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Commercial Management of Turfgrass Insects and Mites

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Arthropod pests of turfgrass are varied and sometimes difficult to manage. Damage caused by arthropod pests can be mistaken for disease, drought stress, or other environmental disorders, so proper identification of the causal agent is an essential component of integrated pest management (IPM) of turfgrass pests. Chemical control should not be used as a substitute for good horticultural practices or as “preventative insurance” because it is usually not economically or environmentally justifiable. Careless pesticide use also can encourage the development of insecticide resistance. Many turfgrass pest problems can be avoided by following good horticultural practices such as selection of Oklahoma-adapted varieties that are resistant or tolerant to commonly encountered pests. Other cultural control methods include effective thatch management, mowing heights and frequencies that do not stress turfgrass, proper fertilization and irrigation, and weed and disease control. Keep in mind that insecticides with a broad spectrum of activity can harm more than the intended target pest, including pollinators and natural enemies (predators and parasites) of pests. Whenever possible, choose a “reduced risk” insecticide that is not harmful to the environment or non-target organisms when used correctly. Rotate among different pesticide classes to delay or prevent resistance among target pest populations. Chemical recommendations made within this publication are current as of the revised date and are

intended for commercial use by golf course superintendents, lawn and landscape professionals, and parks and recreation managers. Always check the insecticide label for the most current application rates and methods, and any use restrictions. Refer to the following OSU publications for additional information.

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| E-1020 | A Pocket Guide to Oklahoma Turfgrass Diseases, Insects, and Other Disorders (\$5 and available through Oklahoma Cooperative Extension Service) |
| HLA-6418 | Selecting A Lawn Grass for Oklahoma |
| HLA-6419 | Establishing A Lawn in Oklahoma |
| HLA-6420 | Lawn Management in Oklahoma |
| HLA-6600 | Turfgrass Management of Bermudagrass Football Fields |
| HLA-6601 | Broadleaf Weed Control for Lawns in Oklahoma |
| HLA-6604 | Thatch Management in Lawns |
| CR-6605 | 2014 Oklahoma Turfgrass Sod Source Directory |
| HLA-6608 | Managing Turfgrass in the Shade in Oklahoma |
| EPP-7324 | Large Patch (Zoysia Patch) of Warm-Season Turfgrasses |
| EPP-7658 | Dollar Spot of Turfgrass |
| EPP-7665 | Spring Dead Spot of Bermudagrass |

<i>Pest, Damage, and Management</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name and Formulation</i>	<i>Pesticide Class</i>	<i>Comments</i>
ANTS	Baits			Baits may be applied as a broadcast or perimeter treatment around individual mounds. Apply when ants are foraging. Follow specific label instructions. See end of publication for control notes on red imported fire ants.
Includes red imported fire ants and harvester ants.	Abamectin	Award II Fire Ant Bait	6	
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	
Social insects that live in colonies. Size and color variable, depending on species. All have characteristic narrow "waist."	Hydramethylnon	Amdro Pro Fire Ant Bait	20A	
	Pyriproxyfen	Distance Fire Ant Bait	7C	
Damage: Build mounds, sometimes clear bare areas in turf. Red imported fire ants and harvester ants can inflict a painful sting. Some people are hypersensitive to the sting.	S-Methoprene	Extinguish Professional Fire Ant Bait	7A	
	S-Methoprene + Hydramethylnon	Extinguish Plus	7A + 20A	
	Spinosad	Conserve Fire Ant Bait	5	
Management: No specific threshold has been established. Ants can be managed with baits or registered turf insecticide applications as mound drenches or perimeter sprays.	Sprays and Granulars			Sprays may be applied as a perimeter spray around the outside of a building or a mound drench. Follow specific label instructions.
	Acephate	Orthene T, T&O WSP	1B	
For detailed control options for fire ants, see CR-7309: Treatment Options for Controlling Red Imported Fire Ants.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Observe phytotoxicity precautions.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	Use high rate for fire ant nests. Do not use in pastures or areas of food crop production.
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
	Spinosad	Conserve SC T&O	5	
ARMYWORMS and CUTWORMS	Acephate	Orthene T, T&O WSP	1B	
Larval stage of several moths. Measure up to 1.5 inches. Some live above and some below ground.	Azadirachtin	Ornazin 3% EC	UN	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	Insects must consume material. Most effective against young caterpillars.
Damage: These caterpillars chew grass blades and often live below ground during the day, especially in bentgrass greens. Damage is most evident with feeding activity of large larvae.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC [†] or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid	Allectus G	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom. Not for use on golf courses or sod farms.

