Volume 9, Number 5

TURFAX™

of the International Sports Turf Institute, Inc.

September–October 2001

The International Newsletter about Current Developments in Turfgrass

IN THIS ISSUE

A System for Winter Overseeding Warm-Season Turfs

James B Beard

The following is a summary of findings generated from an 8-year turfgrass research program at Texas A&M University. Primary emphasis was on winter overseeding cool-season turfgrasses onto bermudagrass (*Cynodon* spp.) under putting green conditions. Twenty-eight distinct field experiments have been conducted, mostly in College Station, Texas at the TAMU Turfgrass Field Research Laboratory, with some studies located in Corpus Christi, Dallas, Denton, Houston, and San Antonio.

Late Summer-Early Autumn Preparation. The cultural system should involve a season-long vertical cutting program as needed to control thatch and turf cultivation to correct soil compaction. Late-season coring and fertilization should be completed at least 30 days prior to the overseeding date. Thus, the actual overseeding and topdressing can be done on a relatively undisturbed turf surface. Play may be withheld from the turf for only 1 to 2 days during the actual overseeding, although a longer period is beneficial for full establishment.

Annual Bluegrass Control. Fenarimal (Rubigan®) has been identified as the first herbicide that will provide selective, preemergence control of annual bluegrass (*Poa annua*) in winter overseeded perennial ryegrass and rough bluegrass (*Poa trivialis*) turfs. The applications should be completed at least 4 weeks prior to the winter overseeding date.

Seeding Date Prediction. A biological indicator of the optimum winter overseeding dates has been established via our detailed research. It is the period when the soil temperature at a 4-inch (100-mm) depth, is between 72° and 78°F (22–26°C). This approach is far superior to using a historical calendar date.

Species/Cultivar Selection. The preferred turfgrass community for winter overseeding involves either a blend of 3 to 4 perennial ryegrass (*Lolium perenne*) cultivars, or a mixture involving 80% by weight of 2 to 3 perennial ryegrass cultivars and 20% by weight of a rough bluegrass (*Poa trivialis*) cultivar. In the case of certain newer very-high density hybrid bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) cultivars that tolerate cutting heights of 1/8 to 1/10 inch (3.2 to 2.5 mm), the suggested winter overseeding mixture consists of 80% rough bluegrass and 20% creeping bentgrass (*Agrostis stolonifera*) by weight, with 20% of the rough bluegrass applied 4 weeks after the initial winter overseeding. The seed may be treated to protect against seedling disease problems, especially on wet sites.

Seeding Rates. The preferred seeding rate for greens has been established in the range of 30 to 35 lb/1,000 ft^2 (15.0–17.5 kg•100 m^{-2}) for perennial ryegrass blends; whereas for sports fields, fairways, and race tracks, where rapid cover and initial wear tolerance are desired, a minimum seeding rate of 20 lb/1,000 ft^2 (10 kg•100 m^{-2}) is suggested for perennial ryegrass blends. For certain very-high density hybrid bermudagrass cultivars a rate of 10 lb/1,000 ft^2 (5 kg•100 m^{-2}) of rough bluegrass plus 2 lb/1,000 ft^2 (1 kg•100 m^{-2}) of creeping bentgrass is suggested.

Continued on page 7

FEATURE ARTICLE

Green June Beetle Management on Golf Courses and Sports Fields

Daniel A. Potter

In early September, I was contacted by a sports turf manager seeking advice about an outbreak of green June beetle, *Cotinis nitida* (GJB), grubs at a college baseball facility. The grubs had reached nearly full-size and were wreaking havoc on the bermudagrass (*Cynodon* spp.) playing field by burrowing, throwing up mounds of soil, and uprooting the turf. That same day, a golf superintendent called with a similar problem on a driving range. Despite my forewarning, both turf managers applied a curative insecticide and the following morning were confronted by the sight and stench of countless thousands of fat, juicy grubs dying and rotting on the turf surface. The aftermath and cleanup required closing both sites to use. **GJB populations seem to be increasing in many areas.** With an ounce of prevention, problems such as the aforementioned ones can be avoided.

