



# Current Report

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## Management of Insects and Mites in Tree Nurseries

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Insect and mite pests of nursery crops present unique challenges and opportunities with respect to their management and control. Nurseries produce a wide variety of ornamental plants, ranging from trees to bedding plants, annuals to perennials, and both woody and herbaceous crops. This diversity and high density of plants requires varied and often conflicting horticultural practices, and creates an environment that supports a larger number of arthropod species than is encountered in less diverse cropping systems. Many of these arthropods are pests, kept under control by beneficial arthropods such as predators and parasitoids (i.e., natural enemies). However, natural enemies are susceptible to broad-spectrum pesticides applied during nursery production. Thus, effective alternatives to chemical control should be incorporated into production systems, reducing negative impacts on natural enemies, pollinators, and other beneficial arthropods.

Integrated Pest Management (IPM) is a sustainable approach to managing pests that combines biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. Many pest populations in nurseries can be reduced by implementing and following a comprehensive IPM plan. At a minimum, such a plan should include the following:

- Correct identification of arthropod pests and their associated plant damage
- Regular monitoring and scouting for pests, documented with accurate recordkeeping
- Inspection and, when necessary, quarantine of incoming nursery stock
- Maintaining health and vigor of nursery stock

Pesticides can be part of a comprehensive IPM plan, but pesticide use should not substitute for good horticultural practices or be used as 'preventative insurance' against pests. Such practices are rarely justifiable economically, and provide a recipe for the selection and proliferation of pests that are resistant to pesticides. Overreliance on chemical control may lead to rapid resurgence of pest populations as key natural enemies are eliminated following exposure to pesticides. Pesticides should be applied using specified application methods and equipment to ensure optimal control and safety. Follow ALL label directions and adhere to Worker Protection Standards and special precautions including protection of pollinators, aquatic organisms, and other non-target species. Pesticide recommendations in this publication are current as of the "Modified Date."

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
<b>ANTS</b>	<b>Baits</b>				Baits may be applied as a broadcast or perimeter treatment around individual mounds. Apply when ants are foraging.
Includes red imported fire ants and harvester ants.	Abamectin	Award II Fire Ant Bait	6	See label	
	Fipronil	Chipco Choice <b>or</b> Quali-Pro Fipronil 0.0143G <sup>†</sup>	2B	24	Check registration for specific site uses. Some bait products are not registered for nurseries.
Social insects that live in colonies. Size and color variable, depending on species. All have characteristic narrow "waist."	Hydramethylnon	Amdro Pro Fire Ant Killer	20A	12	
	Pyriproxyfen	Distance Fire Ant Bait	7C	12	
	S-Methoprene	Extinguish Professional Fire Ant Bait	7A	4	
Ants build mounds and sometimes clear bare areas in turf. Red imported fire ants and red harvester ants can inflict a painful sting. Some people are hypersensitive to the sting.	S-Methoprene + Hydramethylnon	Extinguish Plus	7A + 20A	12	
	Spinosad	Conserve Professional Fire Ant Bait	5	4	
	<b>Sprays and Granulars</b>				
No specific treatment threshold has been established. Ants can be managed with baits or registered turf insecticide applications as mound drenches or perimeter sprays.	Bifenthrin	Talstar <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin + Imidacloprid	Discus N/G	3A + 4A	12	
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
For detailed control options of fire ants, see CR-7309: Treatment Options for Controlling Red Imported Fire Ants.	Permethrin	Astro	3A	12	
<b>APHIDS</b>	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums, and gerbera.
Measure 1/8 to 1/5 inch long.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Pear-shaped, soft-bodied, sucking insects. Active all growing season.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray. Use non-ionic spreader-sticker adjuvant, but observe phytotoxicity precautions associated with surfactant.
Aphids secrete honeydew (sticky, sugar-like material), which may attract ants and flies and provide growing media for sooty mold.	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	Use for suppression and adult feeding deterrence.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Provides suppression only.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.

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<b>APHIDS (cont'd)</b>					
Aphids generally attack the tender terminals and leaves. Leaves may twist and curl and become distorted.	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
Small infestations can often be washed off plants with strong water pressure (stream of water).	Dimethoate	Dimethoate 4 E	1B	10–14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Provides suppression only. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	Must be tank mixed with Orthene T, T&O WSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying at frequent intervals.
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro	3A	12	
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Pyriproxyfen	Distance or Fulcrum	7C	12/12	Use for suppression only. Does not control adults.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
	Thiamethoxam	Flagship 25 WG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
<b>BAGWORM</b>					
	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Measure 1-2 inches long (bagworm case).	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	
Active May through September.	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	4	Insects must consume material. Most effective against young bagworms.
Common caterpillar pests on cedars, arborvitae, and sometimes feed on bald cypress, elms, pines, willows, maples, sycamores, and other trees.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.

