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EXTENSION

# Insect Control in Commercial Turf



Whether on golf courses, athletic fields, sod farms, or as part of the landscape, turfgrass is subject to attack by a number of different insect pests. Professional turf managers must be familiar with these pests to avoid damage and maintain high-quality stands of grass. In addition to being able to identify the insects, it is important to understand their biology, know how to scout for them, understand the different management options that are available, and be familiar with the insecticides that control them.

Insect pests that attack turfgrass are managed in a variety of ways. "Integrated pest management" includes using economic thresholds, scouting, resistant varieties, cultural practices, and natural parasites, predators, and diseases, as well as pesticides. Insecticides certainly play a key role in managing turfgrass insects. However, relying on insecticides as the only way to manage insects can cause

problems such as insect resistance, "flaring" (increased numbers of target pests), secondary pest outbreaks, and environmental contamination.

When insecticides are used, proper application timing and, when necessary, adequate post-treatment irrigation are important to ensure effective results. For example, insecticides for white grub control work best when applied around egg hatch and properly watered in after treatment. Thatch, or the buildup of organic matter, may prevent an insecticide from reaching targeted pests in the soil.

Although the tolerance for insect damage in highly managed turf is low, not all insect infestations are severe enough to warrant treatment. Natural enemies such as spiders, predators, and parasites of pests are abundant even in high-maintenance turf, and often help keep pests below damaging levels. However, when pest insect populations

reach potentially damaging levels, it is important to treat them promptly with an effective insecticide. Many turf insect pests are easiest to control at certain life stages, so proper timing of insecticide applications is an important part of turf insect management. Frequent monitoring and sampling can help you detect threatening infestations before damage occurs and can aid in proper timing of insecticide treatments.

## Insecticide Selection for Different Turfgrass Sites

All turfgrass sites are not equal. In particular, the potential for human exposure to pesticide residues is much greater in some turf situations than in others. Home lawns and commercial landscape turf may be frequented by barefoot toddlers, and athletes, ranging from preschool soccer players to high school football players, often end up lying on sports turf. The potential for such intimate contact with turfgrass is considerably lower on golf courses, and with the exception of harvest, is even lower on commercial sod farms.

This is one reason an insecticide may not be labeled for all turfgrass uses (e.g., home lawns, commercial landscapes, athletic fields, golf courses, and sod farms). Some products are only labeled for particular turfgrass sites, and some insecticides are only labeled for use against certain pests or certain types of application. For example, acephate (Orthene) is labeled for spot treatment of fire ant mounds in home lawns, but acephate may not be applied as a broadcast treatment or used to treat other pests in home lawns. However, some formulations of acephate are labeled for use as broadcast treatments on golf courses and sod farms.

In some cases, manufacturers will have products that are specifically labeled for certain types of turf while other products with similar active ingredients are not labeled. For example, Allectus SC is not labeled for use on golf courses, but Allectus GC SC is. The product name does not usually indicate where the product can be used. You have to read the product label carefully to find out. For example, Merit 0.5 G is not labeled for use on sod farms, but Merit 2 and Merit 75WP are labeled for use on sod farms.

Before you buy any insecticide, read the label carefully to be sure the product is labeled for the particular site you plan to treat and to be sure the product will control the pest or pests you need to control. Read the label again just before mixing the insecticide to be sure you understand all directions for application and how to safely mix and apply the appropriate rate.

## Fire Ants

Although they do not directly attack grass, fire ants are the number one insect pest in Mississippi turfgrass. Their mounds are unsightly and can interfere with play and maintenance, but their stings and aggressive nature cause the greatest concern. It is unlikely this pest will be eradicated, but you can reduce fire ant populations to tolerable levels by using safe and effective control methods.

There are many available methods of fire ant control. The choice of method depends on the size and type of area being treated and the level of control required. Most control methods greatly reduce fire ant populations, but keeping an area practically free of fire ants usually requires persistence and a combination of control methods.



Fire ants are ubiquitous pests of all types of turfgrass.

**Baits.** One of the most effective methods of fire ant control is the use of granular baits. When properly applied two to three times per year, baits can provide 80 to 90 percent control. Although baits can be applied as individual mound treatments, broadcast applications are much more effective. This is because, in addition to the large mounds you can easily see in an area, there are usually many small, hard-to-detect colonies. Individual mound treatments eliminate only the large mounds, and these are quickly replaced by smaller colonies that thrive in the absence of foraging competition from the larger colonies.

Broadcast bait treatments target all colonies in an area, regardless of size. Early spring is one of the best times to use granular baits because recently developed queens are controlled before they leave on their flights and establish new colonies. Follow-up granular bait applications usually are necessary in midsummer and again in the fall.

Apply baits when the ground is dry (with no forecast of rain) and when ground temperatures are between 70 and 90°F. Avoid irrigating for one or two days after applying fire ant baits. The insecticides used in granular baits are slow-



acting for a reason: Foraging ants pick up the baits, carry them back to the colony, and pass them among the ants in the colony, eventually reaching and killing the queen. Depending on the specific bait used, maximum control of the colony takes 2–6 weeks.

**Mound treatments.** In small areas, fire ant control can be improved by combining granular baits with spot treatment of any individual mounds that escaped the bait treatments. It is best to wait several days after applying a bait treatment before treating individual mounds. This gives foraging worker ants time to carry the baits into the colonies, improving the odds of killing the queen or queens.

Several different types of individual mound treatments are available. These include mound drenches, granular treatments, and dry powders. Insecticides used for individual mound treatments are fast-acting contact insecticides. **When treating individual mounds with any insecticide, do not disturb mounds before treating.** If you do, the colony may take the queen or queens to safety, either by moving them deeper in the mound or by moving them to the side to set up other mounds.

**Broadcast insecticide treatments.** In highly sensitive areas, such as athletic fields, the tolerance level for fire ants is essentially zero. Reaching and keeping this high level of control requires a high level of management that involves several methods of control. Broadcast bait treatments can serve as the backbone of an intensive fire ant control program. But to achieve and maintain high levels of control, you may have to supplement bait treatments with broadcast

insecticide treatments and, when necessary, with individual mound treatments.

Broadcast insecticide treatments differ from baits in that they are fast-acting contact insecticides intended to control foraging workers and newly settled queens. Although many broadcast insecticide treatments are applied as granules, these granules are not attractive to the ants (they are not baits). The granules only serve as carriers for the insecticide. To be most effective, most broadcast insecticides must be applied every 4–8 weeks during the growing season. Some broadcast insecticide treatments indicate one application will provide season-long control, but in areas where tolerance for fire ants is very low, the wise turf manager will be prepared to supplement these treatments when necessary.

Many of the insecticides used as broadcast treatments for fire ants also act against other turf pests, such as mole crickets and white grubs. Turf managers can take advantage of this by knowing the range of pests the various insecticides control and choosing treatments and application methods that will be most effective against the complex of pests you want to control.

Fire ant control is never-ending because managed turf areas are continually reinfested by swarming queens that emerge from mounds in nearby unmanaged areas. When swarming queens try to establish mounds in areas already heavily infested with other fire ants, the ants already there often prey on the queens. When swarming queens attempt to establish colonies in areas without other fire ants, their chances of success are much higher because of the absence of competition.