Distribution. GJB is a native species that is widely distributed east of the Mississippi River. It occurs from the Gulf states as far north as St. Louis and Columbus, Ohio in the Midwest, north into New Jersey along the Atlantic coast, and west to Texas, Oklahoma, and Kansas. It is especially abundant in the transition zone from Arkansas and Missouri east to the Carolinas. Local infestations have been reported in southern California, probably originating from beetles that were accidentally transported on aircraft originating from eastern states.

Description. Adult GJB are larger than Japanese beetles, measuring 0.75 to 1 inch (19–25 mm) long and about 0.5 inch (12.5 mm) wide. The upper body and wing covers vary from uniform velvety, forest green, to dull brown with lengthwise stripes of green. The underside is shiny, metallic green or gold. GJB grubs are larger (1.75 inch [45 mm] long when full-sized), more robust, and more parallel-sided than other grub species. They have a brown head, six stubby legs, and typically curl into a tight C-shape when first disturbed. GJB grubs can be easily recognized by their unique mode of locomotion—when placed on the soil or any flat surface they "shimmy" along on their back, like a lumbering, upside-down caterpillar.

Life History, Habits, and Damage. GJB have a 1-year life cycle, with the adults active in late June or July. The beetles are active by day. Swarms of males may be seen flying back and forth, just over the turf, in search of virgin females as they first emerge from the soil. The buzzing sounds of their flight, and their superficial resemblance to wasps, may cause unfounded fear of being attacked or stung. Females attract males with an airborne sex pheromone. The beetles form jostling clusters in the grass as several males try to mate with a single, virgin female. Adult GJB feed on ripening tree fruits or berries, oozing tree sap, and other sugary foods. They often remate at such food sources. **Like the grubs, adults throw up small piles of soil as they burrow in and out of turf for egg-laying and resting.** On putting greens and collars, such mounds mark the beetles' presence beneath the surface.

Once mated, female GJB fly to moist soils in which to lay eggs. They seem to favor soils with plenty of decaying organic matter; in fact, this is more important than the species of grass present. They are attracted to piles of rotting mulch or compost, and may also favor turf sites where manure-based fertilizers have been applied. The female burrows down 2 to 5 inch (5–13 cm), excavates a small cavity, and lays a cluster of 10 to 30 eggs. Each female lays several such clutches, depositing as may as 75 eggs over several weeks. Eggs hatch in about 2 weeks, and young grubs are present by early August. By September, the grubs will have molted twice, reaching about three-quarters of their full size. GJB grubs may burrow down 12 inch (30 cm) or more, remaining within the burrow by day but often coming to the surface at night to graze on thatch, decaying grass clippings, or other plant matter. They are especially active on the surface following rains or heavy dew. Burrowing and surface activity also occur in the spring, following overwintering. As the large grubs creep about on the turf surface, they may wind up in swimming pools, garages, outdoor stairwells, or basements.

GJB grubs do not eat living roots to the extent of other white grubs, but their tunneling loosens the surface soil and dislodges the grass, causing it to thin. Loose soil is pushed out of the burrows, forming unsightly mounds that dull reel mower blades, smother the grass, and cause the turf to feel lumpy underfoot.

Management. GJB grub populations tend to be sporadic and patchy, so routine, nonselective treatments usually aren't warranted. **High-risk sites are those where the beetles were seen swarming over the turf during their mating flights, areas treated with compost or**

Continued on page 6

FEATURE ARTICLE

Advances in the Biological Control of Turfgrass Diseases

Peter H. Dernoeden

In July 2001, the International Turfgrass Society (ITS) met in Toronto, Ontario. Numerous research papers involving turfgrass pathology were presented and published in the ITS Research Journal. In this issue of Turfax, a summary of two ITS papers dealing with biological control are reviewed.

