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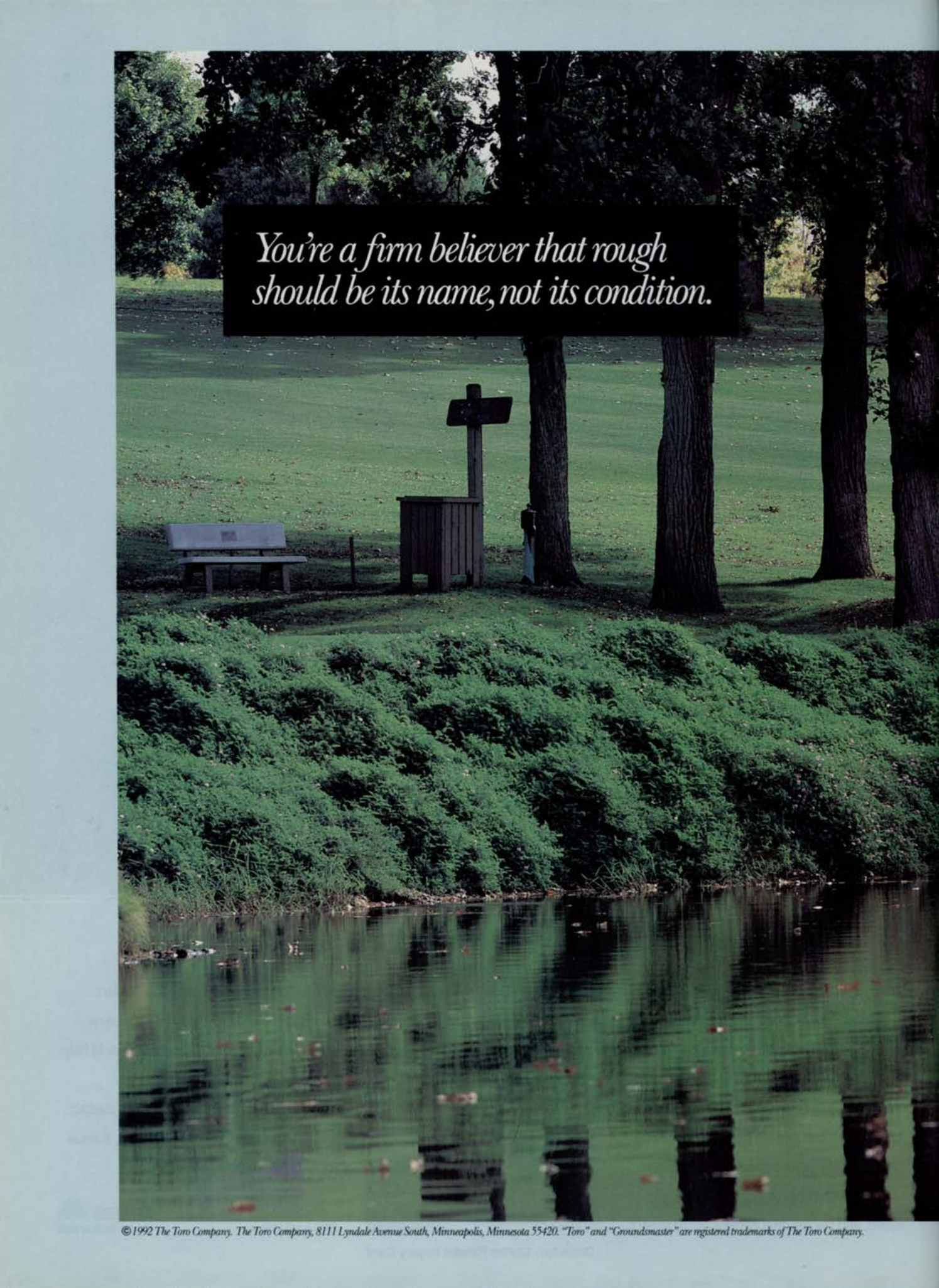
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Circle No. 129 on Reader Inquiry Card

A photograph of a golf course scene. In the foreground, a pond reflects the surrounding greenery. A dense line of ferns runs along the edge of the pond. In the middle ground, a wooden bench sits on the left, and a wooden signpost with a cross-shaped top stands in the center. The background features a well-maintained green lawn and several large, mature trees with thick trunks. The lighting is soft, suggesting a late afternoon or early morning setting.

*You're a firm believer that rough
should be its name, not its condition.*



Roughs can be beautiful.

And playable. If you've got the time. Toro's

Groundsmaster® 455-D

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Because it's the first rotary mower designed

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Extremely maneuverable, it gives you a consistently superb quality of cut at higher heights. Even around trees, bunkers and other obstacles. That means you have more time to spend on other areas of your course.

It's one more way Toro has worked with golf course superintendents

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*Groundsmaster® 580-D.
16' cutting width
plus great moves. Also
available: compact, nimble
Groundsmaster 223-D.*

Especially when the going gets rough.



Helping You Put Quality Into Play.™

Circle No. 137 on Reader Inquiry Card

Volunteer jobs

Members of the community, whether they be coaches, players, players' parents or just interested spectators, can be used to help maintain fields. Some of the jobs they willingly accept are:

- ☞ raking
- ☞ dragging
- ☞ laying sod
- ☞ cleaning up
- ☞ fence mending
- ☞ painting
- ☞ fund-raising



The sports turf manager's skill can create field conditions that allow players to concentrate solely on the game and their part in it.

QUALITY from page 30

are many sources of help: university extension agents, sports turf consultants, state and local turf organizations, and professional associations.

The Sports Turf Managers Association (STMA) and its regional chapters offer excellent hands-on events for the major aspects of field care. Members readily share their own expertise with other members.

Over the last 10 to 15 years, safety and the quality of playing conditions have

improved drastically. Equipment has been modified for greater player protection. Weight training and nutrition programs have been incorporated into athletic programs at the high school and college levels. Field quality may be the last factor to be addressed, but it has reached the attention of the public.

The groundskeeper has the opportunity to pull together the entire program. By listening to everyone's expectations, he or she can develop a plan to deliver the best facili-

ty for the least cost. The athletic field manager can then make sure that wheel is rolling steadily forward, with a sturdy set of spokes supporting it all the way.

—Jesse Cuevas is stadium superintendent of Johnny Rosenblatt Stadium, Omaha, Neb., home of the Class AAA Omaha Royals and the College World Series. He is a board member of the national Sports Turf Managers Association.