### BAITS FOR FIRE ANT CONTROL

Brand Name (Insecticide)	Rate/mound	Rate/acre
Advion Fire Ant Bait (indoxacarb)	4 Tbsp	1.5 lb
Amdro Bait (hydramethylnon)	5 Tbsp	1–1.5
Ascend Fire Ant Bait (abamectin)	5–7 Tbsp	1 lb
Award II (abamectin)	5–7 Tbsp	1 lb
Distance Fire Ant Bait (pyriproxyfen)	1–4 Tbsp	1.5 lb
Extinguish Professional Fire Ant Bait (s-methoprene)	3–5 Tbsp	1.5 lb
Extinguish Plus (hydramethylnon + s-methoprene)	2–5 Tbsp	1.5 lb
Siesta Insecticide Fire Ant Bait (metaflumizone)	2–4 Tbsp	1.5 lb

Avoid applying baits just before or after irrigation or rain. Baits may require 4–8 weeks for best results. Broadcast applications are much more effective than individual mound treatments.

## MOUND DRENCH TREATMENTS FOR FIRE ANT CONTROL

<b>Insecticide</b>	<b>Brand Name</b>	<b>Rate</b>
acephate	Orthene TTO 97	0.75 oz per 5 gal
bifenthrin	Talstar Select	1 teaspoon per gal
bifenthrin	Talstar Professional	1 fl oz per gal
carbaryl	Sevin SL	0.75 fl oz per gal
lambda-cyhalothrin <b>Restricted-use insecticide</b>	Scimitar CS (landscape turf only)	0.5 fl oz per 2.5 gal
lambda-cyhalothrin <b>Restricted-use insecticide</b>	Scimitar GC	0.5 fl oz per 2.5 gal
deltamethrin <b>Restricted-use insecticide</b>	DeltaGard GC 5SC	1.5 fl oz per gal
imidacloprid + bifenthrin <b>Restricted-use insecticide</b>	Allectus GC SC (golf courses and sod farms)	0.66 fl oz per gal
imidacloprid + bifenthrin <b>Restricted-use insecticide</b>	Allectus SC (landscape turf only)	0.66 fl oz per gal
permethrin	Astro (landscape turf only)	1.6 fl oz per gal
spinosad	Conserve	0.1 fl oz per gal
thiamethoxam	Meridian 25WG	0.1-0.3 oz per gal

Generally, it takes 1-2 gallons of water to drench a fire ant mound effectively. Do not disturb mounds before drenching.

## DRY MOUND TREATMENTS FOR FIRE ANT CONTROL

<b>Insecticide</b>	<b>Brand Name</b>	<b>Rate/mound</b>
acephate	Orthene Fire Ant Treatment	1 Tbsp
bifenthrin + zeta-cypermethrin <b>Restricted-use insecticide</b>	Talstar XTRA GC Granular Insecticide	½ cup
cyfluthrin	Bayer Fire Ant Killer	1 tsp
deltamethrin	Bengal Ultra Dust Fire Ant Killer (0.05%)	1 Tbsp
deltamethrin	Terro Fire Ant Killer (0.05%)	1 Tbsp
deltamethrin <b>Restricted-use insecticide</b>	DeltaGard G (landscape turf only)	2 Tbsp <sup>[1]</sup>

Sprinkle dry product over and around mound as directed on label. Do not disturb the mound before or after treatment.

<sup>[1]</sup>Follow application with 1-2 gallons of water for best results.

## BROADCAST TREATMENTS FOR FIRE ANT CONTROL

Insecticide	Brand Name	Rate
fipronil <sup>[1]</sup> <b>Restricted-use insecticide</b>	Topchoice	2 lb per 1000 sq ft
bifenthrin <b>Restricted-use insecticide</b>	Talstar GC Granular	2.3–4.6 lb per 1000 sq ft
bifenthrin <b>Restricted-use insecticide</b>	Talstar Select	1 fl oz per 1000 sq ft
bifenthrin <b>Restricted-use insecticide</b>	Talstar Professional	1 fl oz per 1000 sq ft
bifenthrin + zeta-cypermethrin <b>Restricted-use insecticide</b>	Talstar XTRA Granular Insecticide	2.3–4.6 lb per 1000 sq ft
carbaryl	Sevin SL	3 fl oz per 1000 sq ft
cyfluthrin <b>Restricted-use insecticide</b> (landscape turf only)	Tempo SC Ultra	8 ml per 1000 sq ft
cyfluthrin <b>Restricted-use insecticide</b> (landscape turf only)	Tempo WP Ultra	5–10 g (1–2 scoops) per 1000 sq ft
cyfluthrin <b>Restricted-use insecticide</b> (for use on golf courses)	Tempo WP GC	1 packet per 7800 sq ft
lambda cyhalothrin <b>Restricted-use insecticide</b> (landscape turf only)	Scimitar CS	3.4–7 ml per 1000 sq ft Apply 4–10 gal of spray per 1000 sq ft
lambda cyhalothrin <b>Restricted-use insecticide</b>	Scimitar GC	3.4–7 ml per 1000 sq ft Apply 4–10 gal of spray per 1000 sq ft

Except for fipronil (Topchoice), apply broadcast treatments every 4–8 weeks as a supplement to broadcast baits.

<sup>[1]</sup>The label for Topchoice indicates that a single spring application will provide season-long control.

## Chinch Bugs

Chinch bugs are the most common pests of St. Augustine grass, but they can occasionally cause damage to other grasses, such as zoysia, Bermuda, and centipede. Adult chinch bugs are about one-fifth of an inch long and are black with white wings folded over their backs.

Nymphs are yellow upon hatching, but they soon turn red and have a light-colored band across their abdomens. With each molt, nymphs more closely resemble the adults. Both the adults and nymphs cause damage by sucking plant juices through their piercing-sucking mouthparts. As the chinch bug sucks the plant juices, it releases a toxin that kills the grass and causes yellowish or brownish patches in turf.

This pest is a sunshine-loving insect and seldom attacks grass in dense, shady areas. Expanding patches of discolored turf located in full sun are characteristic of a chinch bug infestation.

Scout turf on sunny days by parting the stems and looking for the small, reddish or black nymphs and/or adults in the crown region or running across the exposed soil. You can also check for chinch bugs by using a large



Young chinch bug nymphs are red or pink but grow darker with age. Note the winged adult in the lower left of the photo.

coffee can or gallon can with both ends removed. Press one end of the can into the soil and fill with water. If chinch bugs are present, they will float to the surface. Look closely; chinch bugs are small.

When sampling for chinch bugs, be sure to sample the area on the outer edge of the damage in the green, apparently uninfested grass.

Several short-residual insecticides are available to control chinch bugs. Be sure to follow label directions for watering both before and after treatment. Treat the entire area evenly and thoroughly. Where chinch bug infestations are heavy, re-treat the area in 2 weeks to kill recently hatched insects.