Dr. Gary Yuen and coworkers at the University of Nebraska reported on the mechanism of leaf spot (*Bipolaris sorokiniana*) control with the bacterium *Stenotrophomonas maltophilia* strain C-3. **Biological agents suppress diseases either by (a) antagonism and competition, (b) parasitism of the pathogen, or (c) triggering natural host defenses.**

Antagonism involves the production of antibiotics by an agent that inhibit growth or outright kills sensitive microbes (sometimes called antibiosis) or they outcompete pathogens for nutrients and space. **Antagonism is perhaps the most common mechanism of control by biological agents. C-3 was shown to provide control of leaf spot in tall fescue (*Festuca arundinacea*) by both antagonism and induction of host resistance.** C-3 produces an enzyme called chitinase. Most fungi have cell walls composed of chitin (see Polyoxin D article in Turfax 9(4)). In the case of C-3, the chitinase inhibits cell wall production in germinating spores. The Nebraska researchers also found strong evidence that C-3 triggers the plants' own natural defense mechanism on leaves, but not roots. They worked with both live and heat-killed C-3 cells. Live cells provided better disease control than heat-killed cells. The application of C-3 cells to any portion of a tall fescue leaf inhibited the germination of *B. sorokiniana* spores on the entire surface of the same leaf. Hence, placement of C-3 cells on just the leaf tips resulted in a reduction of spore germination on lower segments of the same leaf that was not treated with C-3. The phenomenon, however, only occurred on leaves treated with C-3 and therefore, the effect was not systemic. The nature of induced host resistance is imperfectly understood. Evidently, the presence of C-3 cells on a leaf sends a signal to the plant that the leaf is about to be infected by a pathogen. The signal is believed to be elicited by substances exuded by a microbe on the surface of the plant. The cells in the leaf respond by producing specialized cells that inhibit infection or the cells may produce antifungal chemicals known as phytoalexins. Phytoalexins are phenolic compounds that are toxic to or inhibit the growth of a pathogen. These compounds may be preformed or induced as a result of infection by specialized cells. Other lab and field studies conducted by Yuen and coworkers showed that C-3 suspensions reduced the level of blighting by *Rhizoctonia solani* (i.e., brown patch) in both tall fescue and perennial ryegrass (*Lolium perenne*). Hence, unlike most biological agents, which often target one pathogen, C-3 shows promise for controlling at least two diseases.

Davis and Dernoeden reported on their four-year study involving the Bioject Biological Management System® (Bioject) (Eco-Soil Systems, San Diego, CA). The Bioject automatically ferments and distributes disease suppressive bacteria onto turf and soil through the irrigation system. **The bacterium evaluated was *Pseudomonas aureofaciens* strain Tx-1 (Tx-1).** Tx-1 was developed by Dr. Joseph Vargas Jr. and coworkers at Michigan State University. Vargas and coworkers showed that Tx-1 effectively suppressed dollar spot (*Sclerotinia homoeocarpa*) in lab and field studies (Powell and Vargas, 2001). They found that the mechanism of disease suppression was the production of phenazine-1 carboxylic acid (PCA) by Tx-1. The PCA is an inhibitor (i.e., antibiosis) of fungal growth and hence, the mechanism of action of Tx-1 is antagonism.

The Bioject first appeared on golf courses in large numbers around 1995. The initial system consisted of a plastic fermentation tank, which was hooked-up to the irrigation system in the pump house. Tx-1 was added to the tank only a few times per month and the tank had to be manually cleaned each time new Tx-1 was added. In 1996, a prototype of the Bioject was evaluated at the University of Maryland. The prototype failed to ferment and deliver high populations of Tx-1. It was shown that Tx-1 could live only a few days in the plastic tank and it was clear that potable water was required. Use of pond water introduces countless numbers of other bacteria, which outcompete Tx-1 for nutrients. **There appears to be no possibility of using pond water in the Bioject for delivering high populations of a bacterial biological agent.**

In 1997, Eco-Soil Systems introduced a much more sophisticated system. Tx-1 in the new system is stored in

