



The black cutworm is a leaf feeding insect. These types of insects are more vulnerable to biological control products such as parasitic nematodes than subsurface inhabiting pests like grubs.

Biological insect control products have had limited success. Industry and university researchers continue their quest to find the best agents and application techniques.

by Harry Niemczyk, Ph.D., Ohio State University

Insecticides still remain the most effective means of controlling established populations of insects causing damage to turf. Interest in—and expectations for—biological means of controlling cool season insect pests of turfgrasses is at an all-time high.

Naturally occurring biological agents, such as parasites, predators, entomogenous (insect parasitic) nematodes, fungi and bacteria, remain important suppressors of insect populations (both beneficial and harmful) in turfgrasses. However, with the exception of the development of endophyte-enhanced peren-

nial ryegrasses and turf-type tall fescues, and chinchbug resistant varieties of St. Augustine grass, the artificial introduction of cultured biological agents, such as nematodes and parasitic bacteria, has met with limited success, at best.



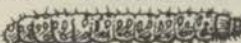



Despite the general impression that these agents are effective, the collective scientific data obtained to date simply does not support this conclusion.

The current strong desire for effective biological controls for turfgrass insect pests has led to expectations that far exceed those realistically achievable at this time.






The search continues

Researchers in industry and at state universities are not discouraged by the limited success of biological control agents. In fact, research in this area has intensified in all quarters. Major chemical companies are interested in and have obtained development and other rights to certain biological agents. This is an encouraging sign. Both industry and university researchers are working on new application technologies for more precise placement of biological control agents in order to bypass some of the natural barriers to effectiveness, such as desiccation, ultraviolet light and the thatch