Save time, make money

Mowing equipment tips from Mike Kail, founder and owner of Lawn Rangers, Inc., a full-service mowing/maintenance company in Indianapolis:

☞ If you have an open mind for mowing equipment and techniques, you can improve your profitability.

☞ If you're using walk-behinds, as your company grows, Kail suggests you consider switching to mid-size riding mowers.

"Years ago, when we first started our operation, the mid-size walk-behind mowers (36- to 52-inch deck) were—and still are—quite popular. But it takes a man to run every one." Kail says labor needs have changed in such a way to require more companies to do the same or more with

fewer employees. Stricter time management requires that he now use the mid-size riding mower. It's easier to maneuver and covers more ground faster.

"A mid-size rider (48- to 61-inch deck) will replace two walk-behinds and one man," says Kail.

☞ Mulching mowers are essential; Kail says the time you save by leaving the clippings is considerable. Tell your customers: *clippings don't cause thatch!*

☞ Select an equipment dealer who will work with you, from sale to maintenance. "If you have a good dealer who keeps you mowing, keeps you making money, that's the key."



Kail: find a dealer who'll keep you making money.

Survey shows customers want and need more information on organic programs

The big challenges to an organic lawn care business are customer education and straight talk about results.

■ Organic lawn care programs take time. First there's the time it takes before an organic program shows results on a client's lawn.

Then comes customer education: customers should know what they're getting for their money.

Brent Flory, president of Freedom Lawns, Delphi, Ind., is tackling both challenges at once. As a man with a background in agriculture, he continues to experiment to find the best agronomic approach for each individual lawn problem. As a businessman, he strives to educate his customers about the difference between chemical and—as he describes it—"pesticide-free" applications.

Like any good fact-finder, Flory recently surveyed a majority of his customer base to learn for himself how they rate the service he offers at Freedom Lawns. He hopes to share his findings with others interested in the natural lawn care market, but for now, he's working on his own learning curve.

"I'm satisfied there is a very useful place for organic lawn care at this time," says Flory. "I am also convinced we need much more research."

Partners—Flory's goal is a "partnership" with his customers, one founded on customer awareness and approval of organic lawn care.

The biggest challenge he faces is in the area of terminology. According to his survey, 68 percent of those surveyed consider a pesticide to be something that

only eradicates insects; 21 percent call a pesticide an environmental hazard.

"Most people do not understand the term, 'pesticide,'" says Flory. "This tells me that the industry is not properly informing the public about what pesticides are. Only three percent considered a pesticide to include a weed-killer. As a result, I must use terms such as 'chemical-free' rather than 'pesticide-free.'"

When asked about the most desirable benefit of the Freedom Lawns service, 68 percent cited the chemical-free feature. Twenty-one percent were more appreciative of a healthy lawn, and eight percent listed three benefits: chemical free, safety and a healthy lawn.

"Several indicated they were pleased," says Flory. "After several years of chemical lawn care, they are now seeing much improvement in their lawns with our organic program."

But how does it look?—One customer "summed it up," says Flory. "He said our chemical-free ideas would not be a fair sacrifice if the lawn did not look good. The environment was important to him, but, the package was a benefit only because of pleasing results."

"We can say 'organic' all we want," says Flory, "but without a pretty lawn, what's the benefit?" Other findings included:

- ✓ 22 percent felt the company's techniques needed improvement;
- ✓ 17 percent said they would like more information on organics;
- ✓ 96 percent read the newsletter;
- ✓ more than half the clients surveyed said they're satisfied with service as is.

Flory says the majority of those surveyed prefer direct discussion and recommendations over videos. Several appreciate being given product labels, something Flory suspects is missing from most lawn



Flory: Without a pretty lawn, what's the benefit to the customer?

care companies.

"I have many opportunities to view invoices from other lawn companies," says Flory, and they are often vague as to what materials are being applied. I firmly believe that most homeowners should become informed about what they are buying and how much."

A 1992 Roper/Gallup survey revealed that 57 percent of those surveyed favored environmental restrictions; 80 percent said economic growth and environmental protection were not incompatible goals, but if forced to choose, 59 percent would put the environment first. Results like that convince Flory that there is still a lot of interest in environmental issues.

"Whether we agree with it or not," he says, "we need to become more concerned about the environment since the majority of people place more importance on it than ever before."

—Terry McIver

IN THIS ISSUE

Nematode efficacy studied in Scottsdale
The importance of scouting in IPM programs
Predator insects as biological controls

Nematode progress reviewed by company, turf research experts

SCOTTSDALE, Ariz.—Representatives of the Biosys Co. and Ciba-Geigy met here in March with leading university turfgrass entomologists to discuss the future of the Exhibit nematode product for use in professional turf care.

The 14 university and USDA researchers included Drs. Harry Niemczyk, David Shetlar and Michael Klein from Ohio State University; Dr. Patricia Cobb, Auburn University; Dr. Patricia Vittum, University of Massachusetts; and Dr. Lee Hellman, of the University of Maryland.

The Palo Alto, Calif.-based Biosys has established itself as a leader in nematode research and breeding. It recently entered into a joint marketing agreement with Ciba-Geigy Corp. and at least two other major chemical firms.

Currently, Exhibit controls cutworms, armyworms, sod webworms and billbugs.

The two-day meeting, meant to help drum up support for the product and to keep track of field research progress, contained a summary by Dr. Ramon Georgis of the current nematode research on soil insects in turf, including:

- ✓ black cutworms;
- ✓ sod webworms;
- ✓ billbugs;
- ✓ armyworms;
- ✓ chinch bugs;



Houseworth: new packaging designed for easier measure.

- ✓ mole crickets;
- ✓ white grubs;
- ✓ crane flies.

The only significant surface-feeding turf pest not yet included on the Exhibit label is the chinch bug, and it was suggested that various research strategies be used to tackle the problem of chinch bug control.

One of the recognized drawbacks with nematode control is its delayed action following application. To overcome this problem on golf courses, Niemczyk, Shetlar and Stan Swier of New Hampshire are going to develop a research program to judge the efficacy of season long applications on golf course turf.

The group approved the introduction of a bulk LCO product based on *S.*

glaseri and/or *H. bacteriophora* for control of white grubs, and another, based on *S. scapterisci*, for control of mole crickets.

Nematode formulations currently under development by Biosys include:

- a filled-flowable nematode formulation in a paper pouch supported by cardboard;
- a gel formulation in a bag, in which an insert is broken and the nematodes become flowable;
- a moist granular flowable that dissolves in the mixing tank;
- a granular formulation that absorbs water, and then breaks open to disperse the nematodes.