Continued on page 4

Continued from page 3

a refrigerated unit. Tx-1 and nutrients are automatically dispensed into a stainless steel fermentation tank on a daily basis. This newer unit is equipped with a daily cleaning mechanism and a UV light filter to kill most bacteria entering the system from a potable water source. This new unit was tested in Maryland in 1997. It was a tremendous improvement in fermentation, but populations of Tx-1 delivered again were too low to provide any suppression of dollar spot. During the 1997–1998 winter, scientists from Eco-Soil Systems worked with us to improve the fermentation capabilities of the Bioject. The amounts of nutrients and Tx-1 metered into the fermentation tank were adjusted and high populations of Tx-1 were produced.

In 1998 and 1999, the Bioject again was field-tested. The research involved monitoring the number of colony forming units (cfu) of Tx-1 fermented and delivered through the irrigation heads. The number of Tx-1 cfu's found in the foliage plus thatch and soil were quantified. The Tx-1 was delivered to four blocks of turf daily at 8:00 P.M. (20:00 h). Each block was split in half, with Crenshaw creeping bentgrass (*Agrostis stolonifera*) grown on one-half and SR 7000 (*A. tenuis*) grown on the other half. The blocks were divided into seven subplots consisting of three fungicides, three nutrient supplement treatments and a control. There were four identical control blocks, which received irrigation water without Tx-1. **The Crenshaw is very susceptible to dollar spot and the SR 7200 is very susceptible to brown patch.** Both diseases developed naturally and uniformly across the study areas.

Results from 1998 and 1999 showed that the Bioject effectively fermented and delivered high populations of Tx-1 to the foliage plus thatch (average = 40 million cfu's per gram of tissue) and soil (average = 340,000 cfu's per gram soil). The Tx-1 also was shown to survive the winter in low populations in the foliage plus thatch and the soil. **Dollar spot was suppressed on average of 30% over both years.** There were dates in June and July of each year when Tx-1 was shown to provide dramatic reductions in dollar spot during high disease pressure periods. The level of dollar spot suppression provided by Tx-1 was not improved in subplots receiving ammonium sulfate (0.2 lb N/1000 ft^2 or 0.1 kg•100 m^{-2}, applied on a 2-week interval throughout the test period) or the 2 other nutrient supplements that were evaluated. **In 1998, but not 1999, Tx-1 was shown to increase the residual effectiveness of Chipco 26GT® (iprodione) and Banner MAXX® (propiconazole) by 7 to 10 days.** These fungicides and Daconil Ultrex® (chlorothalonil) had little effect on the levels of Tx-1 recovered from the turf on soil. **Although some brown patch suppression was noted under low disease pressure in 1998, Tx-1-treated plots were more severely blighted than nontreated control plots during moderate to high disease pressure in 1999.**

This study showed that the Bioject fermentation and delivery technology works well and demonstrated that Tx-1 could significantly reduce dollar spot. Although the reduction in dollar spot was only 30%, it should be noted that Crenshaw is among the most susceptible cultivars to infection by *S. homoeocarpa*. Ohio researchers observed 50 to 60% dollar spot suppression in Penncross (Han et al., 2000). Hence, where cultivars with greater dollar spot resistance are grown, there can be a significant benefit from using Tx-1. Unfortunately, interest in the Bioject has declined in recent years. The company in a rush to earn revenue, placed unproven technology in the market. Golf course superintendents, as a result, may be hesitant to utilize the system due to some early failures. Eco-Soil Systems provided the Bioject, technical support and some funding for the study. The University of Maryland, however, invested over $25,000 of its own money to complete this research project. This should be a warning to other scientists not to get involved with costly research projects without up-front funding. **This research provided more evidence that it is unlikely that biological agents will replace the need for fungicides on golf courses. The use of Tx-1 and other biological agents, however, may extend the residual effectiveness of some fungicides and reduce the potential for *S. homoeocarpa* resistant biotypes from developing.** The search for more effective biological agents continues. Extensive field testing should be performed in order to inform end-users the best possible information on their target disease(s) and the levels of control that can be realistically expected.

