

An Integrated Approach to Insect Management in Turfgrass: Billbugs

Fact Sheet FS1015

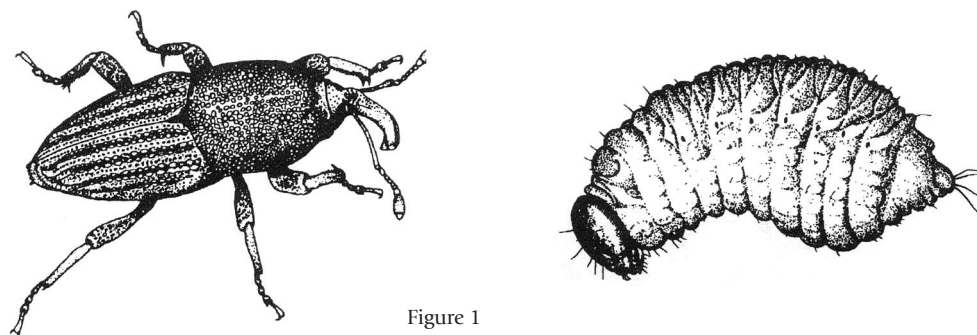


Figure 1

Cooperative Extension

Richard J. Buckley, Director, Plant Diagnostic Laboratory
Albrecht M. Koppenhöfer, Extension Specialist, Turfgrass Entomology
Sabrina Tirpak, Senior Laboratory Technician, Plant Diagnostic Laboratory

Introduction

Billbugs are an occasional pest of turfgrass in New Jersey. They are usually implicated as pests of Kentucky bluegrass, but can also be found feeding on perennial ryegrass, most fescues, Zoysia, bermudagrass, and at least 14 other non-turf species of grasses. There are at least nine species of billbug that attack turfgrass in the United States, four of which occur in New Jersey. These four species are found in various combinations of almost equal abundance in many areas. High populations can cause significant injury to home lawns, athletic fields, golf turf, and commercial grounds.

when gently tugged. As the larvae age, they leave the stems and migrate into the soil/thatch interface to feed on the crowns and roots of neighboring plants.

Billbug injury is most often first noticed in mid-summer. Low billbug populations result in scattered small patches of brown turf that may be misdiagnosed as dollar spot. Large populations cause larger areas of turf to decline as the smaller patches killed by each billbug coalesce. The damage normally occurs during late June and July, but will continue into August when the turf is under temperature and moisture stress.

Billbug Species in New Jersey

Bluegrass billbug – *Sphenophorus parvulus*
Hunting billbug – *Sphenophorus venatus vestitus*
Little billbug – *Sphenophorus minimus*
Uneven billbug – *Sphenophorus inaequalis*

Insect Description

Billbugs are beetles in the family Curculionidae, commonly known as weevils. Adult beetles are easily recognized by their distinct beak-like snout or bill. Recently emerged adults are reddish-brown, but as their cuticle hardens they turn grayish to black. Billbugs are oval shaped, 5/16" to 7/16" (8–11 mm) long, and somewhat pointy on each end. The snout, head, and thorax are about as long as the wing covers. The elbowed antennae are attached near the base of the snout. The thorax and wing covers are ornamented with rows of tiny pits that are characteristic for different species.

Billbug eggs are oblong and white and about 1/16" (1.6 mm) long. They are inserted into small cavities chewed into the stems. Billbug larvae are fat, legless grubs, slightly curved and creamy white with a brown head. The five larval instars are all

RUTGERS

New Jersey Agricultural
Experiment Station

Rutgers, The State University of New Jersey
88 Lipman Drive, New Brunswick, NJ 08901-8525
Phone: 732.932.5000

similar except for size. Mature larvae are about 3/8" (10 mm) long. Billbug pupae are initially creamy white, but turn brown as they mature. The pupae resemble the adult in many ways, with visible wing pads, legs, and snout.