Populations of chinch bugs have shown resistance to certain pyrethroids, organophosphates, and carbamate insecticides, so selecting products with different chemistries or modes of action would reduce the likelihood of resistance. For example, Arena (clothianidin) has a different mode of action than pyrethroids, such as Talstar (bifenthrin). In areas where chinch bugs have become resistant to pyrethroids, Arena (clothianidin) may be an effective alternative.



This St. Augustinegrass lawn has been heavily damaged by southern chinch bugs.

### CHINCH BUG CONTROL

Insecticide	Brand Name <sup>[1]</sup>	Rate	Comments
acephate	Orthene TTO 97 (golf course or sod farm use only)	0.9–1.1 oz per 1000 sq ft	Irrigate before application only.
bifenthrin	Talstar XTRA GC Granular	2.3–4.6 lb per 1000 sq ft	Irrigate immediately after application with a minimum of ¼ inch of water. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Professional	0.5–1 fl oz per 1000 sq ft	Irrigate before treatment. Higher application rate may be required to control heavy infestations. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Select	0.5 fl oz per 1000 sq ft	Irrigate before treatment. Higher application rate may be required to control heavy infestations. <b>Restricted-use insecticide</b>
carbaryl	Sevin SL	6–8 fl oz per 1000 sq ft	Irrigate before application, then no irrigation for 24 hours.
clothianidin	Arena 50WDG	12.8 oz per acre	Irrigate immediately after application.
cyfluthrin	Tempo SC Ultra (landscape turf only)	8 ml per 1000 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
cyfluthrin	Tempo WP Ultra	7.7–15.4 oz per acre	Irrigate before and after application. <b>Restricted-use insecticide</b>
cyfluthrin	Tempo 20 WP (golf course only)	1 packet per 7800 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
deltamethrin	DeltaGard GC 5SC	0.6–0.9 fl oz per 1000 sq ft	<b>Restricted-use insecticide</b>
deltamethrin	DeltaGard T&O Granular (landscape turf only)	2–3 lb per 1000 sq ft	<b>Restricted-use insecticide</b>
imidacloprid + bifenthrin	Allectus SC (landscape turf only)	0.9–1.65 fl oz per 1000 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
imidacloprid + bifenthrin	Allectus GC	1.7–2.9 lb per 1000 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
lambda-cyhalothrin	Scimitar CS (landscape turf only)	7 ml per 1000 sq ft	Apply using 2–10 gal spray per 1000 sq ft. Water in following application ¼ to ½ inch. <b>Restricted-use insecticide</b>
lambda-cyhalothrin	Scimitar GC	7 ml per 1000 sq ft	Apply using 2–10 gal spray per 1000 sq ft. Water in following application ¼ to ½ inch. <b>Restricted-use insecticide</b>
trichlorfon	Dylox 420 SL	6.9 fl oz per 1000 sq ft	

<sup>[1]</sup>See page 18 for explanation of abbreviations.



## Mole Crickets

Mole crickets are a prominent turf pest in the southern portion of Mississippi, especially in the coastal area, but they are less often a problem north of I-20 in Mississippi and are rarely encountered north of Highway 82. Mole crickets are most damaging in highly managed turf areas, such as golf greens, but they can occur in other commercial turf areas, as well.

These insects damage turf by burrowing in the soil and feeding on roots and stems of grasses, and their tunnels can interfere with play on golf greens. They are especially fond of light, sandy soils. Mole crickets directly damage plants by feeding on the roots, and they indirectly damage plants by extensive tunneling, which destroys roots and disrupts root development. Mole crickets usually feed at night, tunneling several feet per night.

Two species of mole crickets, southern and tawny, damage turf in Mississippi. Southern mole crickets are primarily predators on other animals living in the soil, but still cause damage by tunneling. Tawny mole crickets cause damage both by tunneling and feeding on the roots. Although the appearance and habits of these two species are different, their general biology is similar.

Mole crickets overwinter as nymphs (immatures) in the soil, become active in early spring, and mature by mid- to late spring. The most severe damage usually occurs in the spring as a result of the heavy tunneling and feeding of these large nymphs and adults. New adults emerge and begin mating flights in mid-March to mid-May (mating flights of tawny mole crickets are generally a bit earlier than those of southern mole crickets). Exact timing of mating flights can vary considerably, depending on weather and location in the state (flights occur earlier on the Gulf Coast than in the central portion of the state). Eggs, which are deposited in the soil in clusters of 35–40 eggs, hatch in 10–40 days, depending on temperature. At first the damage caused by the newly hatched nymphs is minimal and nearly impossible to detect. However, this is the stage that is most vulnerable to insecticides. There is only one generation per year.

Because damage is usually greatest in the spring, it is often necessary to treat at this time. But these large nymphs and adults can be very difficult to control. Mole cricket treatments are most effective when targeted toward the young nymphs in June and July. Because the grass has recovered from spring damage, and the damage caused by newly hatched nymphs is not obvious, it is sometimes difficult to realize the need to treat then. But if mole crickets were present in the spring, they will be present in June and July. This is the best time of the year to apply treatments on turf areas that have a history of mole cricket infestation.



The tolerance for mole crickets in golf greens is near zero—for obvious reasons.



An adult southern mole cricket. The front legs are well-adapted for digging.



Northern mole crickets occur throughout the state but are not significant pests because they are rarely numerous. Don't panic if you spot one of these in the northern part of the state.

Mole crickets can be persistent and difficult pests to control, and it may be necessary to make several applications per season to reduce or prevent damage. But the treatment targeted to control young, newly hatched nymphs is the most important. Treatments containing fipronil have proven to be highly effective against mole crickets when applied at this time and also provide long-term control of fire ants.

Check for mole crickets by mixing 1–2 fluid ounces of dishwashing liquid per gallon of water and pouring it over a small area of turf. This is best done early in the morning when crickets are most likely to be near the surface. The soapy water flushes any crickets to the surface. This sample will provide an approximate number and age of the mole crickets present, as well as how near they are to the soil surface. If crickets appear promptly after the soap solution is applied, they are near the surface.

Before treating for mole crickets, be sure that the turf is well watered because mole crickets tend to burrow deeper in dry soil, where they can escape an insecticide treatment. With most mole cricket treatments, it is also important to water immediately following treatment in order to leach the treatment into the soil where it can contact the mole crickets.