References

Davis, J.G. and P.H. Dernoeden. 2001. Fermentation and delivery of *Pseudomonas aureofaciens* strain Tx-1 to bentgrass affected by dollar spot and brown patch. *International Turf Res. Soc. J.,* 9:655–664.

Han, D.Y., J.W. Rimelspach, B.F. Parisi, and J.M. Boehm. 2000. Biological control of dollar spot of golf courses using *Pseudomonas aureofaciens* Tx-1 delivered via the Bioject. *Ohio Turfgrass Foundation Turf News,* 62(2):18–20.

Powell, J.F. and J.M. Vargas. 2000. Management of dollar spot on creeping bentgrass with metabolites of *Pseudomonas aureofaciens* (Tx-1). *Plant Disease,* 84:19–24.

Yuen, G.Y. and O. Kilic. 2000. Evidence of induced resistance in the control of *Bipolaris sorokiniana* in tall fescue by *Stenotrophomonas maltophilia* C3. *International Turf Res. Soc. J.,* 9:736–741.

FEATURE ARTICLE

Global Warming and Soil Carbon Sequestration

James B Beard

There is worldwide concern regarding greenhouse gas emissions and their potential effects on global warming. The Soil Science Society of America (SSSA) has published a small book of 16 chapters entitled *Soil Carbon Sequestration and the Greenhouse Effect.* It is available from SSSA under the listing of Special Publication No. 57. Summaries are given in this publication of the global trends relative to the sources and soil processes associated with carbon (C) as it relates to the greenhouse effect.

In the chapter by Professor Rattan Lal of Ohio State University, **he indicates that the atmospheric concentration of carbon dioxide has increased by about 32% from 280 ppm in the year 1700 to 370 ppm in the year 2000.** The three principle sources of this atmospheric CO_2 increase are (a) **combustion of fossil fuels** such as coal, oil, and natural gas, which currently supply 85% of the world's total energy, (b) **the industrial production of cement, lime and ammonia,** and (c) **agricultural activities** such as deforestation and biomass burning that are involved in the conversion of natural to agricultural ecosystems. **Sequestration** is the process of being separated or removed, typically in an organic complex in soils. The carbon sequestered in soil is in two primary forms: soil organic carbon (SOC) and soil inorganic carbon (SIC), with the latter occurring principally as soil carbonates. The SOC pool comprises highly active humus and relatively inert charcoal carbon, with the soil organic humus encompassing a wide range of organic substances from plant and animal residues. The carbon in the form of carbonates is particularly significant in soils in the semiarid and arid climatic regions.

Certainly, the soil carbon pool is of importance in the global carbon cycle, but unfortunately this is not widely recognized as significant by many spokespersons. An analysis revealed that **the carbon in the upper 1 meter depth of the soil profile is 3.0 times greater than the carbon in the atmospheric pool and 4.1 times the carbon in the biotic pool involving trees and other living entities.** Typically, carbon constitutes approximately 58% of the total mass of soil organic matter. Activities that reduce the soil organic carbon (SOC) pool and accentuate emissions to the atmosphere include deforestation, biomass burning, plowing, drainage, and indiscriminate use of fertilizers and lime. **Soil carbon is the second largest source of carbon emissions into the atmosphere, ranking second to fossil fuels. It is estimated that cultivated soils have lost 50% of the original soil organic carbon pool and that severely eroded soils have lost 70 to 80% of the original soil organic carbon pool.**

Soil carbon is a large and active pool that often is overlooked in terms of its interaction with the atmospheric carbon pool. There are a number of common myths about soil carbon and its role in an accelerated greenhouse effect. These myths are being perpetuated and are leading to misunderstandings. Twenty-five myths are discussed in another chapter by Professor Rattan Lal, including the following seven:

- **Emissions from soils and biotic pools have made minor contributions to atmospheric carbon dioxide enrichment.** Actually a considerable amount of the 32% increase in the atmospheric carbon dioxide concentration is attributed to depletion of soil and biotic carbon pools and represents 50% of the CO_2 emissions from fossil fuel combustion since the dawn of settled agriculture.
- **Emissions of greenhouse gases from the soil and biotic pools have been significant only since the 1950s.** Actually soil carbon emissions to the atmosphere were most significant during periods of rapid expansion in agricultural cropland. In North America this period was from 1850 to 1950, and was much earlier in Europe and certain other portions of the globe.
- **The historic loss of soil carbon is too small to warrant strategic planning for carbon re-sequestration.** This assumption is refuted above.
- **Soil erosion merely leads to carbon redistribution over the landscape.** A substantial portion of organic carbon is concentrated in the surface soil layer, which also is the most prone portion of the profile in terms of soil erosion. In the erosion process, the soil organic carbon that was previously buried within the soil becomes exposed to microbial processes and climatic elements that result in emissions to the atmosphere.
- **Sediment deposition in depressional sites and aquatic ecosystems leads to carbon sequestration.** The state of soil organic carbon buried in depressional sites such as wetlands depends on the soil and hydrological characteristics. Thus, significant portions of the carbon car-

Continued on page 6

Green June Beetle Management...

Continued from page 2

manure-based fertilizers, and sites with a history of infestation. Preventively spot-treating such areas with imidacloprid (Merit®), either during or up to 2 weeks after the mating flights, will control young GJB grubs soon after egg hatch, before turf damage occurs. Halofenozide (MACH 2®) does not seem to be as effective against this particular grub species. Turf managers who treat with imidacloprid in June or July for preventive control of Japanese beetle, masked chafer, or other annual grub species will suppress GJB at the same time. Imidacloprid must be applied as a preventive—it is not effective as a curative treatment after the damage appears.

Alternatively, GJB can be effectively spot-treated with a short-residual insecticide, e.g., trichlorfon (Dylox®), carbaryl (Sevin®), or bendiocarb (Turcam®), after the eggs have hatched, but while the grubs are still small (i.e., before the mounds appear). As with all grub treatments, water-in the residues to move them into the soil. Presence of young grubs can be verified beforehand by sampling with a spade or golf hole cutter. Even small GJB grubs tend to be a few inches deeper than grubs of other species. **To confirm the identification, recall that GJB is the only species that crawls on its back**.

Your options are more limited once damage from the large grubs has appeared. Raking or sweeping down the soil mounds may be adequate with light infestations. Cultural practices that enhance turf vigor will help to encourage recovery from GJB damage. Overseeding thinned, damaged areas in the autumn helps to prevent weed encroachment the following spring.

Treating with a fast-acting, short-residual soil insecticide (e.g., Dylox®) will stop the mounding and burrowing, but almost certainly will result in piles of dead grubs littering the surface (see above). **Be prepared for a messy, morning-after cleanup**—indeed, I once saw a youth soccer game canceled because of the GJB grub kill on a playing field that had been treated the evening before. In such situations, the best strategy may be to wait, and then use a preventive approach the following summer.

Global Warming...

Continued from page 5

ried into these depressional areas may be emitted as CO_2 or CH_4, depending on the degree of anoxia. Under reducing conditions in wetlands, methanogenesis can lead to the emission of CH_4 to the atmosphere.

- **Subsistence farming and low-input or resource-based agriculture are environmentally friendly.** It should be recognized that agricultural practices that are based on mining soil fertility will produce low returns and adversely effect the environment. The risks of soil erosion are increased by management practices that produce less ground cover and return little, if any, biomass to the soil.
- **Application of nitrogenous fertilizer leads to carbon emission due to fossil fuel used in their manufacture, transport and application.** Countering this myth, studies reveal that judicious applications of nitrogen fertilizers can lead to positive carbon balances in commercial agricultural. In other words, soil carbon sequestration occurs if the nitrogen fertility program is soundly based and judicious.
- **The net effect of irrigation on soil carbon sequestration is negative because of the power use of lifting the irrigation water and the release of carbon dioxide and carbonates brought to surface from ground water.** Contrary to this theory, judicious irrigation increases the biomass by 2 to 3 times compared with rainfed production systems and leads to additional sequestration of soil organic carbon.