Exhibit will soon be available in a new flowable formulation, consisting of plastic polymer pouches attached to a plastic frame.

Rick Miller of Biosys says new Exhibit use recommendations have been established, primarily a significant relaxation of product use barriers, including time of day and pre-irrigation requirement, a reduced screen size requirement and adoption of turf spray volume standards.

Future nematode application research will cover the following:

- investigation of the effects of thatch and soil moisture;
- control evaluation/insect monitoring techniques;

- further work on irrigation requirements and automated delivery systems;
- sub-surface application systems.

continued on next page



Klein: Questions nematode efficacy in white grub control.



Georgis: Exhibit available in bulk for LCOs.



Miller: Exhibit 'The consumer white grub product of the future.'

NEMATODE Q & A

■ Here are the answers to green industry professionals' most common questions about nematodes.

What are nematodes?—They're a large class of worm-like organisms that live in soil and occupy many different biological niches. Some are destructive parasites of plants. Others—called beneficial nematodes—prey exclusively on grubs and larvae of harmful insects.

What are the practical uses of nematodes?—Nematodes are an ideal biopesticide (or, a living organism that controls pests).

How do nematodes control insect pests?—Harmless to humans, animals and plants, beneficial nematodes aggressively pursue insects. When they sense the temperature and carbon dioxide emissions of soil-borne insects, beneficial nematodes move toward their prey and enter the pest through its body openings.

Are nematodes safe?—Beneficial nematodes are harmless to humans, pests and livestock, as well as honey bees, earthworms, ladybugs and other useful organisms. Nematodes represent a "closed system." This means that neither the nematodes nor their accompanying bacteria can live at the warm body temperature of mammals.

Are there any environmental side effects?—No. Beneficial nematodes do not have any negative impact on groundwater, soil, livestock, crops or farm workers. Nor do they become a permanent part of an agricultural or garden ecosystem. Even under ideal conditions, they persist in the soil only for a few months until they run out of prey.

How do nematodes compare to other biological pesticides?—Nematodes do not rely on passive ingestion or contact with the insect pest. They are mobile predators that actively seek out pests. They target a broad range of soil-living insects, at several stages of their life cycles.

What application rates are most effective?—User rates vary, according to the target pest, soil conditions and other factors. Generally, nematode-based pesticides are comparable in applied quantity to chemical sprays. For example, to treat an acre of turf, a grower would apply Exhibit (manufactured by Biosys, marketed by Ciba-Geigy) at the rate of four gallons per 50 to 100-gallons of water.

Suitable targets for steinernema nematodes

Insect group	Market segments
White grubs	turf, ornamentals, vegetables
Root weevils	turf, ornamentals, flowers, cranberries, citrus, banana, mint
Moths/caterpillars	turf, ornamentals, cranberries, artichokes, corn, peanut, vegetables
Root beetles	corn, vegetables, peanuts
Maggots, flies	mushrooms, pasture
Leaf miners	chrysanthemums, vegetables
Stem-borers	trees and shrubs
Cockroaches, yellowjackets	urban environments

courtesy Biosys

Nematodes, continued

A major stumbling block in nematode research is its control of white grubs in commercial turf applications. The product is currently marketed to consumer markets, but its control is not at the 80-85 percent control expected in professional applications.

According to Klein, the nematode was successful against white grubs in research conducted in the mid-1980's. Research conducted later research was not as positive, likely due to inferior quality nematodes, says Klein.

Pat Vittum, entomologist from the University of Massachusetts reports good results from her 1992 research. Her turf plots did not include a buffer zones, and nematode contamination was detected in the check plots.

Other conference participants indi-



Robert Crocker of Texas A & M suggests multiple applications for chinch bugs.

cated similar problems with nematode contamination.

If nematodes are moving actively or passively into other treatment plots, is the population being reduced in treatments in comparison to nematode-contaminated controls.

Suggestions to solve the problem of poor grub control results include larger plot; and increased variance due to uneven population distributions within plots.

Fred Baxendale, in research conducted at the University of Nebraska in 1992, found an 80 percent grub reduction with *S. glaseri*, 36 percent with Exhibit and 79 percent with Dursban.

Dr. Stan Swier of New Hampshire observed a 50 percent reduction with *S. glaseri*. The site contained heavy thatch, and rain occurred during application. No irrigation was applied during the study period.

A similar conference was scheduled for April, in Chicago. The topic: nematode use on ornamentals.

Research finds predatory insects valuable players in IPM strategy

COLLEGE PARK, MD—Are homeowners going to extremes in the quest for an insect-free garden? Dr. Michael Raupp of the University of Maryland thinks so, and he has the research to back it up.

Recent surveys conducted by the University of Maryland's Agricultural Experiment Station found that nine out of 10 Maryland homeowners use pesticides to rid their gardens of what they consider to be insect pests. But according to Raupp, a professor of entomology at the University of Maryland, College Park, as much as 95 percent of this pest control is unnecessary, and it is likely better to do nothing, so the beneficial predators can go to work.

The use of predator insects as a means of biological control is the center of Raupp's most recent research project, and it's a form of biological pest control he believes will be an important part of the future.



Raupp: Tests use "real world settings."

Most of the biological control research being done concerns food crops, but Raupp points out that the production of ornamental plants in greenhouses and nurseries is Maryland's largest agricultural crop industry.

Learning curve—There's still a lot left for researchers to uncover and learn about the predator insect control concept. According to Raupp, the interactions between predatory insects and their prey is virtually unknown for systems involving ornamental plants.

"A greater understanding of the potential and limitations of biological control will benefit virtually all of Maryland's citizens directly by reduced losses to pests," says Raupp, "and indirectly through reduced environmental contamination caused by unnecessary pesticide use when alternative controls, such as natural enemies, are available."

Raupp's study is a part of the Maryland

Agricultural Experiment Station's Integrated Pest Management program—a program that uses multiple techniques—with the emphasis on cultural strategies—to combat pests in the most efficient manner.

"A vital component absent from current landscape and nursery IPM programs is classical biological control," Raupp says. "My research provides a foundation for incorporating classical biological control into IPM programs for landscape plants and nurseries in Maryland."

One of the predators currently studied by Raupp and two graduate assistants is the Korean ladybug, *Chilocorus kuwanae*. Raupp and his assistants hope to determine which pests are most vulnerable to the ladybug, and how quickly it can establish control over those pests in a natural setting.

The bug's a natural—The ladybug is a natural enemy of the *Euonymus* scale, an insect pest that attacks *Euonymus* plants, which are small trees and shrubs commonly found in the landscape.

