BLACK CUTWORMS: Where Are They Coming From?

by R. CHRIS WILLIAMSON
Graduate Assistant, Department of Entomology, University of Kentucky, Lexington, Kentucky
and DAVID J. SHETLAR
Landscape Entomologist, Department of Entomology, The Ohio State University, Columbus, Ohio

WHAT AM I DEALING WITH? This is a question any turf manager asks upon discovering a new turf problem. Proper diagnosis is the key to successful treatment when dealing with turfgrass problems.

Insect identification offers a unique twist. Not only can the superintendent try to diagnose the problem by observing the damaged areas, but he can try to locate the actual insect or larvae as well. In some cases the question must be asked, "Where did the insect come from?" Research at the University of Kentucky Department of Entomology is striving to answer just that question when dealing with the problem of black cutworms.

The black cutworm is a common pest on putting greens, tees, and even fairways. Feeding patterns of larval cutworms, or caterpillars, result in sunken areas, or *pockmarks*, as well as small, dead patches of turf. This damage interferes with ball roll and reduces the overall aesthetic of the turf. Damaged sites also are attractive to foraging birds that pull up tufts of turf. This can further reduce the overall surface quality.

Since damage thresholds for cutworms are low, many superintendents make regular surface insecticide applications to prevent injury. Such treatments are not always necessary or justified because cutworm outbreaks are sporadic and rarely occur uniformly on all greens. Managers relying on bird activity to predict cutworm activity also may be missing the target. Birds may be foraging for earthworms, sod webworms, beetles (especially black turfgrass ataenius adults), or other insects.

Little is known about the biology and habits of the black cutworm on turfgrasses. Other than information gleaned from a few reports made by researchers during pesticide testing, we know little about how black cutworms select sites to lay eggs on turf, when they arrive in the spring, where (or if) they overwinter, how many generations occur in a season, or how the larvae feed in the turfgrass environment. Because of this lack of basic knowledge, we decided to study the biology and behavior of the black cutworm on golf course turf.

General Biology

Black cutworm eggs are attached to the foliage of turfgrasses or weeds by night-flying moths. The eggs hatch in four to five days, and the larva, or caterpillar, goes through six or seven molts. Each larval form between molts is called an instar. The larva is the only destructive stage of this pest. Mature larvae burrow into the soil or thatch to form the pupa or transformation stage. The adults emerge in 10 to 14 days. Each generation (egg to adult) averages about 40 to 50 days, depending on the temperature. The adults prefer to feed on the nectar of flowers, and most female adults wait four to seven days before beginning to lay eggs.

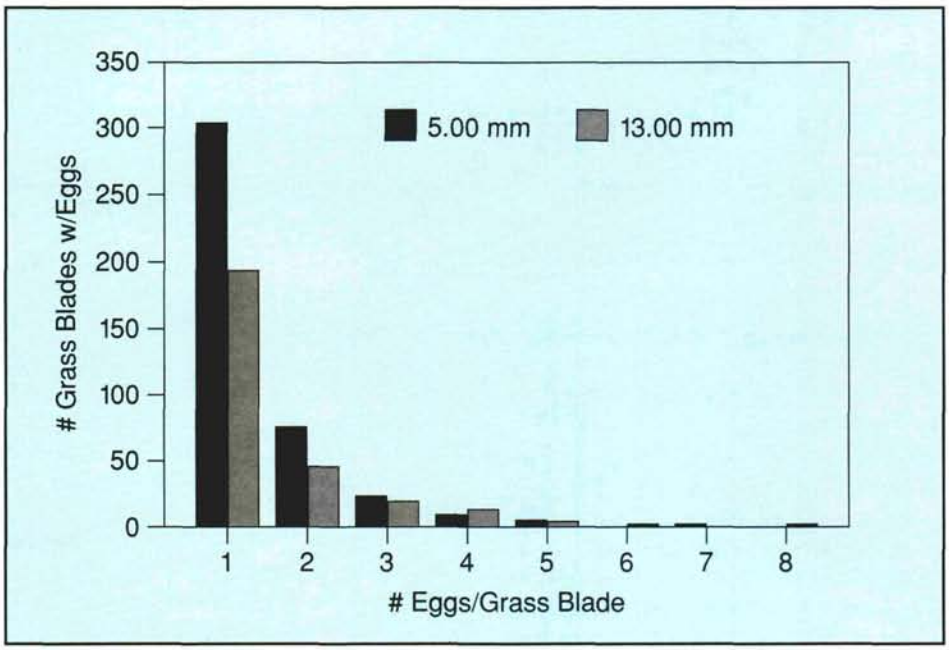
In North America, most areas in the transition zone have three to four generations per year, while cool-season turfgrass zones have one to three generations. Warm-season turf areas have three to five generations per season.