Turfgrass Aspects. The authors of this book did not include the value of turfgrass vegetation in terms of potential sequestration of soil organic carbon. However, as one reads the book and as summarized in this article, **it is obvious that a turfgrass vegetative cover can be very important, and offers significant potential for the sequestration of carbon that affects global warming.** This is especially true for irrigated, judiciously fertilized turfgrass areas at higher cutting heights that enhance the depth of root growth. It is also obvious that turfgrasses can play a significant role in the restoration of eroded or agricultural soils that have been depleted of organic matter. There is a need to better understand turfgrass-soil processes and properties that influence the soil carbon pool under turfs, as well as their changes as affected by cultural practices. Hopefully those scientists involved in the study of soil carbon sequestration will recognize this turfgrass dimension as an important component and develop specific science-based information for use.

Research Summary

Health Risks from Exposure to Feces of Canada Geese

Giant Canada geese (*Branta canadensis maxima*), which are nesting locally in Northwest Ohio and other parts of the state, are commonly perceived as a public nuisance when they inhabit urban areas. The feces of giant Canada geese litter both grass and pavement in many occupational and recreational sites in the Toledo area. The purpose of this study was to identify sites with fecal droppings of giant Canada geese that test positive for *Cryptosporidium, Giardia,* and *Campylobacter,* qualitatively assess the occupational risks of infections, and recommend protective measures. The fecal droppings of giant Canada geese were tested for *Cryptosporidium, Giardia,* and *Campylobacter,* using sensitive monoclonal enzyme immunoassay (EIA) methods. Fourteen out of sixteen sites tested positive for at least one pathogen. None tested positive for all three. ***Cryptosporidium* was the most common infectious organism found in the fecal droppings. It was detected in 14 out of 18 (77.8%) samples.** *Campylobacter* was found in 7 out of 18 (38.9%) samples, and 3 out of 18 (16.7%) samples tested positive for *Giardia.* Since fecal droppings of giant Canada geese are dense in many sites, occupational exposure to *Cryptosporidium* is very plausible. In addition, fecal droppings from other carrier vertebrates are likely to be present in the same sites occupied by giant Canada geese, thereby increasing the likelihood of occupational exposure to one or more of these pathogens. It has also been suggested that houseflies and dung beetles may be mechanical carriers of *Cryptosporidium.* **We recommend that work environments in close proximity to the nesting sites of giant Canada geese be maintained in a sanitary condition. Workers at risk for exposure should wear protective gloves while working, wash their hands after performing applicable activities and before touching their mouths, launder work clothes daily, and, ideally, shower at the end of the workday. We further recommend that potentially exposed workers who develop gastrointestinal infections have their stools tested for *Cryptosporidium, Giardia,* and *Campylobacter.***

Comment. Also, at risk of disease exposure are individuals involved in recreational activities, especially at parks, recreational areas, and golf courses.

Source. Hailu Kassa, Brian Harrington, and Michael S. Bisesi. Risk of Occupational Exposure to *Cryptosporidium, Giardia,* and *Campylobacter* Associated with the Feces of Giant Canada Geese. *Applied Occupational and Environmental Hygiene,* 16(9): 905–909.

Winter Overseeding Warm-Season Turfs

Continued from page 1

Seeding Method. Cease mowing or raise the cutting height on greens to allow the leaf extension to reach 5/16 inch (8 mm) in order to trap and hold the seeds in place. Divide the seed into two lots and apply in two opposite directions. Then apply topdressing using a soil mix comparable to the underlying root zone, if in the proper textural range. Higher-cut turfs may not need to be topdressed. Next, drag the area with a heavy, inverted carpet, possibly with multiple passes. With higher-cut turfs, it is especially critical to work the seed down through the turf canopy into close contact with the soil to provide favorable moisture needed for seed germination. Finally, irrigate the seeding immediately and keep the surface moist for three weeks by light irrigation or syringing applied as many times daily as needed. Be sure to lower the cutting height on greens to its original level after two-to-three weeks. It is essential that the first mowings are accomplished with a properly adjusted, sharpened mower.