## MOLE CRICKET CONTROL

Insecticide	Brand Name	Rate	Comments
acephate	Orthene TTO 97	0.8–1.4 oz per 1000 sq ft	Irrigate before application, but not following application. Golf course and sod farm use only.
bifenthrin	Talstar Select	1 fl oz per 1000 sq ft	Irrigate before and after application with a minimum of ½ inch of water. Apply during peak egg hatch. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Professional	1 fl oz per 1000 sq ft	Irrigate before and after application with a minimum of ½ inch of water. Apply during peak egg hatch. <b>Restricted-use insecticide</b>
bifenthrin	Talstar GC Granular	2.3–4.6 lb per 1000 sq ft	Irrigate before and after application with a minimum of ½ inch of water. Apply during peak egg hatch. <b>Restricted-use insecticide</b>
carbaryl	Mole Cricket Bait	0.75–0.9 lb per 1000 sq ft	This is a bait. Do not water following treatment. Baits are used primarily for control of large nymphs and adults.
cyfluthrin	Tempo WP Ultra	7.7–15.4 oz per acre	Irrigate after application. Landscape turf only. Apply during peak egg hatch period. <b>Restricted-use insecticide</b>
cyfluthrin	Tempo SC Ultra	8 ml per 1000 sq ft or 12 fl oz per acre	Irrigate after application. Landscape turf only. Apply during peak egg hatch period. <b>Restricted-use insecticide</b>
fipronil	Topchoice	2 lb per 1000 sq ft	Apply when eggs and small nymphs are present. Water in after treatment. <b>Restricted-use insecticide</b>
imidacloprid	Merit 75 WSP	1.6 oz per 8250 sq ft	Apply before or during peak egg hatch period. Irrigate within 24 hours after application.
imidacloprid	Criterion 2F	0.6 fl oz per 1000 sq ft	
imidacloprid	Merit 0.5 G	1.8 lb per 1000 sq ft	
imidacloprid + bifenthrin	Allectus SC (landscape turf only)	1.32–1.65 fl oz per 1000 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
imidacloprid + bifenthrin	Allectus GC	2.9 lb per 1000 sq ft or 4.6–5.7 lb per 1000 sq ft	Irrigate before and after application. <b>Restricted-use insecticide</b>
indoxacarb	Advion Insect Granules (This is a bait.)	1.15–4.6 lb per 1000 sq ft or 50–200 lb per acre	Rates at or above 2.3 lb per 1,000 sq ft may be needed against heavier infestations. Do not irrigate after application. Crickets may die on surface for 1–5 days after treatment.
lambda-cyhalothrin	Scimitar GC	7 ml per 1000 sq ft	Apply 4–10 gal spray per 1000 sq ft. Irrigate before and after application. <b>Restricted-use insecticide</b>
trichlorofon	Dylox 420 SL	6.9 fl oz per 1000 sq ft	Irrigate before and after application.

## White Grubs

White grubs are the larvae of several species of beetles, including May beetles, June beetles, and chafers. When fully grown, grubs are whitish or grayish in color, are about 1½ inch long, have a distinct brownish head, have three pairs of legs (which distinguishes them from the larvae or billbugs), and characteristically rest in a C-shaped position.

Most grubs spend about 10 months in the soil, but some require 2–3 years to develop into beetles. White grubs feed on grass roots and organic matter in the upper 3 inches of soil. Turf with severe white grub damage has dead patches that roll back like a loose carpet when pulled. Periods of drought with water-stressed grass accentuate this damage. Grub damage is often most noticeable in the spring, when



White grubs have legs and a distinct head and usually curl into a C shape when exposed.



severely grub-damaged areas fail to “green up,” but damage also can occur in summer and fall. Grubs are easiest to control in midsummer, when larvae are the smallest.

Well-watered and maintained turf can harbor lots of white grubs without showing signs of damage. In such cases, vertebrate predators, such as skunks, moles, or armadillos, may do more damage to the turf than the grubs themselves. Controlling the grubs may eliminate or reduce the damage caused by these predators.

When scouting for grubs in the spring or summer, cut several 1- to 2-foot square samples 2–3 inches deep, lift out or roll back the turf square, and examine for grubs. If you find an average of three to five grubs per square foot, you may need to treat.

Water grass before treatment if soil is dry (this causes grubs to move nearer the soil surface), and thoroughly water again after treatment (this leaches the insecticide into the soil where the grubs are feeding).

Treatments for white grubs should be applied at or before egg hatch, usually in midsummer. Well-timed treatments can provide 90 percent or greater control of young, hatching larvae. Diamide products (chlorantraniliprole, cyantraniliprole, and tetraniliprole) and neonicotinoid products (clothianidin, imidacloprid, and thiamethoxam) are best for treatments targeting small larvae. Treatments containing carbaryl or trichlorfon are more effective against large larvae, if treatment is required to control heavy infestations in the spring of the year.

### WHITE GRUB CONTROL

Insecticide	Brand Name	Rate	Comments
carbaryl	Sevin SL	6 fl oz per 1000 sq ft or 8 qt per acre	Irrigate turfgrass soon after treatment.
chlorantraniliprole	Acelepryn 1.67	8–16 fl oz per acre	Irrigate following application.
chlorantraniliprole	Acelepryn Granular Insecticide	50–100 lb per acre	Irrigate following application.
clothianidin	Arena 50WDG	8–12.8 oz per acre	Irrigate within 24 hours after treatment.
clothianidin	Arena 0.25G	100–160 lb per acre	Irrigate within 24 hours after treatment.
cyantraniliprole	Ference 1.67	8–16 fl oz per acre	Irrigate immediately after application.
imidacloprid	Merit 75 WSP	8.6 oz per acre	Irrigate within 24 hours after treatment.
imidacloprid	Merit 0.5 G	1.4 lb per 1000 sq ft or 60 lb per acre	Irrigate within 24 hours after treatment.
imidacloprid + bifenthrin	Allectus SC (landscape turf only)	1.32–1.65 fl oz per 1000 sq ft	Irrigate within 24 hours after treatment. <b>Restricted-use insecticide</b>
imidacloprid + bifenthrin	Allectus GC Granular	2.3–2.9 lb per 1000 sq ft	Irrigate within 24 hours after treatment. <b>Restricted-use insecticide</b>
tetraniliprole	Tetrino	0.367–0.735 fl oz per 1000 sq ft	Treat from peak adult flight through egg hatch. Irrigate after application.
thiamethoxam	Meridian 0.33G	7–9 lb per 5000 sq ft	Irrigate granular formulation after treatment. Use 1.5–5 gal of spray per 1000 sq ft for 25WG formulation.
thiamethoxam	Meridian 25WG	12.7–17 oz per acre	Irrigate granular formulation after treatment. Use 1.5–5 gal of spray per 1000 sq ft for 25WG formulation.
trichlorfon	Dylox 420 SL	6.9 fl oz per 1000 sq ft	Irrigate following application.

## Billbugs

Billbugs are weevils that sometimes damage turfgrass. They are most common in zoysia and hybrid Bermudas, but they also occur in centipede and St. Augustine. Several species of billbugs occur in Mississippi. Hunting billbugs are the most common. Adults are shiny, dark-colored weevils with long bodies and distinct snouts. They are about one-fourth to three-eighths inch long. The larvae are small, legless grubs, normally found in the crown area.

Billbug damage first appears as isolated, hand-sized patches of dying, discolored turf, but these patches may overlap when populations are heavy. Damage is often most obvious in the fall, but it can be difficult to detect when turf is also browning because of drought. Although the adults feed on the runners and stolons, larvae cause the most damage. They feed heavily in crowns and stolons. Check for billbug damage by the tug test: turf infested with billbug larvae will break at the crown when tugged. Often, you can locate larvae or their frass by digging in the crown and root area.

Billbug infestations on sod farms can interfere with turf harvesting by causing sod to break apart when lifted. Two strategies can be used to target billbugs in turf.

First, target adults with pyrethroids. Several insecticides are listed for use against adults. The objective is to kill the gravid female before she lays eggs in the turf. Second, target the larval stage. Young larvae will feed inside the stem protected from surface-applied insecticides. When the larvae get too large for the stem, they emerge and burrow into the soil where they feed on roots.

