An Integrated Approach to Insect Management in Turfgrass: Annual Bluegrass Weevil

Fact Sheet FS1016

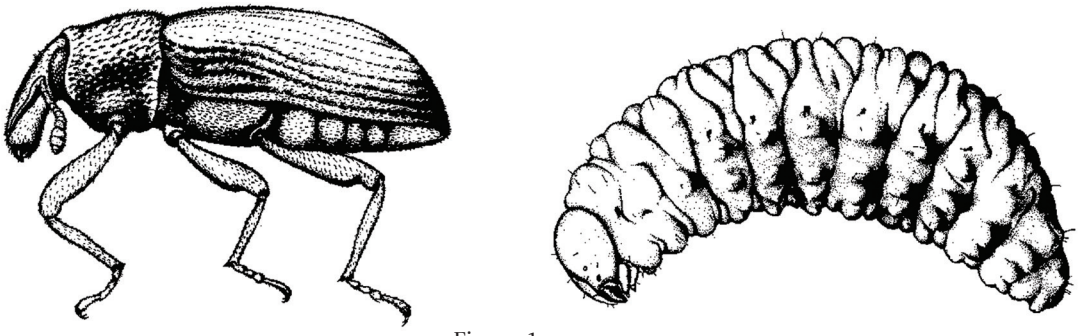


Figure 1

Cooperative Extension

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Introduction

The annual bluegrass weevil (ABW), *Listronotus maculicollis* (Dietz), formerly 'Hyperodes weevil', *Hyperodes* sp. near anthracinus (Dietz), is a notorious and damaging pest of annual bluegrass (*Poa annua*) in greens, tees, and fairways in the Northeast.

Turf damage caused by ABW has been reported from Virginia, Maryland, Delaware, New Jersey, Pennsylvania, New York, and all New England states. The worst ABW problems have occurred around the New York metropolitan area including northern New Jersey, Long Island, and southwestern Connecticut.

Host Plants

Larval ABW will feed not only on annual bluegrass but also some other species including velvet and creeping bentgrass. But damage to the other grass species is rare. In mixed stands with annual bluegrass patches of bentgrass normally remain healthy while the annual bluegrass may be completely devastated. Creeping bentgrass can tolerate much higher larval densities than annual bluegrass before damage becomes evident.

Adult ABW prefer annual bluegrass, but will also feed on tall fescue, Canada bluegrass, rough bluegrass, Kentucky bluegrass, creeping bentgrass, perennial ryegrass, and red fescue. Clover, plantain, and dandelion are occasional hosts.

Symptoms

Adult ABW only chew holes or notches in the leaf. However, serious damage can be caused by the larvae. Young larvae tunnel the stem, causing the central leaf blades to turn yellow and die. Older larvae feed externally on the crowns, sometimes completely severing the stems from the roots. Each larva may kill several plants during its development.

Damage from the larvae intitially appears as small yellow/brown spots. As the larvae grow and move about, and as population density dictates, the spots enlarge and will eventually coalesce into large areas of dead or dying turf. On golf course fairways the injury generally starts at the outer edge near the rough and gradually spreads toward the center.

Damage from ABW normally occurs between late May and mid-June in the New York metropolitan area, later in New England, and earlier in southern New Jersey and eastern Pennsylvania. Damage from the second-generation larvae may be seen during July and August but is usually much less severe and more localized.

Insect Description

Annual bluegrass weevils are beetles in the family Curculionidae. The adult beetles are easily recognized by their distinct beak-like snout or bill. Recently emerged adults are reddish-brown

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but as the cuticle hardens they turn grayish to black. ABW are oval-shaped and covered with fine hairs that may wear off as time passes. ABW resemble the turf infesting billbugs, but are much smaller at about 1/8″ (3.6 mm) long. The wing covers make up about 2/3rds of the total length including snout. In contrast, in billbugs the wingcovers make up only ½ of the total length. The elbowed antennae of ABW are attached near the apex of the snout, but can be folded back along the side of the snout in a compact groove. In billbugs, the antennae are attached at the base of the snout.

ABW eggs are oblong, smokey-gray, and about 1/32″ (1 mm) long. They can be found in small cavities chewed into the stems or behind the leaf sheath.

ABW larvae are fat, legless grubs, slightly curved and creamy white with a brown head. The five larval instars are all similar except for size. Mature larvae are about 3/16″ (3.5 mm) long. Prepupae are nearly identical to the last instar larvae except the thoracic segments lose many of their folds and become distended.