In our initial studies, we determined the location of egg placement in turf, sampling techniques for adults and larvae, and daily larval behavior in a turfgrass profile.

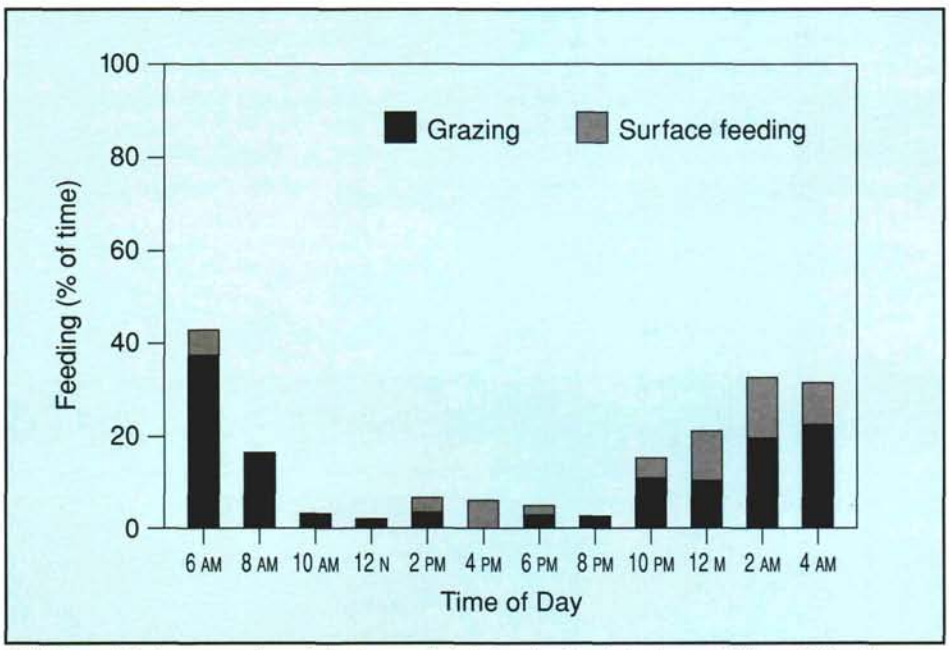
Egg Location and Early Larval Behavior

Agricultural information indicates that black cutworm females prefer to lay their eggs on weedy plants such as curled dock and yellow rocket mustard. Golf courses are typically devoid of these species, except perhaps in the out-of-play roughs. We discovered that the moths will readily lay eggs on turfgrass leaves in the absence of weeds.

Typical feeding damage by a black cutworm larva.



Ovipositional incidence of black cutworm eggs on 5.0 mm (3/16 inch) and 13.0 mm (1/2 inch) bentgrass.



Fifth instar black cutworm larval daytime and nighttime feeding behavior on 13.0 mm (1/2 inch) golf course turf.

Female moths, given the choice of laying eggs on 3/16- or 1/2-inch bentgrass turf, appeared to prefer the shorter cut turf, though analysis showed no significant differences. Regardless of the mowing height, most of the eggs were attached to the terminal 25% of the turfgrass leaf blade. This observation may provide some crucial information for developing cultural control strategies.

Golf course putting greens are typically mowed daily at 1/8- to 3/16-inch. Clippings are always collected in mowing baskets and discarded, often in the rough surrounding the green. If cutworm eggs are laid on turfgrass leaf blades where the clippings are collected, it is highly probable that nearly all of the eggs will be physically removed and discarded with the clippings. If this hypothesis is correct, the question remains, where do the black cutworm larvae found on the greens come from?

At present, the definitive answer remains unclear, although our observations provide some intriguing insights. From other research work, as well as our own larvae-rearing experience, we know that the first, second, and third instar black cutworm larvae can feed together in a rearing container or on the same grass blade. However, when they molt into the fourth instar, their behavior changes dramatically. The older larvae become aggressive and even cannibalistic.

To field sample for cutworm larvae on putting greens, a soapy water flush was used. We never observed the first, second, and third instar larvae. In contrast, the fourth, fifth, and sixth instar larvae were easily brought to the surface. It is possible that our inability to find small cutworms on putting greens is due to the soap drench killing the smaller larvae before they surface. However, we commonly find small sod webworm larvae and tiny fly larvae coming to the surface.

We hypothesize that the majority of older, damaging cutworm larvae found on greens are originating from areas surrounding the green. Most likely, they are coming from areas where the clippings are not removed during mowing or even from areas near the green where the clippings are spread. If this hypothesis is found to be correct in our ongoing research, then it may be possible to dramatically reduce cutworm damage by treating only the areas surrounding the greens.

