



Current Report

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
osufacts.okstate.edu

Commercial Management of Turfgrass Insects and Mites

Eric J. Rebek
Extension Entomologist

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.

- | | |
|----------|--|
| 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-6421 | Controlling Weeds in Home Lawns |
| HLA-6423 | Controlling Grassy Weeds in Home Lawns |
| HLA-6600 | Turfgrass Management of Bermudagrass Football Fields |
| HLA-6601 | Broadleaf Weed Control for Lawns in Oklahoma |
| CR-6602 | Performance of Tall Fescue Turfgrasses at Stillwater, Oklahoma |
| CR-6603 | Trade Publications for Professional Turfgrass Managers |
| HLA-6604 | Thatch Management in Lawns |
| CR-6605 | 2006 Oklahoma Turfgrass Sod Source Directory (revised 2009) |
| 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				
Includes red imported fire ants and harvester 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.
	Abamectin	Award II Fire Ant Bait	6	
Social insects that live in colonies. Size and color variable, depending on species. All have characteristic narrow "waist."	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	
	Hydramethylnon	Amdro Pro Fire Ant Killer	20A	
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.	Pyriproxyfen	Distance Fire Ant Bait	7C	
	S-Methoprene	Extinguish Professional Fire Ant Bait	7A	
	S-Methoprene + Hydramethylnon	Extinguish Plus	7A + 20A	
Management: No specific threshold has been established. Ants can be managed with baits or registered turf insecticide applications as mound drenches or perimeter sprays.	Spinosad	Justice	5	
	Sprays and Granulars			Sprays may be applied as a perimeter spray around the outside of a building or a mound mound drench. Follow specific label instructions.
Acephate	Orthene T, T&O WSP	1B		
Treatment Options for Fire Ants For detailed control options for fire ants, see CR-7309: Controlling Red Imported Fire Ants	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 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.
	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				
Larval stage of several moths. Measure up to 1.5 inches. Some live aboveground and some belowground.	Acephate	Orthene T, T&O WSP	1B	
	Azadirachtin	Ornazin 3% EC	UN	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF or Javelin WG	11A	Insects must consume material. Most effective against young caterpillars.

<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>
ARMYWORMS and CUTWORMS (cont'd)				
<p>Damage: These caterpillars chew grass blades and often live belowground during the day, especially in bentgrass greens. Damage is most evident with feeding activity of large larvae.</p> <p>Management: Treat when damage is noticeable and two to three small (1/2 inch or less) caterpillars per square foot are present.</p>	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	
	Cyfluthrin	Tempo Ultra [†] GC or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam 20 SG or Zylam Liquid	4A	
	Indoxacarb	Provaunt	22A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	Do not irrigate or mow treated areas within 24 hours post-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 post-application.
Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B		
BILLBUGS				
<p>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.</p> <p>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.</p>	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	M	Slow acting; reapply as needed.
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Active against adults.
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 3A	
Carbaryl	Sevin SL Carbaryl Insecticide	1A	Active against larvae. Do not irrigate or mow treated areas within 24 hours post-application.	

<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>
BILLBUGS (cont'd) <u>Management:</u> No threshold established. Treat if damage is noticeable in lawn in spring and billbug larvae are present.	Chlorantraniliprole	Acelepryn SC or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	
	Cyfluthrin	Tempo Ultra [†] GC or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam 20 SG or Zylam Liquid	4A	
	Imidacloprid	Merit 75 WP or Merit 0.5 G	4A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Thiamethoxam	Meridian 25 WG or Meridian 0.33 G	4A	
CHIGGERS	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
Small (0.5 mm) mite larvae				
<u>Damage:</u> Bites cause reddish welts, accompanied by intense itching that can persist for seven to ten days. Bites usually occur in areas where clothing fits tightly to the skin.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
<u>Management:</u> 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.	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Permethrin	Astro [†] or Perm-up 3.2 EC [†]	3A	
CHINCH BUGS	Acephate	Orthene T, T&O WSP	1B	
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."	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	M	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.
<u>Damage:</u> More of a problem in St. Augustinegrass. Aggregations of chinch bugs suck plant juices and clog phloem and xylem. As they feed, they also inject a toxin. Symptoms resemble drought injury;	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A+ 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>
CHINCH BUGS (cont'd) patchy with chlorotic and necrotic leaves.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
<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 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>	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Cypermethrin	ProBuild TC	3A	
	Deltamethrin	Deltagard G	3A	
	Dinotefuran	Zylam 20 SG or Zylam Liquid	4A	
	Imidacloprid	Merit 75 WP or Merit 0.5G	4A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Permethrin	Astro [†] or Perm-up 3.2 EC [†]	3A	
Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B		
DIGGER WASPS	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
Includes cicada killer, scoliid and typhiid wasps.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
<p>Typical wasp appearance often colorful. Males often harass people who enter their breeding territory. Nest underground.</p> <p>Management: No threshold established. Wasps prefer bare ground over mulched landscapes. Control with spray or dust of the nest entrances or broadcast of a granular product where heavy nesting exists.</p>	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	3A	
	FLEAS	Acephate	Orthene T, T&O WSP	1B
<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 bump that is itchy and/or painful. Bites typically located on lower legs and ankles.</p>	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid+ Cypermethrin	Triple Crown T&O	3A + 4A+ 3A	Higher spray volume recommended for control of flea larvae.