Seasonal History and Habits

Billbugs have one generation per year. The adults overwinter in protected areas around the turf stand. During the first warm days in spring the adults migrate from the over-wintering sites to suitable feeding areas. In New Jersey this normally takes place in April to mid May when soil temperatures reach 65°F (18°C). After a brief feeding period, the adult beetles mate and the females start laying eggs. They lay around 200 eggs at a rate of 2–5 per day. Most egg-laying is completed by early July, but a few females may lay eggs into August. The eggs will hatch in approximately six days.

The young larvae tunnel up and down the grass stem and then burrow into the crown. Once the stem becomes hollowed out, the larvae may exit and bore into another stem. Older larvae migrate into the thatch and soil and feed externally on crowns, roots, and rhizomes.

Bluegrass billbug larvae are most abundant in the soil from early July to early August, but other species may occur at later times. It takes between 35–60 days to pass through the five larval instars. Then the larvae burrow 1–2" (2.5–5 cm) into the soil to pupate in small earthen cells. Pupation takes 8–10 days. New adults are abundant in late summer and fall. Adults can be found wandering around on warm afternoons in fall looking for an overwintering site.

Monitoring

Adults crawling over paved areas during May and June, and again in the fall, may signal a potential problem building up in nearby turf. Pitfall traps are an excellent tool for monitoring the spring migration of overwintered adults. The traps can be made of large plastic picnic cups (e.g., 16 oz cup) alone or with a funnel (e.g., 7 oz coffee cup liner with bottom cut out) and sample receptacle (e.g., 4 oz cup). Punch pin holes in the bottom for water drainage.

The traps have to be set in a hole in the ground with the lip of the cup just below ground level. Place the traps in out-of-the-way places near sensitive turf areas. Check the traps several times per week. If billbug counts reach 7–10 every third day, a preventive insecticide treatment targeted against the adult beetles or future larvae in infested plants may be considered.

Early detection of the larvae is tricky because the young larvae are hidden within the stems. Watch for scattered patches of dead or dying grass beginning in early summer. The presence of billbug larvae can be confirmed using the "tug test", which involves gently tugging yellowing grass stems. If the stems break off easily at the crown and are hollowed out or filled with sawdust like frass, then larvae are present. Use a knife to check the crown and roots for the larger larvae.

Degree-Day Model

A degree-day model, using a 50°F (in bracket the values using 10°C) base temperature and starting at March 1, predicts first adult billbug activity at 280–350 (155–195) DD.; 30% adult activity at 560–620 (311–347) DD is considered to be the last effective date for a surface insecticide treatment targeted against adults. After that date, the insects have laid too many eggs for the insecticide to make a difference. Larvae will emerge from the stems at 925–1035 (513–575) DD. Insecticides can be directed at the larvae while they feed externally on the crown until 1330–1485 (739–825) DD.

Cultural Control

The damage from low populations of billbug can be masked with irrigation and good plant nutrition.

Fungal endophytes (*Neotyphodium/Epichloë* species) in perennial ryegrass and tall fescue are a useful and effective source of pest resistance. These endophytes produce toxins that are harmful to many insects feeding on the above ground parts of the grass plant. The toxic substances produced by the endophyte can also act as feeding deterrents to some insects

Kentucky bluegrass varieties differ in the level of susceptibility to billbugs. Bluegrass cultivars that are thinner leaved, that are aggressive creepers, or those that tolerate heat and drought have been reported as resistant to billbug feeding.

Natural Enemies

At least two parasitoids have been reported from billbugs. The wasp *Anaphoidea calendrae* parasitizes egg and the fly *Myiophasia metallica* parasitizes adults. Toads, reptiles, and a number of birds are listed as predators of billbug.

Biological Control

The entomopathogenic nematodes *Steinernema carpocapsae* (e.g., Ecomask™, Millenium®, Carpsanem) and *Heterorhabditis bacteriophora* (e.g., Heteromask™, Nemasys®G, Terranem) can control billbugs and should be applied after mid-June when the larvae start moving from the plants into the soil. Nematodes need moist soil for optimal performance. Apply with sufficient water and water in immediately (follow label instructions). Ideally, keep soil moist for 1–2 weeks after treatment. To avoid heat and direct sunlight exposure of the nematodes, apply in early morning or late in the day. While these nematode products have to be handled and stored with more care than chemical insecticides (living organisms!), they have the advantage of no reentry interval due to their non-toxicity to humans.