Spring Transition. Based on detailed studies, the preferred procedure for proper spring transition back to the warm-season turfgrass is achieved by manipulating the cultural system. This involves (a) lowering the mowing height substantially, (b) increasing the nitrogen fertility level by 50 to 100%, and (c) weekly vertical cutting. This combination ensures sunlight penetration through the winter-overseeded canopy to the bermudagrass, thereby stimulating spring greenup. These cultural practices should be initiated before the soil temperature at a 4-inch (100 mm) depth reaches 64°F (18°C). Transition techniques such as withholding water are ineffective and can enhance death of the bermudagrass, especially if spring root decline occurs.

TURFAX™
© 2001 Ann Arbor Press
Introductory offer: $69.95 + shipping and handling
6 issues/year
Available by mail and/or fax

Ann Arbor Press
P.O. Box 20
Chelsea, MI 48118
Telephone: 800-487-2323; 734-475-4411
Fax: 734-475-0787
www.sleepingbearpress.com

JB Comments

Solving Mole Problems in Turf

When asked questions about solving mole problems on lawns over the past 44 years I have suggested using an insecticide to control the food source which results in the moles moving to more favorable feeding sites. There is a lack of research concerning this approach. Mole activity can result in a major disfiguring of the lawn due to numerous mounds, which then smother the grass causing 8 to 14 inch (20–35 cm) diameter dead patches.

I became a victim of a serious mole problem at my northwest lower-Michigan residence. Initially, I tried to ignore them, but the damage became more and more serious over two years. Visible aboveground turf damage from white grubs or root-feeding insect activities was never observed. **A single application of an insecticide was made annually for two consecutive years, which resulted in the elimination of mole damage within the lawn.** During the third year, the insecticide application was skipped, resulting in a reoccurrence of mole damage on the lawn. Subsequently, an insecticide has been applied annually at the labeled rate, and appropriate timing in relation to the life cycle of the grubs. This program has continued to eliminate the mole problem. **For the past few years the moles have decimated the neighbor's lawn. Approximately twice a year there will be one to two mole mound probes made into my lawn, but the moles then return to the neighbors lawn where the food supply is favorable for their activities.** Obviously, this specific experience involving a relatively severe mole population with allied disfiguration and loss of turf has been solved by this procedure. These findings were not based on replicated plots but were replicated over eight years.

Ask Dr. Beard

Q. *Does a rotary or a reel mower provide a better cut on turfs?*

A. **Unquestionably, a properly adjusted and sharpened reel mower provides a far superior quality of cut of grass leaf blades than does a rotary mower.** This was documented in a six-year study at four cutting heights conducted on a Kentucky bluegrass (*Poa pratensis*) turf by this author. There was a semi-brown appearance on the turf after mowing with a reel mower, especially when the leaf extension rate was rapid. In contrast, during very-slow growth periods, the visible differential effect was more minimal. The reason for this is that the reel mower has a fixed bedknife against which the reel pushes the grass leaf blades, thereby causing a more scissors-like cutting action. This contrasts with the rotary mower, which cuts by impact that creates a significant area of damage back from the cut end of grass leaves. This results in leaf tip browning, which affects the turf appearance to varying degrees. **Another significant observation during the 6-year study was a 65% increase in disease occurrence on the rotary cut turfs versus the reel cut turfs.** The more extensive wound area on the rotary cut turfs provided a greater opportunity for germinating spores of pathogens to invade the plant, thereby resulting is increased disease problems.

Ask Dr. Beard: TURFAX
c/o Ann Arbor Press
P.O. Box 20
Chelsea, MI 48118
Email: skip@sleepingbearpress.com