Fluvalinate	Mavrik Aquaflow	F, G	
<p>¹“F” indicates field production. Lath house and shade house production normally are considered components of field production. “G” indicates greenhouse production.</p> <p>²Notes are taken from product labels and restrict use to the condition indicated (nursery, potted plants, beet armyworm, exposed thrips, etc.), limit numbers or patterns of applications, provide phytotoxicity precautions, etc.</p>			