Beyond its ability to thrive on the *Euonymus* scale, Raupp's research has found that the Korean ladybug can also survive on the San Jose scale, a pest that attacks fruit trees and many types of common landscape plants.

According to Raupp, the Korean ladybug's palate favors the *Euonymus* scale, however, about 10 percent of the Korean ladybug population studied in research prefers the San Jose scale.

Raupp realizes the importance of field research when it comes to ultimate acceptance of a pest control strategy.

"For the classical biological approach to be accepted as a viable management option, its merit must be evaluated in 'real world' settings," says Raupp. In initial testing, he and his assistants released the Korean ladybug at a housing project in Baltimore and several government facilities in Washington, D.C. The first 50 ladybugs were released in 1990.

There are now several thousand at the

site. Many have migrated to plants on which they hadn't been released.

The bad news, says Raupp, is that the ladybug is not able to achieve

successful control when the pest population is high.

When the pest population is moderate to low, and environmental conditions are favorable, the ladybug appears to maintain scale populations below damaging levels.

One year after the study began, Raupp says he did observe a dramatic decline in pest populations at several locations where beetles were released. "However, at several sites nearby, where no ladybugs were present, scale populations also declined," says Raupp, who concludes that other factors such as bad weather were responsible for the pest reductions.

Questions remain—Raupp's research raises other biological control questions, such as which environmental factors favor pests, weaken plants and put predators at a disadvantage?

"The bottom line here is that we have to be careful," says Raupp. "Careful experimentation will help us avoid making premature recommendations concerning the use and efficacy of biological control agents such as ladybugs."

Some researchers believe that parasites, like wasps, which lay their eggs inside the pests, may be better at controlling pest populations than predators.

According to Raupp, another approach which will be tried soon combines parasites with predator control.

The Korean ladybug is a natural enemy of the *Euonymus* scale, which attacks the *Euonymus* plant, a favorite in many landscape designs.



A Korean ladybug feeds on *Euonymus* scale.

Scout client's property, get to know individual environment

■ "Personalized environmental management" is the lawn care of the future, says Glenn Bonick, owner and founder of Fertigrow, Dallas, Texas

As reported in a previous edition of *Bioturf News*, Bonick is one of those landscaping/lawn care professionals who offer natural or biological programs just in case a client requests it.

"What we're trying to do with IPM (Integrated Plant Management)," says Bonick, "is imitate what takes place in nature.

"By regularly scouting [each client's] property, we can get to know [each individual] environment.

Every yard is different and has different needs."

The Fertigrow program offers monitoring, inventory and diagnosis,

as well as diversified pest management and tree health treatment services. According to Bonick, scouting and monitoring guide all decisions in selecting the most suitable management strategy for each property.

Scouting and monitoring guide all management strategy decisions for each client's property.

Personal Plant Managers—Each of Fertigrow's IPM customers is assigned a Personal Plant Manager, whose job it is to scout a site to assess the insect, weed and disease presence.

Weather conditions are also tracked. Insects or disease are treated at the best time with the lowest possible impact on the environment. Natural defenses, such as beneficial insects, are used, and an evaluation of their efficacy is noted.

Bonick Landscaping was founded in 1982. The Fertigrow division was formed in 1987 to provide individual, environmentally conscious lawn, tree and shrub programs for those clients who may prefer to have a choice. Fertigrow also offers a basic low-impact program and an organic program in addition to its IPM service.

Biological controls to give supers more options and tougher turf

The most effective turf-grass control strategy is disease management, not pathogen elimination.

■ Disease management on the golf course turf is a concern of every superintendent.

The high level of management demanded by both golfer and superintendent is achieved through the use of naturally-occurring microorganisms to suppress disease development.

It is important to realize that diseases are an important component of the natural ecology and that the most effective control strategy is disease management, not pathogen elimination.

Turfgrass diseases are dynamic, and their development on golf courses will change as management practices are varied.

Biological management of disease is one area that will offer new approaches to the superintendent. This would include the use of resistance in grass plants and the

use of microorganisms.

The use of naturally-occurring microorganisms is an undeveloped resource in turfgrass. The goal of current research is to identify particular microorganisms that live naturally in the turfgrass ecosystem and which will control the activities of pathogens.

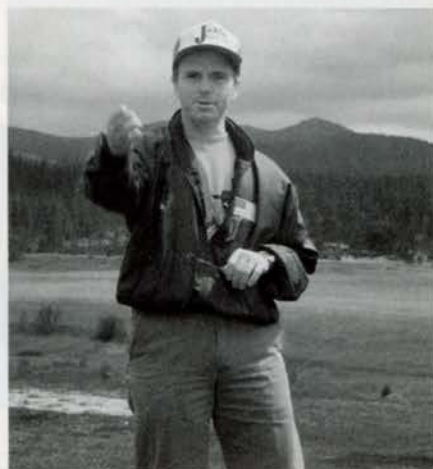
Once having identified these beneficial microorganisms, methods must be developed to insure that they are present in the turf.

At the University of Illinois, we have identified several microorganisms that have the specific ability

to inhibit the activities of *Pythium* and *Gaeumannomyces*-like fungi. These microorganisms can reduce the severity of disease. We are determining if they can be used with current golf course management practices.

We are also investigating if they can be integrated with the use of fungicides. The most exciting aspect of this research is the

The goal of current research is to identify particular microorganisms that live naturally in the turfgrass ecosystem and which will control the activities of pathogens.



Wilkinson: microbes reduce disease severity, will be used more for control.

use of genetic engineering to develop grass plants that not only resist pathogen attack, but also preferentially attract those beneficial microorganisms that will suppress pathogen activities.

—Dr. Hank Wilkinson, plant pathologist at the University of Illinois, Urbana-Champaign, presented during a talk at a Golf Course Superintendents of America meeting.

PRODUCTS

Thatch control made easier: product breaks down lignin layer

Thatch control might be the most talked-about turf problem, after insect/weed/disease control.

The layer of stems and roots that accumulates at the soil surface is one of the causes of weakened root systems and thinning turf.

A new product from Envirogenesis, called Thatch Biodigester, is reported to have shown good results in breaking down thatch through the action of naturally occurring organisms that improve the soil, increase turf disease resistance and restore the turf to a balanced ecosystem.

A key factor in the apparent success of Thatch Biodigester is its ability to reduce the concentrations of lignin, an aromatic polymer which surrounds woody tissue, and which makes up much of the composition of thatch.