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<b>BAGWORM (cont'd)</b> Small infestations can be removed by hand in winter before larvae emerge in May, but be sure to destroy all bags.	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Permethrin	Astro	3A	12	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when bagworms are small and actively feeding.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
<b>BORERS</b>  Make sure label specifically lists the type of borer you are trying to control.  Pheromone traps may be used for early detection of clearwing moth adults.  For detailed information about managing borers, see EPP-7326: Woodborers.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	Apply to lower branches and trunk when adults begin to emerge.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Chlorpyrifos	Dursban 50 W <sup>†</sup>	1B	24	Apply to lower branches and trunk when adults begin to emerge.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Permethrin	Astro	3A	12	Apply to lower branches and trunk when adults begin to emerge.
<b>BOXELDER BUG and RED- SHOULDERED BUG</b>  Measure 1/2 to 1 3/4 inches long.  Feed on seeds of boxelder, golden raintree, and soapberry, but don't injure the tree.  For best results, spray in early summer when young nymphs are present.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Permethrin	Astro	3A	12	

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<b>CATERPILLARS</b>	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Includes cankerworms, webworms, tent caterpillars, and leafrollers/leaf tiers.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	
Measure 1/2 to 2 inches long.	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	4	Insects must consume material. Most effective against young caterpillars.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
Active spring through fall.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
Larvae feed on foliage. Some species roll and tie leaves with silk and some build webs or tents around foliage or in crotches of limbs.	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
	Insecticidal soap	M-Pede <b>or</b> Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying at frequent intervals.
	Novaluron	Pedestal	15	12	Use against armyworms only.
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro	3A	12	
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	Apply when larvae are small and actively feeding.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
<b>ELM LEAF BEETLES, WILLOW LEAF BEETLES, and ELM CALLIGRAPHA BEETLES</b>	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Adults measure 1/8 to 1/4 inch long. Larvae measure 1/4 to 3/8 inch long.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
These leaf-feeding beetles are active late spring to late summer. Both adults and larvae feed on foliage, but larvae cause the most damage by skeletonizing the leaves.	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	Effective against larvae and adults.
Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12		

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<b>JAPANESE BEETLES and MAY/JUNE BEETLES</b>  Measure 1/2 to 3/4 inch long.  June beetles active at night April through September. Japanese beetles active during the day late June through July.  June beetles occasionally feed on foliage of American elm and other trees.  Japanese beetles are serious pests, feeding on foliage, fruits, and flowers of many landscape plants.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray. Tank mix with an appropriate surfactant.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenprothrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Permethrin	Astro	3A	12	
<b>LACE BUGS</b>  Measure 1/8 inch long.  Tiny, mottled, brown to black and grey insects with long, lace-like wings. Suck sap from underside of leaves, causing them to become mottled with grey or brown spots.  Active spring through summer.  Common on sycamores, elms and some oaks, pyracantha, and occasionally azaleas.  Small infestations can be washed off plants/foliage with strong water pressure (stream of water).	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenprothrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
Permethrin	Astro	3A	12		
Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12		
Thiamethoxam	Flagship 25 WG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.	

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<b>LEAFMINERS and NEEDLEMINERS</b>	Abamectin	Avid 0.15 EC <b>or</b> Minx 2	6	12/12	Repeat at 7-day intervals or as necessary to maintain control.
Includes blotch, serpentine, and tentiform leafminers, so named for the shape of their tunnels.	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	Foliar application for control of larvae. Use with paraffinic oil.
Larvae measure 1/8 to 1/4 inch long.	Bifenazate + Abamectin	Sirocco	UN + 6	12	Effective against boxwood leafminer.
Leafminers are the tiny larvae of several moth, fly, and sawfly species that feed between the upper and lower leaf surfaces.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
Active spring through summer.	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
Seldom cause extensive damage. Prune and burn twigs or leaves when possible.	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	Maybe tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede <b>or</b> Kopa	NS	12/12	Short residual activity. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	Controls adults only.
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently.
	Novaluron	Pedestal	15	12	Use for suppression only.
	Paraffinic oil	Sunspray Ultra Fine Oil	UN	4	Observe phytotoxicity precautions. Use with azadirachtin.
	Permethrin	Astro	3A	12	
	Pyriproxyfen	Distance <b>or</b> Fulcrum	7C	12/12	
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	Apply when stippling or mining first appear. Three sequential applications at 7-day intervals can maximize control of leaf-mining flies.