Billbug adults are susceptible to the naturally occurring fungus *Beauveria bassiana*. This fungus is also marketed as the biorational insecticide Naturalis®-T but there is little information on the efficacy of this product in the field

Chemical Control

To aid in the finding of control products, active ingredients listed below are followed by trade names in parentheses. Be aware that the active ingredients in these products may change. When purchasing control products, **always check the label for the active ingredient.**

For sites with a history of billbug problems or where heavy adult activity has been observed, two different preventive approaches can be pursued.

One preventive approach involves the application of a systemic long-residual that will kill the larvae inside the plants. Products for this approach include the neonicotinoids clothianidin (Arena®), imidacloprid (Merit®), and thiamethoxam (Meridian®); the biorational molt-accelerating compound halofenozide (MACH 2®); and the anthranilic diamide chlorantraniliprole (Acelepryn®). The neonicotinoids and chlorantraniliprole should be applied soon after the adults become active in spring (around early May) to kill the larvae inside the plants. Halofenozide may work better if applied around early June.

Alternatively, preventive applications can be made on sites where large numbers of adults were observed in the spring to kill these overwintered adults before they start laying eggs. This should be done no later than three weeks after the adults become active, which typically occurs around late April in New Jersey. Effective choices for this approach include the pyrethroids bifenthrin (Talstar®), cyfluthrin (Tempo®), deltamethrin (Deltagard®), lambda-cyhalothrin (Battle®), Scimitar®, and permethrin (Astro®). Note that deltamethrin and lambda-cyhalothrin are available only for commercial pesticide applicator use.

Liquid insecticide formulations should be used for applications against adult beetles. Apply the material in 1.5–2 gal/1,000 ft² (6–8 L/100 m²). A light post-treatment irrigation (1/8"=5 mm) before the spray dries may enhance control if low spray volumes are used (i.e., > 2 gal/1,000 ft²). After spraying, withhold deep irrigation and mowing for 1–2 days to leave the residues in the upper thatch layer. If granules are used, they should be

applied to dry grass to allow the granules to sift into the thatch. A light post-treatment irrigation (1/8") is necessary to activate the insecticide.

Preventive applications with systemic insecticides to target the larvae in the infested plants should be favored over using the pyrethroids targeting the overwintered adults for the following reasons. First, pyrethroids have a very broad-spectrum and will have a strong negative effect on numerous non-target species including predators and parasites of billbugs and other turfgrass insect pests. Second, pyrethroids have at best a 3–4 weeks residual effect so that May applications will have no effect on other surface active insect pests in summer. In contrast, early season application of the systemic insecticides can provide protection against many other insect pests throughout the summer with much more limited impact on beneficial insects.

The third approach is the curative control of the larvae once they have moved out of the plants into the root zone. This usually occurs about six weeks after adults become active (around mid-June). The problem with this approach is that the plant crown may already be severely damaged at this time. Insecticides for curative control include the carbamate carbaryl (Sevin®). Applications against the larvae can be done as for the adults except that post-treatment irrigation or rainfall (around 0.25" = 6 mm) is essential to move the insecticide into the thatch/root zone, where the larvae are feeding.

Always rotate materials of different chemical classes to reduce the chance for resistance problems. And always read instructions on insecticide labels very carefully.

Figure Captions

Page 1 (l-r): Adult bluegrass billbug, billbug larva.

Mention or display of a trademark, proprietary product, or firm in text or figures does not constitute and endorsement by Rutgers Cooperative Extension and does not imply approval to the exclusion of other suitable products or firms.

Drawings courtesy of D. Shetlar.

© 2010 Rutgers, The State University of New Jersey. All rights reserved.

For a comprehensive list of our publications visit www.njaes.rutgers.edu

Revised March 2010

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.