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ARMYWORMS and CUTWORMS (con't)				
Management: Treat when damage is noticeable and two to three small (1/2 inch or less) caterpillars per square foot are present.	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O or Triple Crown Golf Insecticide [†]	3A + 4A + 3A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	n/a	To enhance effectiveness, tank mix with a contact insecticide. Do not irrigate following application.
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Cyantraniliprole	Ference	28	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Indoxacarb	Provaunt WDG	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	Do not irrigate or mow treated areas within 24 hours following application.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
	Spinosad	Conserve SC T&O	5	Spinosad applied early morning or late afternoon can maximize control. Delay watering or mowing 12 to 24 hours following application.
	Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B	
BILLBUGS	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	n/a	Slow acting; reapply as needed.
Adults are typical "weevils" with elongate snout measuring 0.25 inches, and having a shiny black body with raised "Y"- shaped area on thorax. Larvae: legless, having a white body with a brown head capsule.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Active against adults.
	Bifenthrin + Clothianidin	Aloft GC SC [†] or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid	Allectus G	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom. Not for use on golf courses or sod farms.

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BILLBUGS (cont'd)				
Damage: Adults chew holes in leaves and stems to lay eggs. Larvae burrow in stems, crown. Feeding leaves sawdust. Plants may die, and sod will not hold together when rolled up. Sometimes mistaken for winter-kill damage.	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O or Triple Crown Golf Insecticide†	3A + 4A + 3A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Active against larvae. Do not irrigate or mow treated areas within 24 hours following application.
Management: No threshold established. Treat if damage is noticeable in lawn in spring and billbug larvae are present.	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W†	1B	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Cyantraniliprole	Ference	28	
	Cyfluthrin	Tempo Ultra GC† or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Imidacloprid	Merit 75 WP or Merit 0.5 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC†	3A	
	Thiamethoxam	Meridian 25 WG or Meridian 0.33 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
CHIGGERS				
Small (0.5 mm) mite larvae. Damage: Bites cause reddish welts, accompanied by intense itching that can persist for 7 to 10 days. Bites usually occur in areas where clothing fits tightly to the skin.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro†	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorpyrifos	Dursban 50 W†	1B	
	Cyfluthrin	Tempo Ultra GC† or Tempo SC Ultra	3A	
Management: Regular mowing of grass and removal of weeds and brush can reduce chigger numbers. Repellents can be used for personal protection. If working in a chigger-infested area, take a soapy bath immediately.	Deltamethrin	Deltagard G	3A	
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G†	2B	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC†	3A	
	Permethrin	Astro or Perm-up 3.2 EC†	3A	

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CHINCH BUGS	Acephate	Orthene T, T&O WSP	1B	
<p>Adults are 1/8 inch long, black with white wings that are folded over the back into an “hour glass” shape. Nymphs are reddish to brown, with a white stripe across their “shoulders.”</p> <p>Damage: More of a problem in St. Augustinegrass in Oklahoma. Aggregations of chinch bugs suck plant juices and clog phloem and xylem. As they feed, they also inject a toxin. Symptoms resemble drought injury; patchy with chlorotic and necrotic leaves.</p> <p>Management: No threshold established. Scout by flotation using a coffee can with both ends cut away; sink one end into the ground and fill can with 3/4 inch of water. Adults and nymphs will float to top. Keep thatch to a minimum and maintain proper levels of water and fertilizer.</p> <p>Irrigation prior to application will help the insecticide penetrate the thatch layer where chinch bugs reside.</p>	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	n/a	Slow acting; reapply as needed.
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Higher application rates of UP-Star may be needed when adults and nymphs are present in mid-summer.
	Bifenthrin + Clothianidin	Aloft GC SC [†] or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid	Allectus G	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom. Not for use on golf courses or sod farms.
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O or Triple Crown Golf Insecticide [†]	3A + 4A + 3A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	n/a	To enhance effectiveness, tank mix with a contact insecticide. Do not irrigate following application.
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
Cyantraniliprole	Ference	28		
Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A		
Deltamethrin	Deltagard G	3A		
Dinotefuran	Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.	
Imidacloprid	Merit 75 WP or Merit 0.5G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.	
Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A		
Permethrin	Astro or Perm-up 3.2 EC [†]	3A		
Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B		