According to Envirogenesis, most natural lignin is not degraded to the level of carbon dioxide but instead ends up as humic material. The lignin surrounding the outer layers of turfgrass tissue forms a barrier against microbial degradative enzymes.

Field trial—Envirogenesis recently reported positive results in thatch reduction in two field experiments; one was conducted at the University of California, Davis and a seven-month trial at Edgewood Tahoe Golf Course in Lake Tahoe, Nev.

Results showed higher population of microorganisms useful in thatch control, and better water movement.

According to Envirogenesis, field trials at Edgewood also support the concept that as the complex thatch organic substrates are metabolized and the water-soluble con-

stituents, cellulose and hemicelluloses disappear, the lignin content of the decaying residue rises. As a consequence, well-decomposed materials have a high percentage of lignin that can be measured in field trials.

Thatched turfs may become hydrophobic when dried, a condition that prevents water from reaching the soil.

Evidence suggests that the Thatch Bio Digester improves the water relationship to the soil atmosphere of thatched turfgrass through lignocellulosic conversion.

According to Envirogenesis, a report by Dr. James Beard in 1973 found that improved water relations will accelerate decomposition of thatch, and may also speed the remedy of localized dry spots.

Circle No. 205 on Reader Inquiry Card

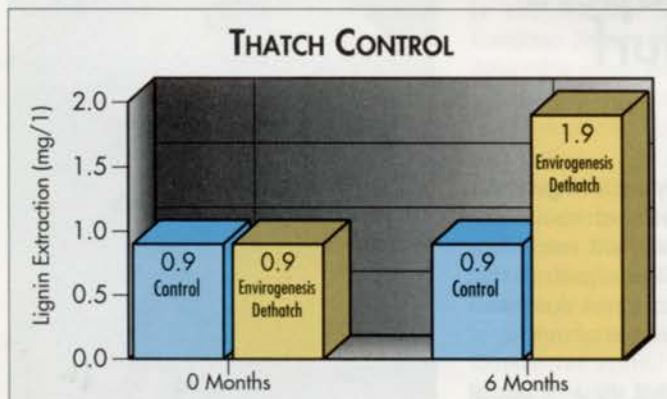


Fig. 1: Lignin content of decayed residue from core samples; Edgewood Golf Course trials, 1992.

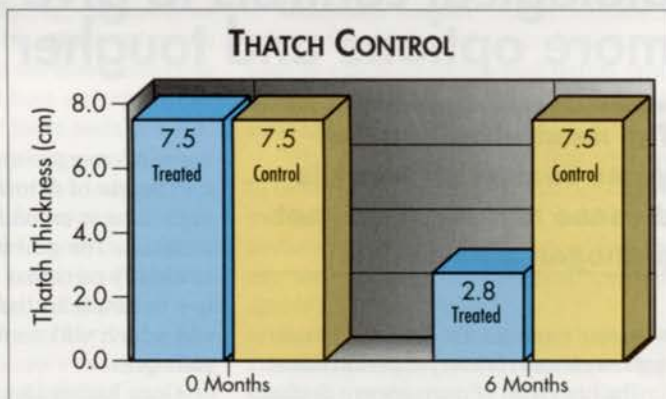


Fig. 2: Thatch thickness from core samples over time; Edgewood Golf Course Trials, 1992.

Carbon-rich blend provides energy for microorganisms

Growth Products, Ltd. has released Essential, an organic matter management product for the professional turf manager.

A liquid solution, Essential is described as a totally natural, organic solution, composed of a unique blend of carbon rich materials, each selected to provide all the various stages of organic decomposition of natural matter.

Essential supplies quick decomposers and more complex forms that require a longer breakdown period, and assist in the

process of soil rejuvenation.

Growth Products says Essential is designed to provide an energy source

for microorganisms, and plant nutrition with simple and complex sugars, enzymes, amino acids and natural organic chelates.

Product nutrients are absorbed through leaf and root tissue to improve plant physiology.

Growth Products says Essential is 100 percent soluble and can be mixed with N-P-K fertilizers and other technical products, for either foliar application or soil injection.

Essential is packaged in quart, gallon,



2-1/2 gal. and drum quantities.

Circle No. 206 on Reader Inquiry Card

PRODUCTS

New inoculant jump-starts compost, produces humus

Enviromate Compost Inoculant, by Chr. Hansen's Biosystems, is a scientific combination of selected microbials, enzymes and nutrients designed to initiate and control the natural composting process. Hansen's says the product initiates and promotes a more controlled process, and produces a rich, uniform humus.

The bacteria in Enviromate—*Bacillus megaterium*, *Bacillus licheniformis*, and *Bacillus subtilis*—are a mixture of mesophiles and thermophiles. Mesophiles grow and metabolize well at medium temperatures; thermophiles do well at higher temperatures. Hansen's says these types of bacteria are the most effective decomposers in the composting process.

The guaranteed levels of highly active enzymes in Enviromate—cellulase and pectinase—assist in the rapid breakdown of plant cell walls and other hard-to-decompose organic material.

Cellulase breaks down plant cellulose, or fiber. Pectinase dissolves, pectin, which is a component of the plant cell wall.

Circle No. 207 on Reader Inquiry Card

Fertilizer eliminates product waste, adds to turf color

The Milorganite Marketing Division has introduced Milorganite Greens Grade fertilizer, primarily for use by golf course superintendents or persons in charge of highly-managed turf areas.

Alan K. Nees, Milorganite director of marketing, says the product was developed after much demand from superintendents.

"They want a dependable product that can be applied at virtually any time of the year and on any type of turfgrass, and yield the kind of results that the golfer will notice," says Nees.

The product is the same analysis as the company's regular grade Milorganite.

The size of the granule will be produced in very tight dimension specifications, eliminating waste caused when fertilizer is picked up by grass catchers. According to the company, the fertilizer granules' uniform sizing will result in an even and sustained release of nutrients.

Circle No. 208 on Reader Inquiry Card

Customized soil blending for golf course, sports turf uses

NorthWoods Organics is an affiliate company of Greensmix, a turf industry leader in customized soil blending. The company provides high quality, custom-processed organics for golf course and sports turf construction.

NorthWoods says its expertise is a result of nearly two decades of applied research at the University of Minnesota and 50 years of construction retail and blending businesses.

Its products include all types of peat sphagnum moss, reed-sedge hypnum and peat humus and composts, processed to specification.

Northwoods says its specialty includes quality control in the area of sports turf organics.

NorthWoods welcomes questions regarding our organic products and their uses in all aspects of sports turf construction, renovation and maintenance.

The company is headquartered in Duluth, Minn.