ABW 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

ABW typically has two to three generations per year in the New York metropolitan area and southern New England, two generations per year further north, and three generations per year further south. The timing of the seasonal distribution of ABW life stages outlined below is based on two to three generations per year.

ABW overwinters in the adult stage in protected areas around the turf stand, which is primarily under the litter of the trees and in golf course rough areas. During the first warm days in spring the adults migrate from the overwintering sites to suitable feeding areas. The spring migration normally takes place in April to early May when Forsythia is in bloom.

By the time dogwood and redbud bloom all of the overwintered adults will have moved out into fairways, greens, and tees. After a brief feeding period the adult beetles mate and the females start laying eggs. Eggs are deposited, usually two to three at a time, under the annual bluegrass leaf sheaths. The females will lay eggs for two to three weeks resting for a few days between each egg-laying session. Eggs take five to seven days to hatch

Upon hatching, the first instar larvae burrow into the stems to feed. They may enter and reemerge from the same stem several times or may move to nearby stems. Feeding by small larvae seldom kills the plant, but the central leaves will yellow. As the larvae increase in size, they make larger tunnels that are filled with sawdust-like frass. They eventually leave the stems for good and begin to feed externally on the crown of the surrounding plants. This is the period when the severe damage occurs and is typically in early to mid-June.

It takes about four weeks to complete the five larval instars. When the development of the fifth instar is complete, typically around mid-June, the larva burrows into the soil to around ¼″ soil depth, forms an earthen cell, and pupates within two to five days. The pupal period takes three to nine days. After emergence the adult beetles remain in the soil for another three to eight days, gradually turning from a reddish-brown callow adult to a black mature adult.

The new adults are active on the surface of the turf around late-June. They lay eggs for the second generation to repeat the cycle. The bulk of the population is present again as large larvae in late July or early August, the period when additional but usually less severe damage than in spring may occur.

After pupation in August, the next generation of adults emerges around mid-August. A third generation may develop between mid-August and mid- to late September, but is usually very low in density, rarely causing damage. With the onset of cooler weather in fall, typically by the end of October, adults from the second and/or third generation return to the overwintering sites. Every year there is considerable overlap of generations, so that from mid to late summer all life stages may be found at any given time.

Monitoring

Presence of holes or notches in annual bluegrass blades is a good indicator of adult ABW activity. The adults can also be spotted with a flashlight as they feed on blades at night.

Adults can be monitored by checking clipping baskets during the periods of adult migration in the spring and early summer. The clippings can be placed into a pan of soapy water, which will make the adults float to the surface. A paper towel can be placed on the water surface to give the floating adults something to cling to. About 50% of the adults will surface within ten minutes, but it may take about an hour of submergence to get 90%.

An irritant solution (disclosing solution) can be used to force adults to the turf surface. Mix one ounce of lemon-scented liquid dish detergent (e.g., Joy®) in two gallons of water and apply over a 2-ft^2 area. Adult ABW will surface within five minutes. Irrigate the sampled area afterwards to reduce any chances of sun scalding.

The quickest and easiest method to sample adults is to vacuum them up with an inverted leaf blower. This works well on fairway turf, and even better on shorter mown grass. To capture the adults, a mesh basket is inserted tightly into the inlet. The basket is made from a plastic deli cup with the bottom replaced by window screening. A wire should be attached to facilitate removal of the basket. The leaf blower inlet is tightly fitted onto the grass surface and moved over the to-be-sampled area for a predetermined time (e.g., ten seconds). The basket is then removed and emptied onto a tray to count any weevil adults caught in it.

Using this vacuuming method, adult counts during adult peak emergence in spring were found to be good predictors of ensuing larval densities in late May.

To monitor larval activity, take soil cores with a 2.5″ diameter turf plugger or a golf course cup cutter and gently tear the turf apart. The larvae, pupae, and callow adults will be present near the soil surface. Placing the soil into a dishpan with lukewarm water will float out any remaining insects. One or more per turf plug or three to five larvae per cup cutter plug indicate a potential problem, but fewer larvae may cause damage to stressed turf or on greens and tees.

Cultural Control

The damage from low ABW populations can be masked with irrigation and good plant nutrition. ABW generally will not cause injury to perennial ryegrasses, bentgrass, or Kentucky bluegrass; so converting turf stands away from Poa annua will minimize the impact of the ABW to the turf.

Natural Enemies

Naturally occurring insect-parasitic nematodes have been found to infect ABW larvae. On fairways not treated for ABW, they can play a role in reducing ABW populations, however, they cannot be relied upon to prevent turf damage by ABW. Observations on other natural enemies such as ground beetles, parasitic wasps, birds, and toads are either very limited or were made under laboratory conditions only.

