



Current Report

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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.

- 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
- 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						
<p>Includes red imported fire ants and harvester ants.</p> <p>Social insects that live in colonies. Size and color variable, depending on species. All have characteristic narrow "waist."</p> <p>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.</p> <p>Management: No specific threshold has been established. Ants can be managed with baits or registered turf insecticide applications as mound drenches or perimeter sprays.</p> <p>For detailed control options for fire ants, see CR-7309: Treatment Options for Controlling Red Imported Fire Ants.</p>	Baits					
	Abamectin	Award II Fire Ant Bait	6	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.		
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B			
	Hydramethylnon	Amdro Pro Fire Ant Killer	20A			
	Pyriproxyfen	Distance Fire Ant Bait	7C			
	S-Methoprene	Extinguish Professional Fire Ant Bait	7A			
	S-Methoprene + Hydramethylnon	Extinguish Plus	7A + 20A			
	Spinosad	Conserve Fire Ant Bait	5			
	Sprays and Granulars				Sprays may be applied as a perimeter spray outside of a building or a mound drench. Follow specific label instructions.	
	Acephate	Orthene T, T&O WSP	1B			
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.			
Deltamethrin	Deltagard G	3A				
Lambda Cyhalothrin	Demand CS or Demand G	3A				
Permethrin	Astro or Perm-up 3.2 EC [†]	3A				
Spinosad	Conserve Fire Ant Bait	5				
ARMYWORMS and CUTWORMS						
<p>Larval stage of several moths. Measure up to 1.5 inches. Some live above, and some below ground.</p> <p>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.</p>	Acephate	Orthene T, T&O WSP	1B	Insects must consume material. Most effective against young caterpillars.		
	Azadirachtin	Ornazin 3% EC	UN			
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF or Javelin WG	11A			
	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 (cont'd) <u>Management:</u> Treat when damage is noticeable and 2-3 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 post-application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W†	1B	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	M	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 20 SG or Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Indoxacarb	Provaunt	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 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 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. <u>Damage:</u> 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	<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	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	Active against larvae. Do not irrigate or mow treated areas within 24 hours post-application.	

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<p>BILLBUGS (cont'd) together when rolled up. Sometimes mistaken for winter-kill damage.</p> <p><u>Management:</u> No threshold established. Treat if damage is noticeable in lawn in spring and billbug larvae are present.</p>	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 20 SG or Zylam Liquid Systemic Insecticide	4A	
	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	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.
<p>CHIGGERS</p> <p>Small (0.5 mm) mite larvae.</p> <p><u>Damage:</u> 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.</p> <p><u>Management:</u> Regular mowing of grass and removal of weeds and brush can reduce chigger numbers.</p> <p>Repellents can be used for personal protection. If working in a chigger-infested area, take a soapy bath immediately.</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 post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	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 or Scimitar CS or Scimitar GC [†]	3A	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	
<p>CHINCH BUGS</p> <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><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; patchy with chlorotic and necrotic leaves.</p>	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	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.

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<p>CHINCH BUGS (cont'd) <u>Management:</u> 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>	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	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	M	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 20 SG or 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	
<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><u>Management:</u> 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	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	Do not irrigate or mow treated areas within 24 hours post-application.
	Chlorpyrifos	Dursban 50 W [†]	1A	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	1B	
	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><u>Damage:</u> 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>	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 post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	

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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.	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	
GRASSHOPPERS				
1-2 inches, outer wings leathery, inner wings clear or colored. Enlarged hind legs designed for jumping.	Acephate	Orthene T, T&O WSP	1B	
	<i>Beauveria bassiana</i>	Botanigard ES or Botanigard 22 WP	M	Slow acting; reapply as needed.
<u>Damage:</u> Grasshoppers feed on foliage of numerous plants.	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.
<u>Management:</u> No threshold established. See EPP-7322: Grasshopper Control in Gardens and Landscapes.	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 post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	Cyfluthrin	Tempo Ultra GC [†] or Tempo SC Ultra	3A	
	Deltamethrin	Deltagard G	3A	
	Indoxacarb	Provaunt	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	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.	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 post-application.
<u>Damage:</u> Millipedes rarely cause damage, but can invade households when populations build and conditions become dry.	Chlorpyrifos	Dursban 50 W [†]	1B	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	3A	
<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.	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	

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MITES				
BERMUDAGRASS and ZOYSIAGRASS MITES Small (less than 1/100 inch), white, cigar-shaped, eriophyid 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.
	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.				
CLOVER MITES Spider-like, less than 1 mm long. Dark green with orange-red markings, long front legs.	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	
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.				
MOLE CRICKETS				
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.	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.
	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	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	
Damage: 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.				
Management: Define injured areas, and treat with insecticide. Normally control is not required.				
	Deltamethrin	Deltagard G	3A	Irrigate after application.

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MOLE CRICKETS (cont'd)	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	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.
SLUGS and SNAILS	Boric Acid	Niban Granular Bait	8D	
	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.
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.				
SOD WEBWORMS	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.
	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 post-application.
	Chlorantraniliprole	Acelepryn or Acelepryn G	28	
	Chlorpyrifos	Dursban 50 W [†]	1B	
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	M	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		
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).				

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SOD WEBWORMS (cont'd)	Dinotefuran	Zylam 20 SG or Zylam Liquid Systemic Insecticide	4A	BEE CAUTION: Do not apply when flowering weeds are in bloom.
	Indoxacarb	Provaunt	22A	
	Lambda Cyhalothrin	Demand CS or Demand G or Scimitar CS or Scimitar GC [†]	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	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 post-application.
	Chlorpyrifos	Dursban 50 W [†]	1B	
	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	
TICKS	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 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 or Scimitar CS or Scimitar GC [†]	3A	

Small, gray, and “armored” arthropods.

Damage: Sowbugs rarely cause damage but can invade households when populations build and conditions become dry.

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.

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.

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.

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.

<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>
<p>WHITE GRUBS</p> <p>Large, "C"-shaped grub with a white body and a brown head. Larval stage of several beetle species.</p> <p><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.</p> <p>Predator activity from armadillos, skunks, moles, and birds indicates infestations and causes secondary damage.</p> <p><u>Management:</u> Masked chafer: 15 to 20 per square foot</p> <p>May/June beetle: 4 to 5 per square foot.</p>	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.
	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 in late summer or early fall. BEE CAUTION: Do not apply when flowering weeds are in bloom.
	<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo PTO	M	To enhance effectiveness, tank mix with a contact insecticide. Do not irrigate following application.
	Cyantraniliprole	Ference	28	
	Dinotefuran	Zylam 20 SG or 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 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 1 to 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 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 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= Cycloidiene 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 acid and tetramic 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= <i>Bacillus thuringiensis</i> and the insecticidal proteins they produce	
11B= <i>Bacillus sphaericus</i>	
12A= Diafenthuron	
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 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). 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.
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