Circle No. 209 on Reader Inquiry Card

Instrument monitors environs and records pest activity

The EnviroCaster is designed to monitor the environmental conditions when plant disease and pests become most active.

The computer driven system is completely automated, solar powered, and PC compatible.

Each EnviroCaster can hold up to six models per module, which allows the user to take preventative measures based on the data collected.

EnviroCaster, made by Neogen Corp., (headquartered in Lansing, Mich.), is designed to monitor:

- air temperature;
- relative humidity;
- degree days (four accumulators);
- soil temperature at two depths;
- wind speed and direction;
- soil moisture and dewpoint.

The unit records data every 15 minutes, for 24 hours each day.

Circle No. 210 on Reader Inquiry Card.

Handbook covers natural approach to landscapes

The Landscape Restoration Handbook is a joint publication of the United States Golf Association and the New York Audubon Society.

The handbook demonstrates how to use naturalization as an alternative to more intensive management of landscapes.

Published by Lewis, the book shows how to obtain a variety of benefits from natural landscaping or ecological restoration projects:

- water quality improvement;
- erosion control;
- low maintenance;
- chemical reduction;
- ecosystem and ecological community protection and plant and animal species diversity.

The book also provides a list of scientific and common plant names associated with ecological communities throughout the US.

Available from Lewis Publishers, Boca Raton, FL, by calling (800) 272-7737; or from USGA, (800) 336-4446.

BIOTURF NEWS

For professional landscapers, lawn care operators and golf course superintendents interested in learning more about organic turf care supplements to existing chemical control.

Published at the offices of LANDSCAPE MANAGEMENT

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BIOTURF NEWS



For the Latest Developments in Biological, Organic and Natural Turf Care!

With our October premier publication of *Bioturf News*, we at *LANDSCAPE MANAGEMENT* magazine continued our commitment to give you the best possible coverage of green industry happenings.

Bioturf News is our new, bi-monthly review of current research and development in "biological, organic and natural" turf care. In 1993, it will exist independently of *LANDSCAPE MANAGEMENT*.

Some alternative turf care products can't be ignored.

Independent University research has determined them to be viable forms of insect, weed and disease control.

Many of our readers have also formed opinions of biological and

organic products.

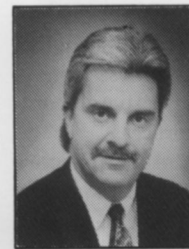
Some say biological and organic products are too expensive and take too long to show results.

Others believe customers should have a choice. And still others are probably wondering what all the excitement's about.

Our job, as an industry information source, is not to tell you what to think, but to simply relay the information to you—as soon as we can and in the best way possible—and let you take it from there.

There are two sides to every story. Your opinions count, and we want to know what you think of these products. Have you tried alternative turf care products? If so, what were the results?

To make *Bioturf News* the most useful green industry news source it can be, we will always welcome your questions and comments.



Jon Miducki
Publisher



Terry McIver
Editor



Bioturf News will be a bi-monthly newsletter reporting on biological, organic and natural products for the specialty turf market. But you have to subscribe in order to receive it. To receive your free, one-year subscription, please return the coupon below to:

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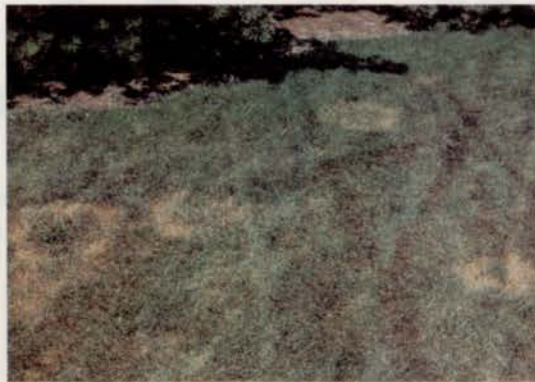


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Rhizoctonia
brown patch
is one
disease
worsened
by poor
drainage.



Proper cultural practices prevent and manage diseases; fungicides are a management tool.

■ When designing a program to combat turfgrass diseases, it is important that the cool-season turf manager know the plant disease triangle—the three factors which determine susceptibility to disease.

For a disease to occur, these three conditions are necessary: a pathogen (agent that causes disease), a susceptible host (in this case, turfgrass), and favorable environmental conditions (cultural practices or weather factors that increase plant stress).

The pathogen—Dr. J.M. Vargas Jr. of Michigan State University, in his text "Management of Turfgrass Diseases," notes that five groups of organisms cause plant diseases: fungi, bacteria, viruses, nematodes and mycoplasma. In descending order, fungi, nematodes and viruses are the three most important causes of disease in turfgrass. The vast majority are caused by fungi.

The host—Different turfgrass cultivars and species are more susceptible to different turfgrass diseases. For example, Drs. W.H. Daniel and R.P. Freeborg, in their

"Turf Manager's Handbook," say that take-all patch primarily affects bentgrass and bluegrass while red thread primarily affects red fescues.

Susceptibility of the host many times depends on the amount of stress placed on the turf. Healthy, vigorous turf is less susceptible to disease. Stress can be caused by a variety of factors, including:

- Either inadequate or excessive nitrogen fertility.

Certain diseases like dollar spot, red thread, pink patch and rusts are more prevalent under low fertility. Diseases that are favored by high fertility include leaf spot, brown patch, pythium blight, stripe smut and the snow molds.

- Improper cultural practices, including mowing.

Grass should not be mowed shorter than its minimum competitive mowing height (see table). And no more than 1/3 of the leaf blade should be removed at any one mowing to minimize stress.

- Improper irrigation practices, improper drainage, excessive rainfall, excessive traffic, thatch build-up, soil pH and other abnormal conditions.

Environmental conditions—Temperature, water, atmospheric water vapor, light, soil and wind are the environmental conditions affecting the development of turf diseases, according to Dr. J.B. Beard.

Temperature is a major factor. Each pathogen has its range of optimal temperatures for development, which may or may not coincide with the optimal temperatures for growth and hardiness of the plant host. Dr. Beard, in his book "Turfgrass Science and Culture," notes that "the optimum temperature for development of a turf disease can range from as low as 35 to 40 degrees Fahrenheit to as high as 95 degrees."

Free water is needed to begin germination of most fungal spores. Also, water stresses or excesses can weaken the turfgrass plant and cause it to be more susceptible to the disease pathogen. Since watering turf in the late afternoon or early evening allows fungi to germinate, grow and infect all night, the best time to water is just before sunrise, according to Dr. Vargas.