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<b>MITES</b>	Abamectin	Avid 0.15 EC <b>or</b> Minx 2	6	12/12	
Measure 1/60 inch long.	Acequinocyl	Shuttle O	20B	12	Allow a minimum of 14 days between applications.
Active spring to early fall; spider mites frequently become a per crop severe problem in hot, dry weather.	Bifenazate	Floramite SC	UN	12	Not effective against rust mites, broad mites, nor flat mites.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Do not make more than two applications per year.
Frequently, two or more applications at 7-day intervals will be needed to reduce mite populations.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Clofentezine	Ovation SC	10A	12	Apply only once per cropping cycle.
Mites can be difficult to control, thus, consider alternating chemicals at the different treatment intervals.	Cyflumetofen	Sultan	25	12	Not effective against broad mites, bulb mites, cyclamen mites, flat mites, nor rust mites.
	Etoxazole	TetraSan 5 WDG	10B	12	Kills all life stages, including eggs.
	Fenbutatin-oxide	Vendex 50 WP <sup>†</sup> <b>or</b> Meraz Miticide WSP	12B	48/48	Do not tank mix with paraffinic oil.
	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&O WSP.
	Hexythiazox	Hexygon DF	10A	12	Activity predominantly against eggs and immature mites.
	Insecticidal soap	M-Pede <b>or</b> Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently.
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Propargite	Omite 30 WS <sup>†</sup>	12C	14 days	Do not tank mix with petroleum-based oils.
	Pyridaben	Sanmite	21A	12	
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	Apply when spider mites first appear prior to webbing.
	Spirodiclofen	Envidor 2 SC	23	24	For use in Christmas tree plantations only. Apply only once per season.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	Provides suppression of spider mites only.



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<b>PINE TIP MOTHS</b>					
Larvae measure 1/2 inch long.					Use pheromone traps to time insecticide applications. Applications should be made 10 to 14 days after moth flight begins. Multiple applications are usually needed.
Active March to September.	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
Larvae bore into buds trunk, stems, and twigs. Most species of 2- and 3-needle pines are subject to attack; however, slash, Austrian, and long-leaf pines are somewhat resistant. Infested shoots usually turn yellow and later, red and brown. Dead, hollowed-out buds and twigs are usually present.	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. Treat trunk, stems, twigs and foliage.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.
Females emerge and lay eggs from late March through late May. Larvae must be controlled before they bore into plant.	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Permethrin	Astro	3A	12	
	Pyridalyl	Overture 35 WP	UN	12	For use on trees or shrubs in enclosed production facilities only.
For best protection with sprays, apply at 20-day intervals from late March through the end of June.	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	Apply when young larvae first appear.
For more information, see EPP-7645: Nantucket Pine Tip Moth.					
<b>PLANT GALLS</b>					
Plant galls on branches can be removed by pruning and destroying the gall-infested material.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	For use against dipterous (fly) gall midges only.
Plant galls are usually a cosmetic problem and difficult to control with insecticides. Timing of application is critical.	Thiamethoxam	Flagship 25 WG	4A	12	Apply during egg laying. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
For more information, see EPP-7168: Plant Galls Caused by Insects and Mites.					

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
<p><b>SCALES and MEALYBUGS</b></p> <p>Includes brown elm scale, euonymus scale, and longtailed mealybug.</p> <p>Active during growing season.</p> <p>Soft scales and mealybugs produce honeydew while armored scales do not.</p> <p>Some insecticide products do not control armored scales.</p> <p>Most non-systemic contact insecticides cannot penetrate protective, waxy layer of scales. Thus, apply sprays to target crawler (nymph) stage. Use double-sided sticky tape to monitor crawler activity.</p> <p>Check label for specific scale pests; some products are only effective against soft scales.</p>	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&O WSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede <b>or</b> Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying too frequently.
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
Pyriproxyfen	Distance <b>or</b> Fulcrum	7C	12/12	Works only on crawlers.	
Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	Provides suppression only.	
Thiamethoxam	Flagship 25 WG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.	