The TOP 10 Cool Season Insect Targets



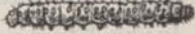






Pest	Spring April-May	Summer June-August	Fall-early winter Sept.-Dec.
<p>1 Chinch bugs</p> 	<p>In northern zones, chinch bugs overwinter as adults in thatch or sheltered sites near buildings. They can become active during warm days in March. Infestations occur in zoysia, Kentucky bluegrass and fine fescues. As the warm days of spring approach, movement of chinch bugs increases rapidly. Generally, egg laying begins the first week of May, but can begin in mid-April if spring arrives early. Generally, application of insecticides to prevent infestations of chinch bugs should be completed by the first week in May. Applications may begin as early as the last week of March. Such applications must be made before significant numbers of eggs are laid. This time may vary as much as a week or more, depending on spring weather.</p>	<p>Chinch bug eggs continue to hatch into June. Bright red nymphs with a center white band appear. The number of chinch bugs increases rapidly in June. Their populations peak in July and August, when northern lawns can receive severe damage. This damage is often masked by summer dormancy of turf caused by drought. Hot, dry conditions are ideal for chinch bugs. During August, the nymphs molt into adults that mate and lay eggs, thus producing a second generation. Some northern areas have only one generation per year.</p>	<p>In the northern U.S., the second generation of chinch bug is at peak numbers in September. Nymphs complete their development to adults in late October. Most chinch bugs overwinter in the turf, but some move to protected areas before winter. Generally, infestation levels at this time are not high enough to warrant the use of insecticides. Early fall rains and infection by a parasitic fungus (<i>Beauveria</i> spp.) usually provide sufficient control.</p>
<p>2 Billbugs</p> 	<p>Billbugs overwinter as adults in thatch or sheltered sites near buildings. They become active during warm days in March. Infestations also occur in zoysia, Kentucky bluegrass and fine fescues. Generally, application of insecticides to prevent infestations of billbugs should be completed by the first week in May. Applications may begin as early as the last week of March. Such applications must be made before significant numbers of eggs are laid. This time may vary as much as a week or more, depending on spring weather.</p>	<p>Bluegrass billbug larvae feed on grass stems during June and move to the plant crowns, roots and rhizomes during July. This feeding pattern causes brown spots that frequently resemble the symptoms of some fungus diseases. Symptoms are also masked when the turf is dormant from drought. The larvae usually move deeper into the soil under dry soil conditions. During late July and August, the larvae burrow deeper into the soil to pupate and transform into adults.</p>	<p>During September, billbug adults that developed from summer larvae are often seen on sidewalks, driveways or other paved surfaces. Before winter, these adults seek shelter in thatch, along sidewalk edges or near foundations and overwinter. Many, if not most, overwinter in turf. In some areas a partial second generation may occur. Larvae of this generation have been known to cause visible damage in September and October.</p>
<p>3 Sod webworms</p>	<p>Overwintered larvae of the sod webworm begin feeding as soon as the grass begins to grow. Usually damage is insignificant, but areas frequently have probe holes from starlings feeding on larvae. Moth flights begin in May in northern areas. Young larvae are usually present about two weeks after the spring moth flight peaks, so treatment of young larvae can be done in May in some areas.</p>	<p>Damage from sod webworm larvae occurs occasionally in most of the cool-season turf region. Injury is more common in Midwestern states, usually in July and August. Older sod fields or areas with heavy thatch are good candidates for infestation. There are generally one or two generations per year, depending on the species.</p> 	<p>Northern sod webworm larvae are small and cause little if any damage in the fall. Late in the fall the larvae construct a cocoon-like shelter in which they overwinter. The most common sod webworm species overwinter as larvae in the thatch or upper inch of soil. Feeding does not resume until hibernation (dipause) is broken by early spring warmth.</p>
<p>4 Cutworms</p> 	<p>Moths of cutworms blown north on the winds aloft begin laying eggs on golf course greens and other turf areas in the spring. These eggs hatch, producing larvae that feed on grass blades during the night. The black cutworm is the most common species on cool-season turf. While visible damage is uncommon on home lawns, damage can be significant on golf course greens in late May.</p>	<p>Cutworm larvae continue to cause damage to golf course greens from June through August. These larvae pupate in the soil or thatch and emerge as moths that lay eggs for additional generations.</p>	<p>Damage to golf course greens may be seen in September, but is not common. This insect does not overwinter in any known stage in the northern states.</p>
<p>5 Ants</p> 	<p>Various species occur in turf. Colonies located three or more feet under the surface. Nest cleaning and general activity resumes in April. New mounds begin to appear in late April and May. A single colony may have many surface openings, each with a mound of soil.</p>	<p>Nuisance mounding and foraging continues through the summer, particularly in areas of sandy soils. Colony queens produce a steady flow of more ants. Mounds of soil two to three inches tall are replaced rapidly, causing damage to mowing equipment as well as shading out turf to cause small dead spots.</p>	<p>Mounding, foraging and production of more ants continues until late fall. Some species culture aphids in their colonies by placing them on turf roots. The ants feed on the sweet fluid produced by the aphids.</p>
<p>6 Greenbug aphid</p> 	<p>The only stage of the greenbug known to overwinter in northern states is the egg. Shiny black eggs deposited in the previous fall may be found adhering to grass blades, fallen tree leaves or other debris. Greenbug eggs begin hatching as early as April, but significant infestations do not develop until later in the year. Greenbugs are also brought into the region from the south on upper air winds. Aphid numbers are too low to detect in lawns at this time.</p>	<p>Damaging populations of greenbugs can occur from June-August. Populations and incidents of damage frequently vary from area to area, even within the same city. Symptoms of injury include turf under the dripline of trees and in open areas having a burnt orange color. When symptoms are apparent, numerous aphids (40 or more) may be seen on a single grass blade. Close examination of damaged turf is necessary because the aphids are small. If left untreated, a heavy infestation can kill the turf.</p>	<p>Damage to golf course greens may be seen in September, but is not common. This insect does not overwinter in any known stage in the northern states.</p>