Soil-applied, contact insecticides (e.g., Dylox or Sevin) can be successful when targeting the larger larvae, but most of the damage will be done to the turf by then. Systemic insecticides, such as Merit or Arena, can be applied to the soil and translocated into the stems.

Targeting young larvae feeding inside the stem can potentially reduce the overall damage to the grass.



Adult billbugs have distinct snouts and are sometimes seen crawling over turf or on sidewalks, but it is the larvae that cause most damage.

### BILLBUG CONTROL

Insecticide	Brand Name	Rate	Comments
bifenthrin	Talstar GC Granular	1.15–2.3 lb per 1000 sq ft <b>Restricted-use insecticide</b>	Apply when adults are first observed.
bifenthrin	Talstar Select	0.25–0.5 fl oz per 1000 sq ft <b>Restricted-use insecticide</b>	Apply when adults are first observed.
bifenthrin	Talstar Professional	0.25–0.5 fl oz per 1000 sq ft <b>Restricted-use insecticide</b>	Apply when adults are first observed.
carbaryl	Sevin SL	6 fl oz per 1000 sq ft <b>or</b> 8 qt per acre	Irrigate turfgrass soon after treatment.
chlorantraniliprole	Acelepryn 1.67	8–20 fl oz per acre	Irrigate following application.
clothianidin	Arena 50WDG	8–12.8 oz per acre	Irrigate within 24 hours after treatment.
clothianidin	Arena 0.25G	100–160 lb per acre	Irrigate within 24 hours after treatment.
clothianidin + bifenthrin	Aloft GC SC	0.27–0.54 fl oz per 1000 sq ft	Apply when overwintered adults are first observed.
cyantraniliprole	Ference 1.67	8–16 fl oz per acre	Irrigate immediately after application.
imidacloprid	Merit 75 WSP	1.6 oz per 8250 sq ft <b>or</b> 8.6 oz per acre	Irrigate within 24 hours after application.
imidacloprid	Merit 0.5 G	1.4 lb per 1000 sq ft <b>or</b> 60 lb per acre	Irrigate within 24 hours after application.
imidacloprid + bifenthrin	Allectus GC SC	0.67–1.65 fl oz per 1000 sq ft	Irrigate within 24 hours after treatment. Time applications when adults are active. <b>Restricted-use insecticide</b>
imidacloprid + bifenthrin	Allectus GC	1.7–2.9 lb per 1000 sq ft	Irrigate within 24 hours after treatment. Time applications when adults are active. <b>Restricted-use insecticide</b>
tetraniliprole	Tetrino	0.367–0.735 fl oz per 1000 sq ft	Apply when overwintering adults are first observed. Irrigate after application.
thiamethoxam	Meridian 0.33G	7–9 lb per 5000 sq ft	Irrigate granular formulation after treatment. Use 1.5–5 gal of spray per 1000 sq ft for 25WG formulation.
thiamethoxam	Meridian 25WG	12.7–17 oz per acre	Irrigate granular formulation after treatment. Use 1.5–5 gal of spray per 1000 sq ft for 25WG formulation.
trichlorfon	Dylox 420 SL	6.9 fl oz per 1000 sq ft	Irrigate following application.

## Two-Lined Spittlebugs

Spittlebugs occur in all parts of Mississippi and throughout the eastern United States. The most noticeable signs of spittlebugs in lawns are the adults flying when the grass is being mowed or when children are playing.

Adults are wedge shaped, about one-fourth to three-eighths inch long and black with two orange stripes running perpendicular across their backs. Adults and nymphs are sucking pests that feed directly on the grass. Adults also feed on hollies (Japanese and American holly) planted in the adjacent landscape.

Adult spittlebugs feed openly on the turf foliage and stems and can cause significant damage. Nymphs often feed closer to the thatch or even below the thatch inside a frothy mass called spittle. When populations are high, the grass may be described as being “squishy.”

Nymphs produce the spittle that they use for protection. If you take the spittle mass and gently rub it between your fingers, one or more wingless, light-colored nymphs with brown heads will emerge.

Damage to centipede is apparent when a stand of grass appears to be yellowing or “burned.” Individual grass blades will have a purplish stripe or streak due to the salivary toxin that is injected during feeding then translocated through the parallel veins.

All warm-season turfgrass species can be attacked, but centipede is the most common host. Spittlebug damage to St. Augustinegrass may be mistaken for chinch bug injury. If the damage is in full sun, it is likely caused by chinch bugs, but brown areas in the shade should be inspected for spittlebugs.

Damage is often worse in years where there is above-average spring and summer rainfall or when the turf is well irrigated. Lawns with heavy thatch can also be more



Two-lined spittlebugs are appropriately named. The nymphs suck sap and produce spittle-like masses in the turf.

susceptible to spittlebug damage. This is, in part, because females deposit eggs into hollow grass stems and other debris. Eggs are less than one-sixteenth of an inch long, bright yellow to orange, and present all winter long. They hatch into nymphs in the spring (March and April) and immediately begin to feed. They take about 1 month to develop into adults. There will be two to three generations per year with peak adult activity from the first generation occurring around June.

There are no known parasites of spittlebugs, and the most common turfgrass predators of spittlebug eggs and adults are fire ants and predaceous beetles. To reduce or prevent outbreaks of spittlebugs, reduce thatch and manage irrigation practices carefully so as not to overirrigate.

Liquid formulations of insecticides usually work better than granular ones, and these should be timed around July. If possible, mow and irrigate the turf the night before or morning of the application.

### SPITTLEBUG CONTROL

Insecticide	Brand Name	Rate	Comments
acephate	Orthene TTO 97	0.8–1.4 oz per 1000 sq ft	Make application in the late afternoon or evening. Do not irrigate within 24 hours of application. <b>Golf course and sod farm use only.</b>
bifenthrin	Onyx Pro	0.08–0.16 fl oz per 1000 sq ft	Do not irrigate within 24 hours after application. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Professional	0.25–0.5 fl oz per 1000 sq ft	Do not irrigate within 24 hours after application. <b>Restricted-use insecticide</b>
carbaryl	Sevin SL	1.5–3 fl oz per 1000 sq ft or 2–4 qt per acre	Do not irrigate within 24 hours after application.
clothianidin	Arena 50 WDG	4–8.3 grams per 1000 sq ft	
clothianidin + bifenthrin	Aloft GC SC	0.27–0.54 fl oz per 1000 sq ft	
deltamethrin	DeltaGard GC 5SC	0.2–0.4 fl oz per 1000 sq ft or 8.75–17.5 fl oz per acre	Do not irrigate within 24 hours after application. <b>Restricted-use insecticide</b>
deltamethrin	DeltaGard T&O 5SC	0.2–0.4 fl oz per 1000 sq ft or 8.75–17.5 fl oz per acre	Do not irrigate within 24 hours after application. <b>Restricted-use insecticide</b>



## Turf Caterpillars

There are several species of caterpillars that occasionally damage turfgrass. These include fall armyworms, cutworms, and sod webworms.