Biological Control

Attempts to control adult ABW in early spring with the insect parasitic (entomopathogenic) nematode *Steinernema carpocapsae* (e.g., Ecomask™, Millenium®, Carpsanem) have not been successful, probably because the low soil temperatures at this time limit the activity of the nematode. Applications against the late instars feeding at the base of the plants in late spring appear to be more promising, although optimum timing may be difficult to accomplish. Multiple field trials with application of *S. carpocapsae* and *Steinernema feltiae* (Scanmask™, Nemasys®, Entonem) have given highly variable larval control ranging from no significant control to 94% control.

Nematodes need moist soil for optimal performance. Apply with sufficient water and water in immediately (follow label instructions). Ideally, keep soil moist for one to two 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.

Chemical Control

One strategy to control ABW is to preventively treat areas with high adult activity or at least a recent history of ABW infestations. Treatments should be applied between the time that Forsythia is in bloom until dogwood or redbud are in full bloom, preferably when Forsythia is about half yellow: half green, which is typically in late April in the NY metropolitan area. This intercepts the adults as they move from the overwintering quarters into annual bluegrass areas before they have laid eggs. If an area was damaged by the first generation, an application in early July targeting the second generation adults before they lay eggs may be warranted.

The most effective insecticides against adult ABW are the pyrethroids bifenthrin (Talstar®), cyfluthrin (Tempo®), deltamethrin (Deltagard®), and lambda-cyhalothrin (Battle®, Scimitar®) with typically around 90% control. The organophosphate chlorpyrifos (Dursban®) and the carbamate carbaryl (Sevin®) have provided only around 55% control.

Treatments against adult ABW should be applied as liquids in 1-2 gal/1,000 ft^2 (4-8 L/100 m^2). Do not water in and withhold deep irrigation and mowing for 1-2 days to leave the residues on the foliage and in the upper thatch layer.

The second strategy is to preventively apply a long-residual, systemic insecticide when the adult ABW become active in spring, before the eggs have hatched (between full bloom Forsythia and full bloom dogwood or red bud). The systemic action kills the young larvae inside the stems, and the prolonged residual activity will provide season-long control of larvae that make it into the soil. Insecticides presently available for this approach are the neonicotinoids imidacloprid (Merit®) and clothianidin (Arena®); the molt-accelerating compound halofenozide (MACH2®); and the anthranilic diamide chlorantraniliprole (Acelepryn®). While the neonicotinoids and halofenozide have generally provided only around 50% control, chlorantraniliprole has provided around 90% control.

The third option is to apply treatments when larvae are starting to exit the plants and start feeding externally or when damage is starting to appear. This is around the time when Catawba Rhododendron and its many hybrids are in full to late bloom. Insecticides presently available for this option include the oxadiazine indoxacarb (Provaunt®), the spinosyn spinosad (Conserve®), and the organophosphate trichlorfon (Dylox®).

Applications of the systemic insecticides and those targeting the larvae can be done as liquid or granules. If granules are used, they should be applied to dry grass to allow the granules to sift into the thatch. Whether liquid or granules, post-treatment irrigation or rainfall (0.1–0.2″ = 3–5 mm) is essential to move the insecticide into the upper thatch/root zone.

Resistance Management

Pyrethroid resistant annual bluegrass populations are a problem on the rise due to the often indiscriminate preventive and repeated use of insecticides especially of the pyrethroid class. While rotation of insecticides classes is a crucial component of resistance management, target site insensitivity is only one of several mechanisms responsible for insecticide resistance, others being reduced penetration or absorption, detoxification, sequestering or behavioral avoidance, and combinations thereof.

Detoxification by up to three different systems seems to be at least in good part responsible for pyrethroid resistance in annual bluegrass weevil populations. Due to the non-specific nature of detoxification mechanisms it is not surprising that pyrethroid resistant annual bluegrass populations are also less susceptible to non-pyrethroid insecticides including chlorantraniliprole, indoxacarb, trichlorfon, and, in the most extreme cases, even spinosad.

Once this point is reached, the only tools left for a turf manager are biological and cultural controls, particularly converting annual bluegrass-dominated areas into bentgrass through over-seeding or renovation. The only sure way to avoid getting to this point is to apply insecticides only when and where necessary, ideally by monitoring followed by curative controls if needed combined with cultural controls, in a sound Integrated Pest Management program.

Photo Caption

Page 1, figure 1: Adult beetle (left) and larva (right) of annual bluegrass weevil.

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Figure 1 courtesy of Cornell University AES.

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