The TOP 10 Cool Season Insect Targets

Pest	Spring April-May	Summer June-August	Fall-early winter Sept.-Dec.
<p>7 Winter grain mite</p> 	<p>Damage from this mite is often first noted in March or April, when turf areas are receiving spring fertilizer applications. Winter grain mites are identifiable by eight bright red legs and a dark body. By late May, the mites will have laid their eggs and died. Mites do not appear again until the eggs hatch in October.</p>	<p>Mite is in the egg stage and not active at this time.</p>	<p>Spring laid eggs begin hatching in October. Occasionally, damage may be seen in December.</p>
<p>8 Clover mite</p> 	<p>Incidents of visible damage to home lawns are often seen in April in Ohio cities and Denver. Usually a nuisance pest in and around homes, the clover mite occurs in large numbers (5,000 per square foot) across entire lawns and on turf next to building foundations. Symptoms of injury were the same as the winter grain mite. Turf next to foundations may be killed. The clover mite has a slightly pink body and eight pale-colored legs. The first pair of legs is extremely long and protrude well out in front of the mite. The absence of bright red legs distinguishes the clover mite from the winter grain mite.</p>	<p>Adult mites lay eggs. Occasionally, some eggs hatch, giving rise to a summer generation.</p>	<p>Eggs hatch. Adults feed in turfgrasses, next to building foundations and often enter buildings in large numbers. Turf next to foundations may be killed. Treatment of turf prevents damage.</p>
<p>9 Grubs</p> 	<p>Overwintered grubs return to the surface and begin feeding on turfgrass roots in April. Increased activity and damage from birds, moles, skunks and raccoons foraging on grubs can also be expected and continues through May. Treatment should be delayed until the grubs are in the top one inch of soil. Irrigation or rain-fall should follow such applications to aid in moving the insecticides to the target grub as soon as possible following application.</p> <p>Although milky disease products for control of Japanese beetle grubs may be applied any time there is no frost in the soil, spring is a good time for such applications. The soil is open, and frequent rains move the disease spores into the soil and thatch.</p> <p>Milky disease products are primarily effective against Japanese beetle larvae. Ineffectiveness against other species is low.</p> <p>Incidents of large grub infestations (June bug larvae, for example) have been increasing in cool-season areas. Locations of such infestations should be identified because reinfestation is likely every three years.</p> <p>Eggs are laid in May and June. Therefore, treatment should be made in late summer, early fall of that year or the next spring while larvae are small. Later applications against full-grown larvae have given inadequate control in past studies.</p>	<p>By June, grubs have stopped feeding and are in the pupal stage, three to four inches in the soil. Beginning mid-June and continuing through mid-July, the adults of various species emerge and burrow into the soil to lay eggs. Hatching and appearance of young larvae occur during July and August.</p> <p>Extreme heat and drought during the summer may cause some grubs to move deeper in the soil. Under such conditions, irrigation several hours before treatment, and a thorough soaking afterward is advisable.</p> 	<p>Most species of grubs are in the third of their three stages of development, and are feeding actively. When soil temperatures decrease in late October, the larvae burrow deeper into the soil to overwinter.</p> <p>If soil temperatures remain warm, larvae stay at the surface and continue feeding. Severely cold winters have little effect on survival.</p> <p>The larvae of this group of pests normally overwinter six inches or deeper in soil. If spring comes early, grub activity can be expected along with skunks and raccoons, which tear up the turf in search of them. Moles, which feed on grubs and earthworms, also become active at this time.</p>
<p>10 Black turfgrass ataenius</p>	<p>This golf course pest overwinters as an adult in the soil under debris in roughs or other protected areas. A few may be seen flying about on warm afternoons in early March. Usually this activity begins when crocus starts blooming and intensifies as the bloom of fed bud appears.</p> <p>Adults of the black turfgrass ataenius can be seen "at wing" in April and are often found in grass catchers after early mowing of golf course greens. These adults begin laying eggs in early May, or about the time Vanhoutte spirea first comes into bloom. Dursban applied to a fairways at this time kills adults and prevents summer infestation of larvae. Check with local extension entomologists for the precise time if needed.</p> <p>A second application, two weeks after the first, may be needed to successfully prevent infestation.</p>	<p>Eggs laid by beetles during May hatch in June and the larvae immediately begin feeding on turf roots and thatch.</p> <p>From late June to mid-July, symptoms of injury include wilting in spite of irrigation. In July, larvae move deep into the soil, pupate and emerge as adults. These adults lay eggs during August, producing a second generation in some states. The second generation larvae are capable of damaging turf. States farther north have only one generation.</p>	<p>By September, adults of the current generation begin to fly into protected areas, such as golf course roughs, to overwinter. Larvae that have not completed development to adults before the first frost are killed.</p> 



