Does aerification promote black cutworm infestations?

Mowing, clipping removal and topdressing offer tools against this voracious turf-eating pest.

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Black cutworms are destructive pests of creeping bentgrass on putting greens and tees. Their feeding causes small patches of dead turf and depressions, or pockmarks. This damage interferes with ball roll and reduces the overall aesthetics or value of the turf. Damaged areas are attractive to foraging birds, which pull up tufts of turf in search of cutworms.

Consequently, golfers and golf course superintendents have little tolerance for turf injury from black cutworms (Agrotis ipsilon), and many superintendents make repeated insecticide treatments each year to control this pest. But recent research has produced the following insights into black cutworms and their control:

- Proper timing of mowing and insecticide applications may be effective against the pest.
- Removing clippings from greens may help control cutworms. But grubs can migrate back onto greens from nearby areas where clippings are not removed.
- Cutworms are not necessarily attracted to aerified surfaces, but many will exploit aerification holes as burrows.
- Topdressing may have a deterrent effect on black cutworms.

Cutworm biology

Night-flying black cutworm moths deposit eggs on the foliage of turfgrasses or weeds. The eggs hatch in four to five days, resulting in larvae, or caterpillars. Larvae go through six and sometimes seven molts; each larval form between molts is called an "instar." The larvae stage is the only destructive stage of this turfgrass pest. Adult black cutworms prefer to feed on the nectar of flowers.

Nearly mature, large (sixth instar) larvae burrow into the thatch or soil to form pupae, the transformation stage between larva and adult. About 10 to 14 days later, the moths emerge to mate and lay eggs again. Each generation (egg to adult) requires an average of 40 to 50 days, depending on temperature.

In North America, most areas in the cool-season turfgrass zones have one to three generations per year, whereas the transition zone has three to four generations. In warm-season turf areas, the pest can produce seven generations a year.

Early mowing kills grubs

Lab experiments recently revealed that large black cutworm larvae feed mainly at night (4). But because knowledge of this pest's behavior on golf courses is lacking, we decided to study the cutworms' hours of activity, feeding behavior and larval movement. We also investigated whether black cutworms are attracted or repelled by aerification or topdressing, and whether larval survival is affected when larvae are exposed to topdressing.

Holding flashlights, researchers walked back and forth on selected putting greens on golf courses in Lexington, Ky., counting cutworms for 30 minutes at a time every two hours throughout the night, commencing one hour before sunset and terminat-
ing one hour after sunrise.

Observations indicate that black cutworm larvae are active throughout most of the night on bentgrass putting greens. A few black cutworms became active on greens around dusk, but were not abundant at the surface until 11:30 p.m. Greatest larval activity occurred between 1:30 a.m. and 5:30 a.m. Most larvae began burrowing back into the turf just before dawn.

As is typical on most golf courses, mowing crews arrived to mow the putting greens at about sunrise. By then, nearly all of the cutworms had already burrowed down. Additionally, high rates of bird predation were observed on those few cutworms that still remained on the putting-green surface at sunrise.

Apparently, significant mechanical control of black cutworms could be gained by mowing putting green surfaces an hour or so earlier than usual at sunrise. This research also suggests that insecticide treatments would best be applied just before sunset. In this way, the compounds would be less susceptible to photodegradation by the sun and volatilization. Also, exposure to golfers would be minimized, and the pesticide would likely have greater efficacy.

**Spotting the damage**

When the nighttime researchers observed the feeding behavior of the third through sixth instars, two patterns emerged. Small larvae (third and fourth instar) were mainly surface feeders, crawling about on the putting greens and feeding fully exposed on the surface. In contrast, large larvae (fifth and sixth instar) fed mainly from within a turf burrow (aerification hole, cavity or tunnel).

Consequently, smaller larvae are less likely than larger larvae to create unsightly pockmarks by feeding from burrows or tunnels in the putting surface, although they burrow down at dawn. This is one reason why feeding damage by small larvae is less apparent to golf course superintendents, and why infestations of earlier instars may go undetected.