**Fall armyworms** are the most important insect pests of bermudagrass turf. Because they do not normally overwinter in Mississippi, moths must migrate in from more southern locations each year, and populations vary greatly from year to year. In years of heavy outbreaks, fall armyworms cause significant short-term damage to turfgrass, as well as bermudagrass hay fields. The gray, night-flying moths often go unnoticed, but heavy infestations of large caterpillars are difficult to overlook. Mature caterpillars are about 1¼ inch long and vary in color from green to tan to dark brown.

Depending on the situation, large numbers of caterpillars crawling around in the turf and on adjacent sidewalks and other paved areas can cause as much concern as the damage they do to the grass. Heavy infestations can cause severe defoliation in what appears to be a very short period of time—only a day or two. Actually, it takes these caterpillars around 14 days to complete the caterpillar period of their life cycle, but they become most noticeable—and do most of their damage—in the last two or three days before they pupate. To prevent excessive damage, as well as the presence of large caterpillars, it is important to detect and treat developing infestations when caterpillars are small. Watch for tiny, white “windowpanes” on grass blades or subtle white “frosting” or “frizzing” of blade tips. These are signs of feeding by small, recently hatched caterpillars. Check to be sure small caterpillars really are what is causing the signs you have observed, and treat promptly to prevent damage. Experienced turf managers learn to keep in contact with local cattle and hay producers. If local farmers are having to spray bermudagrass hay fields for fall armyworms, it’s time to pay closer attention to bermudagrass turf, as well.

**Cutworms** are a related group of caterpillars that feed on stems and leaves of turf. Although there are many species of cutworms, the black cutworm is most common especially on creeping bentgrass greens and tees. This species is most often associated with pockmarks and damage to putting greens, which interferes with ball roll. Cutworms are active at night and hide in the day but may become active on cloudy days.

Adult moths begin to appear in March and may produce four generations per year. They lay eggs on the tips of grass blades, so close cutting of putting greens removes most eggs before they hatch. However, cutworms that develop in the rough often migrate into greens as larger larvae.



Fall armyworms are sporadic pests, but in outbreak years they can quickly defoliate bermudagrass lawns.



Mature fall armyworm caterpillars are about 1½ inches long and may range from green to tan to dark brown.

**Sod webworms** cut off blades of grass above the thatch line and pull them into their burrows to feed. Infested areas may appear as small brown patches. If infestation is heavy, patches may run together to form larger irregular brown areas.

Adult moths are small, frail, and “snouted” and are often seen hovering over the turf at dusk. There may be two or three generations per year.

**Tropical sod webworm** moths look much different than the moths of other sod webworms. Adult moths are about a half-inch long and carry their wings in a more triangular, jet-like shape. Moths are often noticed before damage is

observed, with large numbers of low-flying, small, brown moths being flushed up from the lawn and surrounding ornamental shrubs, or being attracted to lights at night. Because these insects do not survive freezing weather, they are more common in the coastal counties. Heavy outbreaks are sporadic, but occasionally occur as far north as I-20. Mature caterpillars are green, covered with darker spots, and approximately three-fourths of an inch long. Heavy outbreaks can cause severe short-term damage, with turf having a dead, ragged appearance, and with trails of webbing present among the grass blades. Tropical sod webworms will damage all types of turf grass but especially favor St. Augustine, bermuda, and centipede.

In residential and commercial lawns especially, outbreaks of caterpillar pests are buffered by the presence of natural enemies such as ants, spiders, or parasites. These natural enemies commonly attack exposed eggs or small larvae, reducing the number of larger caterpillars later. Many insecticides will significantly reduce these natural enemies.

Insecticides with target-selective modes of action reduce the negative impacts on these natural enemies. If possible, try to incorporate biorational products such as spinosad into your chemical control program.



Tropical sod webworm caterpillars are green and about three-fourths of an inch long when mature. Photo by Ross Overstreet, MSU Extension agent

Turf caterpillars are primarily controlled using foliar sprays; but careful, frequent scouting is necessary to detect a developing infestation before it causes damage. Because there are several different species of turf-infesting caterpillars, and because there may be several overlapping generations per year, several applications may be necessary in a growing season. When applied at the caterpillar rates, Acelepryn and

### TURF CATERPILLAR CONTROL

Insecticide	Brand Name	Rate	Comments
acephate	Orthene TTO 97	0.4–0.9 oz per 1000 sq ft	Irrigate before application. Delay watering or mowing for 24 hours following application. <b>Golf course and sod farm use only.</b>
bifenthrin	Talstar Select	0.25 fl oz per 1000 sq ft or 10 fl oz per acre	Delay watering or mowing for 24 hours following application. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Professional	0.25 fl oz per 1000 sq ft or 10 fl oz per acre	Delay watering or mowing for 24 hours following application. <b>Restricted-use insecticide</b>
carbaryl	Sevin SL	1.5–3 fl oz per 1000 sq ft or 2–4 qt per acre	Do not irrigate following insecticide application. Use 6 qt of Sevin SL/acre for sod webworm control. <b>Not for use on athletic fields.</b> Broadcast applications permitted only on golf courses, sod farms, cemeteries, and commercial landscapes (see label).
chlorantraniliprole	Acelepryn 1.67	2–4 fl oz per acre	Delay watering for 24 hours after application.
cyantraniliprole	Ference 1.67	2–16 fl oz per acre	Delay watering or mowing for 24 hours.
cyfluthrin	Tempo SC Ultra (landscape and recreational turf only)	4–8 ml per 1000 sq ft or 6–12 fl oz per acre	Delay watering or mowing for 24 hours following application. <b>Restricted-use insecticide</b>
indoxacarb	Provaunt 30 WDG	2–4 oz per acre or 0.0046–0.092 oz per 1000 sq ft	Delay mowing and irrigation for 24 hours after application. If applied to turf maintained at >1 inch, use 4 oz application rate.
lambda-cyhalothrin	Scimitar CS (landscape turf only)	3.4–7 ml per 1000 sq ft or 5–10 fl oz per acre	Apply 2–5 gal of spray per 1000 sq ft. Delay watering or mowing for 24 hours. Landscape turf only. <b>Restricted-use insecticide</b>
spinosad	Conserve 1SC	0.25–0.8 fl oz per 1000 sq ft or 10–35 fl oz per acre	Lower rate is effective against small fall armyworms and sod webworms, but high rate is required against cutworms. Delay watering or mowing for 24 hours following application.
trichlorfon	Dylox 80 T&O	2.5–3.75 oz per 1000 sq ft or 6.8–10.2 lb per acre	For sod webworm and cutworm control. Do not irrigate following application.



Ference tend to provide somewhat longer residual control than most other treatments. When applied at the higher rates used for white grub control, Acelepryn and Ference will provide extended residual control of fall armyworms and other caterpillar pests, often lasting many weeks. However, because control will eventually decline, turf should be scouted regularly in case supplemental treatments are needed later in the season.

Although turf caterpillars are capable of causing severe short-term damage to lawns and other turf areas, and the presence of large numbers of caterpillars can be distressing to people using the turf, healthy turf that is properly maintained will usually recover fully within a few weeks. In this respect, the long-term adverse effect of defoliation by caterpillar pests is much less damaging than that caused by heavy infestations of most other turf insects.