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<p>DIGGER WASPS</p> <p>Includes cicada killer, scoliid and typhiid wasps.</p> <p>Typical wasp appearance and colorful. Males often harass people who enter their breeding territory. Females nest underground.</p> <p>Management: No threshold established. Wasps prefer nesting in bare ground versus mulched landscapes. Control with spray or dust of the nest entrances, or broadcast of a granular product where heavy nesting exists.</p>	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Do not irrigate or mow treated areas within 24 hours following application.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
<p>FLEAS</p> <p>Small (0.03 to 0.4 inch) brown, wingless insects that are flattened on both sides.</p> <p>Damage: Fleas feed on blood using sucking mouthparts. Bites cause small hardened bumps that are itchy and/or painful. Bites typically located on lower legs and ankles.</p> <p>Management: Treat areas where pets frequent (indoor and outdoor). Flea hotspots can be easily detected by wearing white athletic socks, or taking a white rag attached to a stick and dragging it over areas that might have infestations.</p>	Acephate	Orthene T, T&O WSP	1B	
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
Spinosad	Conserve SC T&O	5		
<p>GRASSHOPPERS</p> <p>1-2 inches, outer wings leathery, inner wings clear or colored. Enlarged hind legs designed for jumping.</p> <p>Damage: Grasshoppers feed on foliage of numerous plants.</p> <p>Management: No threshold established. See EPP-7322: Grasshopper Control in Gardens and Landscapes.</p>	Acephate	Orthene T, T&O WSP	1B	
	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	n/a	Slow acting; reapply as needed.
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC [†] or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O or Triple Crown Golf Insecticide [†]	3A + 4A + 3A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.	

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GRASSHOPPERS (cont'd)				
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Indoxacarb	Provaunt WDG	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
	<i>Nosema locustae</i>	Nolo Bait or Semaspore	n/a	Microsporidian pathogen of grasshoppers. Works best on small nymphs.
MILLIPEDES				
Long, round body and many (80 to 400) legs.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
Damage: Millipedes rarely cause damage, but can invade households when populations build and conditions become dry.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
Management: Reduce or eliminate moist areas and harborage (grass clippings, leaves, etc.). Water lawn during early morning to increase the time that turf is dry. Dethatch high-maintenance lawns.	Chlorpyrifos	Dursban 50 W [†]	1B	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
MITES				
BERMUDAGRASS and ZOYSIAGRASS MITES	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Optimal control of eriophyid mites may be achieved by mixing bifenthrin with the labeled rate of an appropriate surfactant such as a penetrant.
Small (less than 1/100 inch), white, cigar-shaped, eriophyid mites.	Chlorpyrifos	Dursban 50 W [†]	1B	
Damage: Alter the growth of grass, cause stunting and shortening of nodes in bermudagrass (“buggy whipping” in zoysiagrass). Plants may become yellow, weakened.				
Management: Cultural practices, including fertility and mowing, can reduce problem. Spray timing not currently known for most effective control.				

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MITES (cont'd)				
CLOVER MITES Spider-like, less than 1 mm long. Dark green with orange-red markings, long front legs. Damage: Minor turf pest, but can become nuisance when large numbers build and move to buildings for shelter in early spring and fall. Management: Cultural practices that enhance lawn health help limit damage and build up. Spot treat areas where mites accumulate.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
MOLE CRICKETS				
Adults cylindrical, 1.3 to 1.4 inches long, body covered with dense coat of fine hair, and spade-like front legs that resemble a mole's front legs. Damage: Northern mole cricket and prairie mole cricket are Oklahoma residents and are not considered major pests of turf. Can cause injury by feeding on turf and tunneling.	Acephate	Orthene T, T&O WSP	1B	
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Apply late in the day followed by irrigation with up to 1/2 inch of water.
Damage: Northern mole cricket and prairie mole cricket are Oklahoma residents and are not considered major pests of turf. Can cause injury by feeding on turf and tunneling.	Bifenthrin + Clothianidin	Aloft GC SC [†] or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid	Allectus G	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom. Not for use on golf courses or sod farms.
Management: Define injured areas, and treat with insecticide. Normally control is not required.	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O or Triple Crown Golf Insecticide [†]	3A + 4A + 3A	Apply late in the day followed by irrigation with up to 1/2 inch of water. BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	Irrigate after application.
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	
	Imidacloprid	Merit 75 WP or Merit 0.5G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Indoxacarb	Provaunt WDG	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	Use higher rate for populations comprised of mostly adults.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
	Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B	Thoroughly irrigate turf following treatment.