Cool Season Insects - Control Product Strategies

Pest	Spring April-May	Summer June-August	Fall-early winter Sept.-Dec.
Chinch bugs 	When summer damage is expected, preventive application of liquid or granular Dursban (1lb. Ai/acre); Triumph ¹ (1lb. Ai/acre) may be used as soon as the insects become active. Preventative applications of insecticides should be completed by the first week in May.	Treat before injury is severe with Dursban (1lb. Ai/acre), diazinon** (2.5-5.5lbs. Ai/acre), or other labeled insecticides.	Treat if necessary, but generally, infestation levels are not high enough to warrant using insecticides.
Billbugs 	Same as for chinch bugs.	Treat infestations at same rates as grubs with Triumph ¹ , diazinon**, Turcam, Mocap or Sevimol. Application in mid-late June most effective. Irrigate following application.	Treatment is usually not appropriate at this time.
Sod webworms	Overwintered larvae can cause damage in April or May. When necessary, apply diazinon** (5lb. Ai/acre), Triumph ¹ (1lb. Ai/acre), Dylox or Proxol (6-8lb. Ai/acre), Orthene (1-2lb. Ai/acre). Use flush of water-liquid detergent solution to determine level of infestation.	Make application when damage is seen, or larvae are present. Use Dursban (1lb. Ai/acre), Triumph ¹ (1lb. Ai/acre), Diazinon** (5lbs. Ai/acre), Sevin-Sevimol (6-8lbs. Ai/acre), Proxol-Dylox (6-8lbs. Ai/acre), or other labeled insecticides.	Larvae are small and generally cause little damage at this time. Treatment in September reduces population and damage potential for next spring. 
Cutworms	The insecticides effective against sod webworm are also effective against cutworms. Apply late in the afternoon. Do not irrigate following liquid applications unless specified on label.	Use Orthene (1-3lbs. Ai/acre), Dursban (1lb. Ai/acre), Triumph ¹ (1lb. Ai/acre), Proxol-Dylox (8lbs. Ai/acre) or Sevin-Sevimol (2-4lbs. Ai/acre). Do not irrigate following liquid applications unless specified on label.	Same as for summer. 
Ants 	If more than a nuisance, Dursban (1lb. Ai/acre) or Triumph ¹ applied when ants first become active (April) provides control for about 30 days.	Retreatment likely to be necessary to control ants and mound building. Follow label instructions.	Treatment usually not necessary. Dursban (1lb. Ai/acre) may be used.
Greenbug aphid 	Aphid numbers are too low to detect.	Use Orthene (1lb. Ai/acre) or Dursban (1lb. Ai/acre) or Diazinon** (2.5lbs. Ai/acre).	Severe infestations may occur as late as December. Use the same insecticides as in the summer.
Winter grain mite 	If needed, use spring treatment.	If treatment is necessary, use liquid diazinon** (2-3lbs. Ai/acre) or Dursban (1lb. Ai/acre). Avoid repeated use of Sevin-Sevimol.	Infestations may develop in December under snow. Treatment is not appropriate.
Clover mites 	Liquid diazinon** (2.5lbs. Ai/acre) or Dursban (1lb. Ai/acre) may be used.	Treatment usually is not necessary. Mite is in egg stage.	Treat as needed, with liquid diazinon** (2.5lbs. Ai/acre) or Dursban (1lb. Ai/acre).
Grubs 	If treatment of overwintered grubs is necessary, apply only when all grubs are in the first two inches of surface soil. General or spot treatment with Triumph ¹ (2lbs. Ai/acre), Mocap (5lbs. Ai/acre) or Turcam (2-4lbs. Ai/acre) may be used. Irrigate as soon as possible after application. Green June beetle larvae are difficult to control at this time. Sevimol (2-4lbs. Ai/acre) may be effective.	Existing infestations found in July or August may be treated with Triumph ¹ , Dylox, Proxol, Turcam, Oftanol, Sevin-Sevimol or Mocap. Apply at label rates. If soil and/or thatch is dry, irrigate thoroughly before and as soon as possible after application. Treat green June beetle with Sevin (2-4lbs. Ai/acre).	Treatment can be made as late as mid-late September, as long as grubs remain in the first inch of surface soil. Triumph ¹ , Mocap, Dylox, Proxol at labeled rates may be effective.
Black turfgrass atenius	Dursban (1-2lbs. Ai/acre) applied to fairways in April for control of overwintered, egg-laying adults, reduces the potential for summer larval infestations. Retreatment after two weeks may be necessary.	If preventative applications were not made, spot or generally treat with Triumph ¹ (2lbs. Ai/acre), Proxol-Dylox (8lbs. Ai/acre) Turcam (2-4lbs. Ai/acre), Sevin-Sevimol (8lbs. Ai/acre) or Mocap (5lbs. Ai/acre), as needed.	Undeveloped larvae die with development of ground frost.

¹ For use only by commercial lawn pest control personnel, and only on golf courses tees, greens and aprons, and on sod farms. See soil restrictions. Use only 2lbs. Ai/acre per year.

** Diazinon may not be used on golf courses or sod farms.



New equipment such as the Dol Overseeder (DOL Ltd., Canada) for granular products, and Rain Saver Jr. (Rain Saver, Walla Walla, Wash.) for liquids, will increase the success potential for biological control agents. The agents are placed directly into the pests' zone of activity.

layer. Some of this equipment is now in use and more will be available for testing.

Artificial production of naturally occurring parasitic organisms, such as fungi, bacteria and nematodes, is a major barrier to their availability. Industry's efforts to develop commercial means of such agents while maintaining their virulence as parasites has intensified.

These encouraging developments are driven by the current demand for such products. Whether this demand

will be translated into a sustained sales volume that warrants their continued availability is a risk that industry is currently, and, thankfully, undertaking. I wish them success.

Lacking supportive data on effective biological controls, the controls mentioned in this guide are insecticides. Knowledge of the pest's life cycle and determining the need for treatment, based on evaluation of population levels at a vulnerable period in the insect's life cycle, is the key to successful control. This guide

points out the seasonal occurrence of the 10 most important cool-season insect pests to beware in 1991, and some of the insecticides that may be effective for their control. No endorsement of products is intended, nor is criticism implied of those not mentioned. **LM**

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Chinch bug damage is most severe during July and August.