<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>
FLEAS (cont'd) <u>Management:</u> 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.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo 20 WP or Tempo SC	3A	
	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	
GRASSHOPPERS 1-2 inches, outer wings leathery, inner wings clear or colored. Enlarged hind legs designed for jumping. <u>Damage:</u> Grasshoppers feed on foliage of numerous plants. <u>Management:</u> No threshold established. See EPP-7322: Grasshopper Control in Gardens and Landscapes.	Acephate	Orthene T, T&O WSP	1B	
	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	M	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	
	Bifenthrin + Clothianidin + Cypermethrin	Triple Crown T&O	3A + 4A+ 3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo 20 WP or Tempo SC	3A	
	Deltamethrin	Deltagard G	3A	
	Indoxacarb	Provaunt	22A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	<i>Nosema locustae</i>	Nolo Bait or Semaspore	M	Microsporidial pathogen of grasshoppers, Works best on small nymphs.
MILLIPEDES Long, with round body and many (80 to 400) legs. <u>Damage:</u> Millipedes rarely cause damage, but can invade households when populations build and conditions become dry. <u>Management:</u> 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.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A+ 3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Permethrin	Astro [†] or Perm-up 3.2 EC [†]	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>
MITES	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	Optimal control may be achieved by mixing bifenthrin with the labeled rate of an appropriate surfactant such as a penetrant.
BERMUDAGRASS and ZOYSIAGRASS MITES	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	Works on clover mite only.
Small (less than 1/100 inch), white, cigar-shaped eriophyid mites.	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	Works on clover mite only.
<u>Damage:</u> Alter the growth of grass, cause stunting, and shortening of nodes in bermudagrass ("buggy whipping" in zoysiagrass). Plants may become yellow, weakened.	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A+ 3A	Optimal control of eriophyid mites may be achieved by mixing this product with the labeled rate of an appropriate surfactant such as a penetrant.
<u>Management:</u> Cultural practices, including fertility and mowing, can reduce problem. Spray timing not currently known for most effective control.	Chlorpyrifos	Dursban 50 W [†]	1B	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	Works on clover mite only.
CLOVER MITES				
Spider-like mites, dark green with orange-red markings, less than 1 mm long, unusually long front legs.				
<u>Damage:</u> Minor turf pest, but can become nuisance when large numbers build and move to buildings for shelter in early spring and fall.				
<u>Management:</u> Cultural practices that enhance lawn health help limit damage and build up. Spot treat areas where mites accumulate.				
MOLE CRICKETS	Acephate	Orthene T, T&O WSP	1B	
Adults cylindrical, 1.3 to 1.4 inches, body covered with dense coat of fine hair, and spade like front legs that resemble a mole's front legs.	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.
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
<u>Damage:</u> Northern mole cricket and prairie mole cricket are Oklahoma residents and are not considered major pests of turf. Can injure turf by feeding on turf and tunneling.	Bifenthrin + Imidacloprid	Allectus GC [†]	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 3A	Apply late in the day followed by irrigation with up to 1/2 inch of water.
<u>Management:</u> Define injured areas, and treat with insecticide. Normally control is not required.	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	
	Cyfluthrin	Tempo 20 WP/ Tempo SC	3A	
	Deltamethrin	Deltagard G	3A	Irrigate after application.