## Eriophyid Mites in Turfgrass

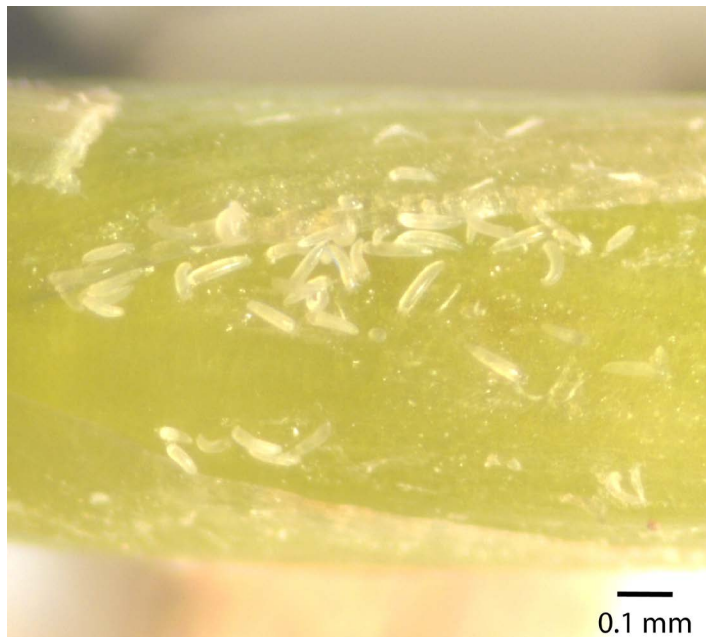
Eriophyid mites (zoysiagrass and bermudagrass mites) are extremely small, much smaller than spider mites and too small to see with the naked eye. When viewed under magnification, they appear elongated, shaped like the upper part of an exclamation point, with two pairs of legs near the head.

Feeding by these mites can bring abnormal growth in their host plants. Eriophyid mites are host-specific to the grasses they infest, and damage may include stunting, witches'-broom (tufting of the grass), or distortion of infested grass blades.

**Bermudagrass mites**, also called **Bermudagrass stunt mites**, have been fairly common in drought conditions in Mississippi. The mites appear as yellow to white, elongated individuals in high numbers on stems and inside leaf sheaths, but it takes careful examination under high magnification to see them. There are multiple generations per year, since they need only 5–10 days to complete a generation. Also, different life stages may be present at the same time.

Bermudagrass mites can be found on most varieties of bermudagrass. Studies have shown these pests rarely attack Tifgreen Tiffine, Tifdwarf, Texturf 1F, Texturf 10, FloraTex, Midiron, Royal Cape, and Everglades, but they often attack Tiflawn, Ormond, St. Lucie, and NoMow. As a rule of thumb, Bermudagrass varieties that are finer textured are generally less susceptible than those with a coarser texture. Everglades and Tifway were rated as both susceptible and resistant in two separate studies. Studies may differ in ratings because cultural practices change susceptibility.

Adequate moisture and fertility may enable grasses with low populations of mites to outgrow the damage. Likewise,



Bermudagrass mites are less than 1/200th inch long and are cigar shaped. You can barely see them with a 10x hand lens and good light—if you know they are there. A microscope is needed to see these well. Zoysiagrass mites are similar. Photo by Matthew S. Brown, Clemson



Heavy infestations of Bermudagrass mites can kill turf. Note the stunted, shortened internodes and yellowing or purpling leaves. Photo by Matthew S. Brown, Clemson

lower mowing heights, more frequent mowing, and removal of clippings will remove mites and reduce populations.

Due to their relative rarity, there are few miticides labeled for eriophyid mites in turf. However, Divanem (abamectin) has a 2ee label (expires December 2024) and Todal (abamectin) has a full label that allows use **on golf courses only** to control bermudagrass mites. Be sure to follow label directions, including use of an appropriate surfactant, and have the product label on hand at time of treatment. For best control, these must be applied as a series of repeated treatments at 14-day intervals.



**Zoysiagrass mites** can damage zoysiagrass. Infested turf looks unhealthy because the leaf blades streak yellow. Closer examination reveals that one side of the leaf blade is rolled longitudinally and yellowed. Often the tip of the terminal leaf blade becomes caught in this roll at the base of the subterminal leaf, creating a curled or hooked appearance. Lawn maintenance personnel sometimes refer to this as the pinstripe and bow tie effect.

Zoysiagrass mites have a similar appearance to bermudagrass mites. The life cycle of this mite is unclear but is assumed to be similar in generation time (5–10 days) to bermudagrass mites. Cultivar evaluations indicate that Royal and Emerald are resistant. Crown, Palisades, and El Torro have intermediate resistance, but Korean Common, Meyer, Belair, Cavalier, and Sunburst are the most susceptible.

There are no products labeled for control of zoysiagrass mites. Avoid planting varieties of grass known to be especially susceptible. Cultural practices such as lowering mowing height, removing clippings, managing thatch, and maintaining adequate moisture and fertility may help turf tolerate heavy infestations.



Zoysiagrass mites cause characteristic “pin stripe and bow tie” growth in grass blades, with one side of the leaf blade being yellow and the other green.

## Other Mites in Turf

**Banks grass mites** are reported to attack zoysiagrass, Bermudagrass, and St. Augustine grass but rarely damage turfgrass in Mississippi. These mites look like typical spider mites and often have two dark spots on their backs. Adults are small and greenish-yellow, which makes them harder to detect in the grass. Webbing may be present at the base of the grass plant and on the underside of the leaf blade. Eggs are laid on the foliage and require 8–25 days to mature into adults. There are multiple generations per year, and hot, dry weather favors their reproduction and development. Damage appears as stippling or chlorotic spots on the grass blade, resulting from mites' feeding on the contents of leaf cells. Damage is more evident in water-stressed turf and rarely occurs in irrigated turf. Evaluations of zoysiagrass cultivars suggest Meyer, Midwest, and Emerald can be severely damaged.

As their name suggests, **winter grain mites** are more common during the cooler months, especially late winter to early spring. Another common name for this mite is the red-legged earth mite, which characterizes the dark body and reddish-orange legs of the adult mite. These mites may damage ryegrass overseeded into stands of warm-season grasses in pastures or managed turfgrass. Eggs are present at the base of the grass plant on stems or roots, or on the thatch. Immatures and adults are present on the leaf blades, feeding mostly at night. Mites spend the day in the thatch or soil just under the foliage. There are two generations per year, both occurring from December through April.

Damage to ryegrass by winter grain mites appears as dead tissue at the blade tip, not as stippling. The location of the damage on the plant at that time of year often leads to misdiagnosis of mite injury as cold or freeze injury in overseeded ryegrass. In Mississippi, damage to ryegrass can be extensive by early January.

