

An Innovative Approach to Black Cutworm Management

Black cutworms can be controlled by a few changes in your turf management program.

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Little is known about the behavior of black cutworms in turf, but the damage is well documented. At night, the larvae emerge from soil burrows to devour leaves and stems, resulting in sunken, pockmarked areas.

BLACK CUTWORMS are major pests of golf courses, especially on creeping bentgrass putting greens and tees (Potter 1998). Cutworms emerge from soil burrows at night to devour leaves and stems. This causes sunken pock-marks that reduce the smoothness and uniformity of the playing surface. Not only do cutworms cause direct damage, but birds and other animals that prey upon them cause further injury by pulling up tufts of turf. Because their damage interferes with ball roll and reduces overall aesthetic quality, tolerance for black cutworms is extremely low. Consequently, many superintendents apply cutworm treatments several times per growing season. Golf course putting greens receive more pesticides per unit area than any other turfgrass site (Smith and Tillotson 1993), making them a focal point for environmental concerns and potential human exposure.

Until recently, little was known about the behavior of black cutworms in turf. In fact, nearly all previous research on this pest had been done on agricultural field crops such as corn. This lack of knowledge, and the importance of black cutworms as turfgrass pests, prompted us to study their behavior on golf courses. We studied where the eggs are laid, effects of mowing on egg removal, survival of eggs on clippings, and nightly behavior of cutworms on putting greens. Our results suggest ways that black cutworms can be managed more effectively, with reduced use of insecticides.

Cutworm Biology

Black cutworm moths (adult) fly at night, depositing eggs on the foliage of turfgrasses and weeds from April to September. The eggs hatch in about five days, and the young larvae, or caterpillars, begin to feed and grow. The

caterpillar is the only damaging life stage. Black cutworms typically undergo six or seven molts, increasing in size each time. The stages between molts are referred to as instars. When the large fifth and sixth instars mature, they burrow into the soil or thatch to form a pupa, a transformation stage between larva and adult. The adult moth emerges from the pupal case in 10 to 14 days. Females begin to lay eggs soon after mating. The moths feed on the nectar of flowers. Each generation (egg to adult) averages 40 to 50 days, depending mainly on temperature, and development is fastest during the summer.

In North America, nearly all areas in the cool-season turfgrass zones have one to three generations per year. There usually are three or four generations in the transition zone, and five or more generations per year in warm-season turf areas.

Removal of Eggs by Mowing

Under typical golf course maintenance schedules, putting greens are mowed daily, whereas tees, collars, and aprons are cut several times per week. Clippings from greens and tees are collected in mowing baskets and discarded, often strewn in surrounding high grass or rough. Clippings from the higher-mowed areas are usually left on the surface to be incorporated back into the turf profile. We sought to determine how mowing affects the fate of black cutworm eggs deposited on putting greens.

Black cutworm moths were caged over a creeping bentgrass putting green maintained at two conventional cutting heights ($\frac{1}{8}$ and $\frac{3}{16}$ inch) and allowed to lay eggs. Numbers and locations of eggs on grass plants were then determined. Twenty leaf blades with single eggs were marked with orange paint within each plot. Then, a standard walk-behind greens mower was used to mow

the plots and collect the clippings containing eggs into mowing baskets. Grass clippings from plots of each cutting height were recovered and inspected for eggs.

Black cutworm moths laid similar numbers of eggs regardless of cutting height. All eggs were laid on leaf blades; none were found on leaf sheaths. Most eggs were laid singly, and more than 97% were laid on the tips of the leaf blades. Importantly, we found that 88% and 87% of the eggs were removed with a single mowing at cutting heights of $\frac{1}{8}$ and $\frac{3}{16}$ inch, respectively. These findings suggest that mowing removes most of the black cutworm eggs laid on putting greens. Where, then, do cutworms come from?

Nocturnal Activity and Movement of Larvae

Understanding the behavior of any insect pest is essential to effective management. Because the feeding activity and movement of black cutworms on putting greens was undescribed, we needed to study these behaviors.