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SLUGS and SNAILS Soft bodied, with shell (snail) or bare (slug). Leave slime trail where they have been feeding. Damage: Chew leaves, scrape leaf tissue. Management: Treat with bait. Don't overwater lawn.	Boric Acid	Niban Granular Bait	8D	
	Iron Phosphate	Sluggo	UN	
	MesuroI	MesuroI 75 W [†]	1A	Not for use on residential lawns.
	Metaldehyde	Metarex 4% Snail and Slug Bait	UN	Rotate with mesuroI to help avoid development of resistance in slugs and snails.
SOD WEBWORMS Larvae vary from gray to light green to brown. Measure 0.6 to 1 inch long. Adult moths with wingspans about 0.5 to 0.75 inch, many with a snout-like projection, and fly in a zigzag pattern when disturbed. Damage: Larvae chew on tender leaves, may cut off grass blades as they get older. Injury can be mistaken for disease or drought injury. Most likely to occur during late summer. Management: Bermudagrass usually can outgrow damage. Young larvae present about 2 weeks after peak moth flights. Monitor by using a soapy water flush (2 T. lemon-scented dish soap per gal water).	Acephate	Orthene T, T&O WSP	1B	
	Azadirachtin	Ornazin 3% EC	UN	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	Insects must consume material. Most effective against young caterpillars.
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	n/a	To enhance effectiveness, tank mix with a contact insecticide. Do not irrigate following application.
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Cyantraniliprole	Ference	28	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Indoxacarb	Provaunt WDG	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
	Methomyl	Lannate SP [†]	1A	For use on sod farms only.
Permethrin	Astro or Perm-up 3.2 EC [†]	3A		
Spinosad	Conserve SC T&O	5	Spinosad applied early morning or late afternoon can maximize control. Delay watering or mowing 12 to 24 hours following application.	
Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B		

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<p>SOWBUGS and PILLBUGS</p> <p>Small, gray, and “armored” arthropods.</p> <p>Damage: Sowbugs rarely cause damage but can invade households when populations build and conditions become dry.</p> <p>Management: Reduce or eliminate moist areas and harborage (grass clippings, leaves, wood debris). Water lawn during early morning to increase the time that turf is dry during a 24-hour period. Dethatch high-maintenance lawns.</p>	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Deltamethrin	Deltagard G	3A	
	Cyhalothrin	Demand G or Scimitar CS or Scimitar GC [†]		
Permethrin	Astro or Perm-up 3.2 EC [†]	3A		
<p>TICKS</p> <p>Small, 8-legged arthropods, appearing flattened when unfed. Body color ranges from red to brown to nearly black. Four life stages: egg, larva (six legs), nymph and adult.</p> <p>Damage: Feeding results in inflammation, swelling and potential secondary infection. Ticks can transmit disease, including Lyme’s disease, Rocky Mountain spotted fever, tularemia, ehrlichiosis and babesiosis to humans.</p> <p>Management: Manage ticks on household pets and pet resting areas. Use physical inspection of anyone who is active in tick-infested areas during “tick season.” Use repellents such as DEET and treat premises as needed.</p>	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours following application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	

<i>Pest, Damage, and Management</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name and Formulation</i>	<i>Pesticide Class</i>	<i>Comments</i>
WHITE GRUBS Large, "C"-shaped grub with a white body and a brown head. Larval stage of several beetle species.	Bifenthrin + Clothianidin	Aloft GC SC† or Aloft LC SC	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Bifenthrin + Imidacloprid	Allectus G	3A + 4A	BEE CAUTION: Do not apply when flowering weeds are in bloom. Not for use on golf courses or sod farms.
Damage: White grubs feed on grass roots at or just below the thatch layer. Grass takes on droughty appearance. Damage more pronounced in fall. Predator activity from armadillos, skunks, moles and birds indicates infestations and causes secondary damage.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Curative treatment of problem areas in turf. Do not irrigate or mow treated areas within 24 hours following application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	Can be used preventively or as a curative treatment in late summer or early fall. BEE CAUTION: Do not apply when flowering weeds are in bloom.
Management: Treatment threshold for masked chafer: 15 to 20 per square foot.	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	n/a	To enhance effectiveness, tank mix with a contact insecticide. Do not irrigate following application.
	Cyantraniliprole	Ference	28	
Treatment threshold for May/June beetle: four to five per square foot.	Dinotefuran	Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Imidacloprid	Merit 75 WP or Merit 0.5 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Thiamethoxam	Meridian 25 WG or Meridian 0.33 G	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B	Curative treatment of problem areas in turf. Thoroughly irrigate lawn following treatment. Can be applied as a rescue treatment in late summer or early fall.

† Restricted Use Pesticide

Control Notes for Imported Fire Ants

Individual mound treatment

Generally, non-chemical methods are not effective against fire ants. Digging or tilling up mounds simply moves them around. Boiling water (3 gallons per mound) may be effective for treating individual mounds, but it must be done carefully to avoid killing plants and not suffering from serious burns.