"Good drainage is just as important as proper watering," Dr. Vargas continues. "Diseases made worse by poor drainage are pythium blight, rhizoctonia brown patch and gray leaf spot."

Cultural controls—According to Dr. Noel Jackson of the University of Rhode Island, cultural factors which may contribute to reducing the incidence of disease are:

- ✓ judicious changes in irrigation and fertilizer practice;

PROPER MOWING HEIGHTS

SPECIES	MIN. HEIGHT	PREFERRED HT.
Annual bluegrass	1/8"	1/4"-1"
Creeping bentgrass	1/8"	1/4"-1"
Fine fescue	1/2"	2"-3"
Kentucky bluegrass	3/4"	2"-3"
Tall fescue		2 1/2"-3 1/2"
Zoysiagrass	3/4"	2"-3"

Source: Dr. J.M. Vargas Jr.

- ✓ modification of soil pH;
- ✓ improvement of soil aeration and drainage;
- ✓ removal of thatch and clippings;
- ✓ adjustments in mowing height and mowing frequency;
- ✓ dew dispersal and improved air drainage;
- ✓ restraints on the amount of wear;
- ✓ incorporation of organic amendments;
- ✓ weed control;
- ✓ insect control;
- ✓ nematode control; and
- ✓ using resistant varieties of grass.

"But even the most skilled turf manager cannot rely entirely on cultural tactics to eliminate the risk of disease in high quality turf," Dr. Jackson admits.

Chemical controls—Turfgrass fungicides are either contact or systemic.

Contact fungicides are generally applied to the leaf and stem surfaces of turfgrasses, according to Dr. Peter Landschoot of Penn State University. Because they don't move appreciably within the plants, they may be washed or mowed off the plant surfaces and so are generally effective for only 7 to 14 days.

Contact fungicides are usually used to control foliar diseases and not root/crown diseases, Dr. Landschoot notes.

Systemic fungicides are absorbed and translocated within the plant, he adds. Systemics may protect the plants for a period of two to four weeks. "Most systemics will control both foliar and root/crown pathogens," he says, "but do not have as broad of a spectrum of control as contact fungicides."

There are many approaches to minimizing resistance of fungi to fungicides. Though some plant pathologists recommend mixing contact with systemic fungicides, Landschoot does not. "A more logical approach is to combine two or more systemic fungicides with different modes of action. Unfortunately, mixtures of systemics at full label rates are costly and may result in turf injury.

"Turf managers should take the threat of resistance seriously and avoid continuous and repeated use of fungicides with narrow modes of action."

Turf experts agree that the best way to control diseases of turfgrass is to use the proper cultural techniques as a preventive means, supplemented with the proper chemical controls to assist the management of a disease.

SOME TRADE NAMES OF TURF FUNGICIDES*

COMMON NAME	TRADE NAME	COMPANY
anilazine	Dyrene	Miles
benomyl	Tersan 1991	DuPont
chloroneb	Teremec	PBI-Gordon
	Terraneb	Kincaid
	Fungicide V	O.M. Scott
chloroneb/thiophan.-methyl	Fungicide IX	O.M. Scott
chlorothalonil	Daconil 2787	ISK Bio
	Thalonil	Terra
ethoprop	Mocap	Rhone-Poulenc
etridiazole	Terrazole	Uniroyal
fenamiphos	Nemacur	Miles
fenarimol	Rubigan	DowElanco
fenarimol/chlorothalonil	Broadway	DowElanco
iprodione	Chipco 26019	Rhone-Poulenc
	Fungicide X	O.M. Scott
maneb	Dithane	Rhone & Haas
mancozeb	Tersan LSR	DuPont
metalaxyl	Subdue	Ciba-Geigy
	Pythium Control	O.M. Scott
metalaxyl/mancozeb	Pace	Ciba-Geigy
pentachloronitrobenzene	Turficide	Uniroyal
propamocarb	Banol	Nor-Am
propiconazole	Banner	Ciba-Geigy
thiophanate-methyl	Cleary 3336	W.A. Cleary
	Fungo 50	Grace-Sierra
	Fungo 85	Grace-Sierra
	Systemic Fung.	O.M. Scott
thiophan.-methyl/iprodione	Fluid Fung.	O.M. Scott
triadimefon	Bayleton	Miles
	Fungicide VII	O.M. Scott
triadimefon/metalaxyl	Fluid Fung. II	O.M. Scott
thiram	Spotrete	W.A. Cleary
thiram/triadimefon	Fluid Fung. III	O.M. Scott
vinclozolin	Vorlan	Grace-Sierra
	Curalan	BASF
	Touché	Lesco

*Many fungicides are sold under trade names other than the ones listed. Check with your pesticide dealer for alternative products.

Sources: LM Buyer's Guide 1993;
Farm Chemicals Handbook, 1992

continued on page 40

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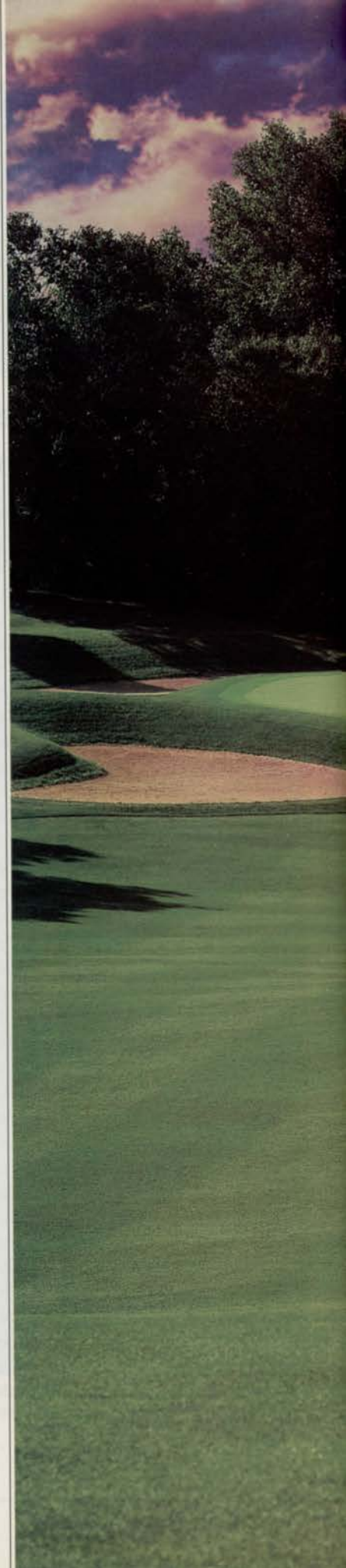
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COOL-SEASON TURF DISEASES

(Before using any pesticide, read and follow all label directions.)