**Larval migration**

Tracks in the morning dew on putting-green surfaces between 4:30 and 7 a.m. revealed that black cutworm larvae can move considerable distances over a putting green in a single night. The average distance was about 30 feet, and the greatest distance was 74 feet.

Many tracks originated at the edge of the putting green and extended onto the surface. Consequently, we recommend treating a 25- to 30-foot buffer zone around putting greens to reduce the likelihood of black cutworms reinfecting greens. Greens mowing alone — even at the right time of morning — probably won’t eliminate a black cutworm infestation from a putting green.

In fact, because the black cutworm’s eggs can survive mowing, clipping removal is also important. Nearly all of the eggs deposited by black cutworms on creeping bentgrass putting greens are laid singly, on the tips of grass blades. In one study, a single mowing at conventional cutting heights (½ or ¾ inch) removed 75 to 97 percent of the eggs from the putting surface (5).

But up to 90 percent of the eggs on discarded grass clippings survived. Thus, disposal of clippings away from greens may be important for reducing reinfections by crawling larvae.

**Go ahead, aerify**

Many golf course superintendents believe that aerification attracts black cutworm larvae, resulting in greater damage to putting greens beginning a few days after aerification. Our experiments, however, suggest that black cutworms do not prefer aerified over non-aerified creeping bentgrass.

Under typical golf course maintenance schedules, putting greens are core aerified and topdressed (100 percent sand or a sand-peat mix) at least twice per year, sometimes more (1). Large black cutworms will often occupy the aerification holes.

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The moths that produce turf-eating black cutworm larva prefer flower nectar.
We studied six different combinations of cultural practices on a Penncross creeping bentgrass green: aerification vs. control; aerification vs. topdressing only; aerification vs. aerification and topdressing; topdressing only vs. control; aerification plus topdressing vs. control; and aerification plus topdressing vs. topdressing only. Each experimental plot was surrounded by low, galvanized steel walls, and several fourth- and fifth-instar larvae were released into the center of the enclosures. We compared differences between the proportion of larvae within each paired cultural treatment.

We found across many trials that just as many cutworms established themselves in the non-aerified parts of the plots as in the aerified turf.

Although cutworms are not necessarily attracted to aerified putting surfaces, we found that a high percentage will nonetheless exploit aerification holes as burrows when such holes are available. This phenomenon suggests that superintendents may not notice larval feeding damage as readily on non-aerified surfaces because it's not as obvious as damage associated with aerification holes. Thus, we question the assumption that aerification causes increased densities of this pest, although it may accentuate the damage from late-instar larvae that are already present.

**Topdressing**

Under the various cultural manipulations, black cutworms were consistently less abundant in topdressed plots than in turf that had not been topdressed. But a laboratory test suggests that topdressing doesn't actually injure or kill the cutworms.

The USGA recommends topdressing with silica sand alone or in combination with peat moss (2). Because of its angular physical properties, silica sand has the potential to be abrasive to insect cuticle (skin).

To study grubs' response to topdressing materials, researchers...
inserted 60 bentgrass turf cores into plastic greenhouse containers. Twenty cores were treated with a topdressing of 100-percent silica sand, 20 with a mixture of sand and peat moss (80:20 by volume), and 20 were untreated.

One fifth-instar larva was released onto each turf core. After four days, cores were destructively sampled, and researchers discovered that the abrasive topdressings had no effect on larval survival and weight.

But considering that outside the lab, black cutworms were consistently less abundant in topdressed plots, the practice may have a deterrent effect on black grubs. Thus, manipulating the timing of topdressing, with or without aerification, should be investigated for possible value in reducing black cutworm infestations on putting greens.

**Further research**

Creeping bentgrass putting greens receive more pesticides per unit area than any other turfgrass site (3). This, coupled with increased government regulation and public concern about pesticides, compels researchers to seek ways of reducing insecticide use through new insect-control measures. Such information would allow superintendents to minimize pesticide exposure to golfers, as well as address environmental concerns.

**Literature cited**


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