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
<b>THRIPS</b>	Abamectin	Avid 0.15 EC <b>or</b> Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums, and gerbera.
Measure 1/16 inch long.	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
Active spring and summer.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
These tiny insects are difficult to control due to their small size and tendency to hide in flowers and under foliage. The body tapers toward the end of the abdomen and both pairs of wings are fringed with hairs.	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	Controls immature stages only.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Provides suppression only.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
Feeding causes small spots of discoloration on leaves and flowers. As feeding continues and populations increase, small spots often coalesce into large blotches.	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
Thorough coverage of sprays is important for effective thrips control.	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&O WSP.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying at frequent intervals.
	Novaluron	Pedestal	15	12	
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Spinosad	Conserve SC <b>or</b> Entrust SC	5	4/4	
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
	Thiamethoxam	Flagship 25 WG	4A	12	Provides suppression only. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
<p><b>WHITEFLIES</b></p> <p>Measure 1/8 inch long.</p> <p>Active summer through early fall.</p> <p>Tiny insects. Adults have yellow bodies and white wings. Adults and nymphs commonly found on underside of leaves.</p> <p>Adults and nymphs feed on plant sap with piercing-sucking mouthparts and cause yellowing of leaves. Often "white clouds" of adults fly out of disturbed foliage.</p> <p>For effective whitefly control, ensure thorough coverage by wetting plants to dripping point. Aim for coverage of the underside of leaves and penetrate dense foliage. Repeat applications are frequently needed.</p>	Abamectin	Avid 0.15 EC <b>or</b> Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums, and gerbera.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Azadirachtin	Azatin XL <b>or</b> Molt-X	UN	4/4	Controls immature stages only.
	Bifenazate + Abamectin	Sirocco	UN + 6	12	Provides suppression only.
	Bifenthrin	OnyxPro <sup>†</sup>	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Labeled for ash whitefly control. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W <sup>†</sup>	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC <sup>†</sup>	3A	24	May be tank mixed with Orthene T, T&O WSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar the spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp
	Insecticidal soap	M-Pede <b>or</b> Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC <sup>†</sup>	3A	24	
	Mineral oil	Ultra-Pure Oil <b>or</b> SuffOil-X	HO	4/4	Short residual activity. Avoid applying at frequent intervals.
	Novaluron	Pedestal	15	12	Active on nymphs.
	Paraffinic oil	Sunspray Ultra Fine Oil	HO	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro	3A	12	
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Pyridaben	Sanmite	21	12	Works on nymphs and adults.
Pyriproxyfen	Distance <b>or</b> Fulcrum	7C	12/12	Only effective against nymphs.	
Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12		
Thiamethoxam	Flagship 25 WG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.	

<sup>†</sup> Restricted Use Pesticide

\*\* REI = Restricted Entry Interval (in hours, unless otherwise noted); 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.**

1A= Carbamates	14= Nereistoxin analogues
1B= Organophosphates	15= Benzoylureas
2A= Cyclodiene organochlorines	16= Buprofezin
2B= Phenylpyrazoles (Fiproles)	17= Cyromazine
3A= Pyrethroids, Pyrethrins	18= Diacylhydrazines
3B= DDT, Methoxychlor	19= Amitraz
4A= Neonicotinoids	20A= Hydramethylnon
4B= Nicotine	20B= Acequinocyl
4C= Sulfoxaflor	20C= Fluacrypyrim
4D= Butenolides	21A= METI acaricides and insecticides
5= Spinosyns	21B= Rotenone
6= Avermectins, Milbemycins	22A = Indoxacarb
7A= Juvenile hormone analogues	22B= Metaflumizone
7B= Fenoxycarb	23= Tetric and tetric acid derivatives
7C= Pyriproxyfen	24A= Phosphine
8A= Alkyl halides	24B= Cyanides
8B= Chloropicrin	25= Beta-ketonitrile derivatives
8C= Sulfuryl fluoride (fumigant)	26= (unassigned)
8D= Borax	27= (unassigned)
8E= Tartar emetic	28= Diamides
8F= Methyl isothiocyanate generators	UN= Unknown mode of action
9B= Pymetrozine	NS= Non-specified, multi-site
9C= Flonicamid	M= Microbials
10A= Clofentezine, Hexythiazox, Diflovidazin	BLO= Biological organisms
10B= Etoxazole	
11A= Bacillus thuringiensis and the insecticidal proteins they produce	
11B= Bacillus sphaericus	
12A= Diafenthiuron	
12B= Organotin miticide	
12C= Propargite	
12D= Tetradifon	
13= Chlorfenapyr, DNOC, Sulfuramid	

#### 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.

The pesticide information presented in this publication was current with federal and state regulations at the time of printing. The user is responsible for determining that the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label directions. The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

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