DISEASE	SUSCEPTIBLE TURFGRASS	CULTURAL CONTROLS	CHEMICAL CONTROLS
algae	all turfgrasses	reduce shade avoid excessive fertilization improve soil drainage	mancozeb
anthracnose (<i>Colletotrichum graminicola</i>)	annual bluegrass bentgrasses fine fescue	fertilize and water syringing may help minimize free water on leaves	benomyl ⁽¹⁾ , triadimefon, thiophanate-methyl ⁽¹⁾ , propiconazole, fenarimol, chlorothalonil
brown patch	(see rhizoctonia blight entry)		
dollar spot (<i>Lanzia and Moellerodiscus</i>)	all cool-season grasses	avoid N deficiency remove dew from greens choose resistant grasses	chlorothalonil, mancozeb, benomyl ⁽¹⁾ , anilazine ⁽¹⁾ , iprodione ⁽¹⁾ , spp.) propiconazole, thiophanate- methyl ⁽¹⁾ , thiram, tria- dimefon, vinclozolin ⁽¹⁾
fairy rings (<i>Basidiomycete</i> soil fungi)	all turfgrasses	replace infested sod & soil improve water penetration increase N fertilization	methyl bromide or for- maldehyde fumigation
fusarium blight (<i>Fusarium poae</i> , <i>F. vulmorum</i> , <i>F. crookwellense</i>)	bluegrasses bentgrasses fescues	light, infrequent watering do not cut blues or fescues under 2 inches reduce excessive thatch	triadimefon, fenarimol, benomyl ⁽¹⁾ , iprodione, thiophanate-methyl ⁽¹⁾
fusarium patch (pink snow mold) (<i>Fusarium nivale</i>)	bluegrasses bentgrasses fescues	avoid late fall fertilization rake leaves and cut short control drifting snow	triadimefon, benomyl ⁽¹⁾ , fenarimol, iprodione ⁽¹⁾ , mancozeb, mercury chlorides, pentachloro- nitrobenzene, thiram, thiophanate-methyl ⁽¹⁾ , vinclozolin
gray snow mold	(see typhula blight entry)		
leafspot/blight/ melting out (<i>Drechslera & Bipolaris</i> spp.)	Kentucky blue bentgrasses fine fescue ryegrasses	use resistant varieties raise cutting height avoid excessive N avoid light frequent watering	iprodione, anilazine, chlorothalonil, maneb, mancozeb, vinclozolin
nematodes	all turfgrasses	maintain growth with fer- tilization and irrigation	fenamiphos, ethoprop
necrotic ring spot (<i>Leptosphaeria korrae</i>)	Kentucky blue annual bluegrass ryegrasses fine fescue	avoid low mowing heights reduce excessive thatch use Kentucky blue, rye- grass mixtures maintain even soil moisture	fenarimol, propiconazole, vinclozolin, benomyl
pink patch (<i>Limonomyces roseipellis</i>)	bentgrass fine fescue perennial rye	balanced fertilization	vinclozolin, mancozeb,
pink snow mold	(see fusarium patch entry)		
powdery mildew (<i>Erysiphe graminis</i>)	Kentucky blue fine fescue	reduce shade increase air circulation by removing surround- ing vegetation use resistant varieties	triadimefon, fenarimol, propiconazole
pythium blight (<i>Pythium aphanidermatum</i> , <i>P. graminicola</i>)	bentgrasses annual bluegrass perennial rye Kentucky blue	improve soil drainage increase air circulation avoid mowing wet grass avoid excess watering	chloroneb, etridiazole, propamocarb, mancozeb, metalaxyl
red leaf spot (<i>Drechslera erythrospila</i>)	bentgrasses	remove clippings fertilize to maintain vigor	iprodione, anilazine
red thread (<i>Laetisaria luciformis</i>)	perennial rye fine fescue bentgrass annual bluegrass Kentucky blue	balanced fertility program	vinclozolin, cadmium, chlorothalonil, mancozeb, thiophanate-methyl, tria- dimefon, propiconazole
rhizoctonia blight (brown patch) (<i>Rhizoctonia solani</i> , <i>Thana- tophorus cucu- meris</i>)	bentgrass annual bluegrass tall fescue Kentucky blue fine fescue ryegrasses	avoid excessive nitrogen increase air circulation avoid excessive watering improve soil drainage	anilazine, chlorothalonil, mancozeb, benomyl ⁽¹⁾ , maneb, propiconazole, pentachloronitrobenzene, triadimefon, thiophan- ate-methyl ⁽¹⁾ , anilazine, iprodione, benomyl, vinclozolin
rust (<i>Puccinia</i> spp.)	perennial rye Kentucky blue	avoid nitrogen deficiency use resistant varieties promote growth with fer- tilization and irrigation	mancozeb, propiconazole, chlorothalonil, fenarimol, triadimefon
slime molds (<i>Myxomycete</i>)	all turfgrasses	remove by mowing, raking	zineb, mancozeb
snow mold	(see fusarium patch and typhula blight entries)		
stripe smut (<i>Ustilago striiformis</i>)	Kentucky blue bentgrasses	avoid drought stress avoid excessive nitrogen use resistant varieties	propiconazole, triadi- mefon, benomyl
summer patch (<i>Magnaporthe</i> spp.)	Kentucky blue	annual bluegrass reduce excessive thatch fine fescue	avoid low mowing height vinclozolin, propiconazole, light, frequent watering use slow-release nitrogen improve drainage
take-all patch (<i>Gaeumannomyces graminis</i> var. <i>avenae</i>)	bentgrass	avoid topdressing with pH greater than 6.0 avoid lime use ammonium chloride or ammonium sulfate fert.	PMA (not labelled)
typhula blight (gray snow mold) (<i>Typhula</i> spp.)	bentgrass annual bluegrass Kentucky blue tall fescue perennial rye	avoid heavy fall nitrogen rake leaves and cut short control drifting snow	triadimefon, cadmium, chloroneb, anilazine, pentachloronitrobenzene, mercury chlorides, thiram
yellow patch (<i>Rhizoctonia cerealis</i>)	bentgrasses bluegrasses	reduce excessive thatch avoid excessive watering	none
yellow tuft (<i>Scierophthora</i> spp.)	bentgrass	improve drainage maintain adequate fertility	metalaxyl

(1) Continued or sole use of these materials may favor build-up of resistant fungal population.