Nightly activity of black cutworms was determined by visually inspecting three infested putting greens every two hours from just before sunset until one hour after sunrise. Observations were made over two summer nights, using a hand-held lantern and systematically walking back and forth across each green. During each interval, we recorded the numbers of cutworms actively feeding or crawling on the putting surfaces.

Although some cutworms became active just after dusk, the greatest number was observed between 11:30 p.m. and 6:30 a.m. Most of these burrowed back into the turf before dawn. Heavy bird predation was observed on those caterpillars that remained on the putting surface at dawn. At this same time, mowing crews arrived to mow the putting greens, and the few cutworms that were still active on the surface were shredded by the greensmower.

During monitoring, we observed that black cutworms may crawl considerable distances within a single night. To document this, we measured cutworm tracks left in the early morning dew, tracing them back to their point of origin and determining the distance traversed by each caterpillar on the putting surface. Of the caterpillar tracks measured, about half originated from high grass off the putting green and terminated on the putting surface. The

average length of the tracks was about 30 feet, although the greatest distance that a cutworm was tracked was more than 70 feet! These observations suggest that black cutworm infestations on putting greens may originate, at least in part, from peripheral areas such as collars and roughs.

Survival of Caterpillars on Clippings

Since the large larvae can crawl considerable distances in a single night, many of the black cutworms found on putting greens may originate from peripheral areas. Indeed, our research showed that black cutworms thrive on perennial ryegrass and tall fescue, as well as on creeping bentgrass. Thus, reservoir populations may develop in roughs or fairways with these grasses. One source of infestation could be the eggs on clippings removed with greensmowers and then strewn in adjacent areas. Thus, we investigated the survival of black cutworm eggs on grass clippings from putting greens.

As for the egg-removal study, black cutworm moths were caged on putting greens to lay eggs, and the grass then was mowed at $\frac{1}{8}$ or $\frac{3}{16}$ inch height. Clippings were removed from the mowing basket and carefully inspected for the tiny eggs. Those with eggs were taken back to the laboratory, where they were distributed into petri dishes or fine-mesh bags. Twenty grass clippings, each with one egg, were placed in each of five petri dishes or mesh bags. The dishes were placed in a growth chamber simulating outdoor light and temperature conditions. The mesh bags with egg-bearing clippings were returned to the high grass surrounding the putting green, where clippings would normally be discarded. Both sets of eggs were observed every day to determine egg hatch. Once hatching was finished, we evaluated overall egg survival.

Survival rates for eggs on grass clippings held in the growth chamber averaged more than 75%. Hatching



Black cutworms are a major pest for the golf course superintendent, especially on creeping bentgrass putting greens and tees.



Black cutworm moths fly at night and lay eggs on the tips of creeping bentgrass leaf blades. One objective of this research was to determine how mowing affects the fate of cutworm eggs deposited on putting greens.

rates for eggs on grass clippings in fine-mesh bags averaged 50.3% and 48.1% for 1/8- and 3/16-inch cutting heights, respectively. This confirms that many eggs survive passage through a greensmower and may hatch if clippings are strewn beside putting greens.

Implications for Pest Management

This work suggests that daily mowing removes most of the black cutworm eggs laid on creeping bentgrass putting greens. Since eggs may survive in grass clippings, it is important to dispose of clippings well away from greens. Older larvae can crawl considerable distances, and many of the large fifth and sixth instars that damage putting green surfaces originate from adjacent, high-mowed turf. We therefore suggest that control actions should include a 30-foot buffer zone around greens. Managing reservoir populations in these peripheral areas may reduce the need for repeated applications of pesticides on putting greens. Because black cutworms are nocturnal, treatments are best applied late in the day (i.e., as close to dusk as possible). This method also reduces potential photodegradation, volatilization, and exposure to humans. Our observations indicate that many black cutworms feed on the surface of putting greens. Pre-dawn mowing, which is already practiced on

some golf courses, may provide significant mechanical control of these larvae.

References Cited

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