<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>
MOLE CRICKETS (cont'd)	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	
	Imidacloprid	Merit 75 WP	4A	
	Indoxacarb	Provaunt or Advion Mole Cricket Bait	22A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	Use higher rate for populations comprised of mostly adults.
	Permethrin	Astro [†] / Perm-up 3.2 EC [†]	3A	
	Trichlorfon	Dylox 420 SL T&O/ or Dylox 6.2 G	1B	Thoroughly irrigate turf following treatment.
SLUGS and SNAILS	Boric Acid	Niban	8D	
Soft bodied, with shell (snail) or bare (slug). Leave slime trail where they have been feeding. <u>Damage:</u> Chew leaves, scrape leaf tissue. <u>Management:</u> Treat with bait. Don't overwater lawn.	Iron Phosphate	Sluggo	UN	
	Mesuroil	Mesuroil 75 W [†]	1A	Not for use on residential lawns.
	Metaldehyde	Metarex 4% Snail and Slug Bait	UN	Rotate with mesuroil to help avoid development of resistance in slugs and snails.
SOD WEBWORMS	Acephate	Orthene T, T&O WSP	1B	
Larvae vary from gray to light green to brown. Measure 0.6 to 1 inch. 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. <u>Damage:</u> 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. <u>Management:</u> Bermudagrass usually can outgrow damage. Young larvae present about 2 weeks after peak moth flights. Monitor by using a soap flush (2 T. lemon-scented dish soap per gal water).	Azadirachtin	Ornazin 3% EC	UN	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF or Javelin WG	11A	Insects must consume material. Most effective against young caterpillars.
	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
Deltamethrin	Deltagard G	3A		
Dinotefuran	Zylam 20 SG or Zylam Liquid	4A		
Indoxacarb	Provaunt	22A		

<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>
SOD WEBWORMS (cont'd)	Lambda Cyhalothrin	Demand CS or Demand G	3A	
	Methomyl	Lannate [†]	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 post-application.
	Trichlorfon	Dylox 420 SL T&O or Dylox 6.2 G	1B	
SOWBUGS and PILLBUGS Small, gray, and “armored” arthropods. <u>Damage:</u> Sowbugs rarely cause damage but can invade households when populations build and conditions become dry. <u>Management:</u> 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.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Clothianidin	Aloft GC SC or Aloft LC SC	3A + 4A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Deltamethrin	Deltagard G	3A	
	Lambda Cyhalothrin	Demand CS or Demand G	3A	
TICKS Small, 8-legged arthropod, appearing flattened when unfed. Body color ranges from red to brown to nearly black. Four life stages: egg, larva (six legs), nymph, and adult. <u>Damage:</u> 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. <u>Management:</u> 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.	Bifenthrin	Talstar or UP-Star Gold or Onyx Pro [†]	3A	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
	Bifenthrin + Imidacloprid + Cypermethrin	Triple Crown T&O	3A + 4A + 3A	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-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	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	
	Bifenthrin + Imidacloprid	Allectus GC [†] or Allectus SC	3A + 4A	
<u>Damage:</u> 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 post-application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Clothianidin	Arena 50 WDG or Arena 0.25 G	4A	Can be used as a curative treatment.
	Dinotefuran	Zylam 20 SG or Zylam Liquid	4A	
	Halofenozide	Mach 2 SC	18	
<u>Management:</u> Masked chafer: 15 to 20 per square foot.	Imidacloprid	Merit 75 WP or Merit 0.5 G	4A	
	Thiamethoxam	Meridian 25 WG or Meridian 0.33 G	4A	
	Trichlorfon	Dylox 420 SL T&O/ 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.
May/June beetle: 4 to 5 per square foot.				

[†] 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 gallon to 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 one foot to three 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 minutes to 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 F and ants are actively foraging. This bait application should be followed up by treating individual problem mounds about one week to two 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	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 = Flucrypyrim
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 = Cyanide
8C = Sulfuryl fluoride (fumigant)	25 = Beta-ketonitrile derivatives
8D = Borax	26 = (unassigned)
8E = Tartar emetic	27 = (unassigned)
9B = Pymetrozine	28 = Diamides
9C = Flonicamid	UN = Unknown mode of action
10A = Clofentezine, Hexythiazox, Diflovidazin	NS = Non-specified, multi-site
10B = Etoxazole	M = Microbials
11A = Bacillus thuringiensis and their insecticidal proteins	BLO = Biological organisms
11B = Bacillus sphaericus	HO = Horticultural oil
12A = Diafenthiuron	
12B = Organotin miticide	
12C = Propargite	
12D = Tetradifon	
13 = Chlorfenapyr, DNOC, Sulfluramid	

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 re-entry intervals and note any ventilation requirements. Wear protective clothing as recommended on each pesticide label.
3. Insecticides having a broad spectrum of activity (e.g., pyrethroids, organophosphates, carbamates, neonicotinoids) may not be compatible with biological control because they can harm some natural enemies. 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 compatibility with biological control.

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.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, gender, age, religion, disability, or status as a veteran in any of its policies, practices, or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, the Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 64 cents per copy. Revised 0415 GH