Behavior of Larger Larvae

Bentgrass profiles were established in 18" long by 15" wide by 16" deep plexiglas containers. Mature fourth instar larvae were placed in the containers in aerification holes formed along the edge of the turf and the plexiglas surfaces. Each profile side was covered with cardboard to exclude light. The light:dark cycle was held at 11L:13D hours. The larvae were allowed to acclimate for five days, at which time most had molted into the fifth instar. The fifth instar larvae were then observed every two hours for a 72-hour period. During the dark hours, the larvae were observed with a small flashlight covered with a red lens.

Most of the time, the cutworm larvae rested in the aerification holes or were not visible. Most of the larval feeding was observed shortly after dark and an hour before morning light.

Feeding appeared to be of two distinct types which we have defined as confined feeding and grazing. Confined feeding was the chewing of the grass blades down to the soil line next to an occupied aerification hole. This type of feeding results in the typical pockmarks on greens. Grazing consists of the larvae crawling over the surface of the turf and chewing down random grass blades.

Adult black cutworm feeding on nectar of a flower.

Black cutworm eggs are laid on terminal 25% of turfgrass leaf blade.

These observations also are important in developing management strategies. First, the larvae feed most actively at night. Second, the larvae seem to prefer to remain in existing holes or aerification holes. Third, mature larvae seem to move from hole to hole, especially after the currently occupied hole has become fouled with fecal pellets.

Monitoring Black Cutworms

Black cutworm adults can be monitored using commercial pheromone traps that contain a synthetic female sex attractant (therefore, only males are caught) and black light traps (males and females). In our studies, the standard delta-wing, *sticky* pheromone trap did not capture as many males as the corn earworm *cone trap*. However, in 1993, neither trap seemed to help us predict when subsequent larval outbreak would occur. Several more seasons of sampling are needed to determine if a relationship exists between pheromone trap counts and resulting larval infestations.

Sampling for black cutworm larvae in turf is easily done by using a soap drench solution. We found that a solution of one ounce of Joy® liquid dishwashing detergent in two gallons of water is effective. Other detergents may work well, but they should be tested to ensure that they will not burn or discolor the turf. The two gallons of mix is applied to one square yard of turf, preferably with a sprinkling can, and allowed to infiltrate into the turf and soil. Larger cutworm larvae will emerge within four to five minutes. Sod webworm and black turfgrass ataenius adults may take five to ten minutes to surface. While this type of sampling was effective to confirm that cutworms were present, we were never able to find the first, second, or third instar larvae.

Since the application of biological control products or insect growth regulators does not cause the dying cutworms to move to the surface, soap flushes are recommended after using these products to determine the effectiveness of these pesticide alternatives.

Timing of Treatments

Black cutworm larvae are nocturnal pests, doing most of their feeding on the turfgrass foliage after dark. Therefore, the optimal time to treat with an insecticide or biological control, such as insect parasitic nematodes, is at dusk. This timing ensures that the cutworms will consume the turfgrass foliage immediately after it has been treated. Treatments in the morning or early afternoon are not as effective due to the fact that most insecticides are susceptible to both photodegradation and volatilization, thereby reducing product effectiveness.

Control Products

A myriad of products exist for golf course superintendents to choose from for the control of black cutworm larvae. Standard insecticides include: acephate (Orthene®), carbaryl (Sevin®), chlorpyrifos (Dursban®), cyfluthrin (Tempo®), ethoprop (Mocap®), fluvalinate (Mavrik®), fonofos (Dyfonate®, Mainstay®), inidacloprid (Merit®), isazofos (Triumph®), isofenphos (Ortanol®), lambda-cyhalothrin (Scimitar®), and trichlorfon (Dylox®, Proxol®). All of these products have performed well in recent tests, although liquid formulations appear to work better than granular products. If possible, select products that do not require immediate irrigation after the application. This will ensure that more pesticide is on the leaf surface to be consumed by the cutworm larvae.

Superintendents who wish to use a biological control should consider the insect parasitic (entomopathogenic) nematodes. Products containing *Steinernema carpocapsae* (Biosafe®, Exhibit®, Vector®) have been the most effective. Be sure to check the mixed product to determine that the nematodes are living, and apply the nematodes in the evening to avoid direct sunlight. Unlike standard insecticides, which should not be irrigated after the application, be sure to water-in the nematodes as soon as they are applied.

Another option for control of black cutworm is the use of an insect growth regulator (IGR). Azadirachtin (Turplex Bioinsecticide®) is a naturally occurring botanical IGR that has shown efficacy against black cutworm larvae. To achieve maximum efficacy, Turplex should be applied when you first think the cutworms are beginning to become active. Make the applications every two to three weeks during your *cutworm season* to achieve maximum efficacy.

Finally, remember that we now think that many of the larger cutworm larvae discovered on tees and greens are moving in from surrounding areas. Therefore, we recommend treating a 20- to 30-foot zone around these high-maintenance areas to reduce the chances of immediate reinfestation.