## NON-ERIOPHYID MITE CONTROL

Insecticide	Brand Name	Rate	Comments
azadirachtin	Azatrol EC	1.3 fl oz per 1000 sq ft	Apply 1–2 gal of spray per 1000 sq ft.
bifenthrin	Talstar Professional	0.5 fl oz per 1000 sq ft	Apply using a surfactant. A second application may be required after 5–10 days. <b>Restricted-use insecticide</b>
bifenthrin	Talstar Select	0.5 fl oz per 1000 sq ft	Apply using a surfactant. A second application may be required after 5–10 days. <b>Restricted-use insecticide</b>
chlorpyrifos	Dursban Pro	2 qt per acre	<b>Golf courses only.</b> <b>Restricted-use insecticide</b>

## Turfgrass Mealybugs

Two species of mealybugs occasionally occur in turfgrass. Both are uncommon, but both can cause serious damage if not diagnosed and treated properly. You may never see either of these pests, but you don't want to miss them if you do get them. Misdiagnosis is common, and turf managers often report considering several other causes, such as nematodes, fertility problems, or herbicide injury, before they realize insects are the cause of their declining turf.

**Rhodesgrass mealybugs**, *Antonina graminis*, occur in all types of turfgrass, but damaging infestations are most common in bermudagrass growing on golf greens or sports fields. Infestations are rare, but they sometimes occur. Heavy infestations cause patches of grass to yellow and die, or damage can progress to more uniform yellowing and browning across the field. Grass suffering from drought stress and/or close mowing (as on golf greens and sports fields) is more susceptible to damage.

Newly hatched crawlers settle just beneath leaf sheaths in crowns and on stem nodes. Upon molting to the next instar, they lose their legs and remain in place for the remainder of their lives, causing damage by sucking sap from the stems. Mature females are usually covered with a layer of white cottony material, often with shiny, purple patches showing through. These mature females are relatively easy to spot if looking carefully on hands and knees. To the naked eye, they may look a bit like small prills of fertilizer scattered in the turf. Use a magnifying glass to carefully examine stems and crowns of freshly dug turf for nymphs and/or adults. One distinguishing characteristic of mature females is that they often have a short, waxy filament extending from their bodies that looks much like a piece of monofilament fishing line. Heavily infested turf may be sticky with honeydew or have accumulations of black sooty mold on the sand and lower parts of plants. There are no males; Rhodesgrass mealybugs reproduce parthenogenically.

**Tuttlet mealybugs**, *Brevinnia rehi*, cause symptoms similar to those of Rhodesgrass mealybugs and have been found in bermudagrass golf greens and in zoysiagrass growing in home lawns and commercial settings. Again, infestations are rare, but it is important to be able to recognize these pests when they do occur. Golf greens or zoysia lawns that exhibit dieback, yellowing, or browning patches should be carefully inspected for mealybugs, as well as chinch bugs.

Tuttlet mealybugs feed at the base of crowns and at internodes, where they produce a cottony, white, waxy material, which makes them relatively easy to spot during close examination. If populations are high, turf may also be



A heavy infestation of Rhodesgrass scale caused severe damage to this golf green.



Eye-level view of Rhodesgrass mealybugs in dead and dying turf. They look a bit like small fertilizer prills.



Mature Rhodesgrass scales occur at crowns and nodes and are covered with white, waxy material, often with shiny, purplish patches showing through.



sticky with honeydew. Adults and crawlers are pale yellow to pink where the white material has been brushed away.

Avoid infestation as much as possible by taking care to purchase sod from reputable suppliers, grown on farms that are frequently and carefully inspected and managed to be free of mealybugs. Maintain healthy turf through good fertility and water management. Good thatch management is especially helpful as it increases pest exposure to predators and insecticide treatments.

Because of their relative rarity, there are no insecticides labeled specifically for controlling mealybugs in turfgrass. However, neonicotinoid products (imidacloprid, dinotefuran, clothianidin, and thiamethoxam) are labeled and effective against other species of mealybugs in ornamental plants, and these treatments are labeled for use in turfgrass to control pests such as billbugs and white grubs. In cases where these products have been applied at full label rates to proactively control white grubs or billbugs in turf with heavy mealybug infestations, turf managers often observe good collateral control of the mealybug pests.



White, cottony material at the bases of grass stems may be a sign of Tuttle mealybugs.



Tuttle mealybugs are yellow when viewed closely. Here, the white material has been brushed away to reveal a female with eggs and a few young crawlers.



Earthworm castings are a common problem on closely mown turf and are sometimes mistaken for insect problems.



## Abbreviations

DG = Dry Flowable

E = Emulsifiable

G = Granular

S = Soluble

SP = Soluble Powder

TI = Turf Insecticide

W = Wettable

WSP = Water-Soluble Package

## Safety Precautions

- Read the label before buying the insecticide.
- Store insecticides in a safe place, especially away from children.
- Read the label before applying the insecticide.
- Wear proper protective clothing while applying insecticides.
- Follow all instructions and restrictions on the label.
- If you spill any insecticide on your body, wash with soapy water immediately. Wash all exposed skin after dusting or spraying.

## Conversion Factors

1 acre = 43560 sq ft

1 fl oz = 29.6 mL

1 oz = 28.4 g

1 gal = 128 fl oz

1 qt = 32 fl oz

1 lb = 16 oz

1 fl oz = 2 Tbsp

1 Tbsp = 3 tsp

1 tsp = 5 mL

## ACTIVE INGREDIENTS FOR USE AGAINST INSECT AND MITE PESTS OF TURFGRASS

Active Ingredient	Examples of Product Names
Abamectin	Ascend, Award II Fire Ant Bait, Divanem, Todal
Acephate	Orthene Tree, Turf, and Ornamental Spray 97
Azadirachtin	Azatrol
<i>Bacillus thuringiensis</i> (all strains)	Biobit HP insecticide, CryMax, Dipel Pro
Bifenthrin	Talstar formulations, Menace GC
Carbaryl	Sevin, Carbaryl
Chlorantraniliprole	Acelepryn
Chlorpyrifos	Dursban Pro
Clothianidin	Arena formulations
Clothianidin + bifenthrin	Aloft GC SC
Cyantraniliprole	Ference
Cyfluthrin	Tempo formulations
Deltamethrin	DeltaGard formulations
Entomopathogenic nematodes	Nematac S (for mole crickets)
Essential oils (peppermint and rosemary oils)	Ecotrol
Fenoxycarb	Award fire ant bait
Fipronil	Top Choice
Hydramethylnon	Amdro fire ant bait
Imidacloprid	Merit formulations, Mallet, Allectus (with bifenthrin)
Imidacloprid + bifenthrin	Allectus formulations
Imidacloprid + bifenthrin + zeta-cypermethrin	Triple Crown formulations
Indoxacarb	Provaunt, Advion brand baits
Lambda-cyhalothrin	Scimitar
Methoprene	Extinguish
Permethrin	Perm-Up, Astro
Pyrethrins: piperonyl butoxide	Pyganic, Evergreen EC
Potassium salts of fatty acids (insecticidal soap)	M-PEDE
Pyriproxyfen	Distance fire ant bait
Spinosad	Conserve
Sulfur	Sulfur 6L (plant nutrient used as an inorganic pesticide)
Tetraniliprole	Tetrino
Thiamethoxam	Meridian formulations
Trichlorofon	Dylox formulations



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