Best control has been achieved with chemical treatment of nests and surrounding areas. The best time to individually treat mounds with contact insecticides is on a sunny morning after a cool night, when ants are near the surface of the mound. Such treatments can be accomplished with drenches, surface sprays, granules, or baits.

Most mound drenches involve mixing the insecticide in 1-2 gallons of water. The treatment should be applied to the mound with a watering can that sprinkles the treatment on the mound much like a gentle rain. If the drench begins to cause the dirt on the mound to run off, stop and allow the liquid to soak into the mound, then resume drenching until all of the liquid is used.

Dust formulations like Pinpoint can be sprinkled on and around the mound, according to label instructions. If the label states that the treatment should be watered in, then do so with a watering can. Other products may state that the products should not be watered in.

Baits

Most ant baits contain a slow-acting insecticide, such as an insect growth regulator (IGR) that can be taken back to the mound and fed to other members of the colony, including the queen. They can be applied as a broadcast, or used as individual mound treatments. If they are used to treat individual mounds, the bait should be placed about 1-3 feet around, but not directly on, the mound.

Baits work best if applied when workers are actively foraging. This can be determined by leaving some greasy food, such as some chunks of tuna fish, or hot dog pieces, potato chips, or peanut butter near a mound and checking if for ant activity after 15-20 minutes. During the summer, worker ants forage at night and are actually inactive during the day. The best time to apply baits is in late afternoon or early evening. Moisture and rain will dissolve bait particles, so use baits only when grass and soil are dry, and no rain is expected within several hours after treatment.

A proven approach for managing red imported fire ants is to make a broadcast bait application in late spring when soil temperatures are above 70 degrees F and ants are actively foraging. This bait application should be followed up by treating individual problem mounds about 1-2 weeks later. For best results, always avoid disturbing the mound before or during treatment since it will cause the ants to move away and avoid the chemical.

For downloadable documents on red imported fire ant control options and more information on red imported fire ants in Oklahoma, check the Oklahoma State University Department of Entomology and Plant Pathology's Fire Ant Website

at <http://entopl.okstate.edu/fireants/red-imported-fire-ants>. For additional information on managing fire ants, check the national eXtension Fire Ant Website at http://www.extension.org/fire_ants.

***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	13=	Chlorfenapyr, DNOC, Sulfluramid
1B=	Organophosphates	14=	Nereistoxin analogues
2A=	Cyclodiene organochlorines	15=	Benzoylureas
2B=	Phenylpyrazoles (Fiproles)	16=	Buprofezin
3A=	Pyrethroids, Pyrethrins	17=	Cyromazine
3B=	DDT, Methoxychlor	18=	Diacylhydrazines
4A=	Neonicotinoids	19=	Amitraz
4B=	Nicotine	20A=	Hydramethylnon
4C=	Sulfoximines	20B=	Acequinocyl
4D=	Butenolides	20C=	Fluacrypyrim
4E=	Mesoionics	20D=	Bifenazate
5=	Spinosyns	21A=	METI acaricides and insecticides
6=	Avermectins, Milbemycins	21B=	Rotenone
7A=	Juvenile hormone analogues	22A =	Indoxacarb
7B=	Fenoxycarb	22B=	Metaflumizone
7C=	Pyriproxyfen	23=	Tetronic and tetramic acid derivatives
8A=	Alkyl halides	24A=	Phosphine
8B=	Chloropicrin	24B=	Cyanides
8C=	Fluorides	25A=	Beta-ketonitrile derivatives
8D=	Borates	25B=	Carboxanilides
8E=	Tartar emetic	26=	(unassigned)
8F=	Methyl isothiocyanate generators	27=	(unassigned)
9B=	Pyridine azomethine derivatives	28=	Diamides
9D=	Pyropenes	29=	Flonicamid
10A=	Clofentezine, Diflovidazin, Hexythiazox	UN=	Unknown mode of action
10B=	Etoxazole		
11A=	<i>Bacillus thuringiensis</i> and the insecticidal proteins they produce		
11B=	<i>Bacillus sphaericus</i>		
12A=	Diafenthiuron		
12B=	Organotin miticides		
12C=	Propargite		
12D=	Tetradifon		

NOTES:

1. Check registration for specific site uses. Some products are labeled for sod farms and golf courses, while others are not.
2. 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.
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) and pollinators. 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.

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs and has been prepared and distributed at a cost of 40 cents per copy. Revised 07/2020 GH.