CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

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Predicting Grub Populations In Home Lawns

Scarab grubs are the major turfgrass pest in New York State and much of the Northeast. Landscape plants, including turfgrass are subject to intense feeding pressure from a number of grub species including the Japanese beetle (*Popillia japonica* Newman), the European chafer (*Rhizotrogus majalis* Razoumowsky), and the Oriental beetle (*Exomala orientalis*). Of these three species, the European chafer is considered the most difficult to control using traditional insecticides and biological control agents. Although not as widespread as the Japanese beetle, the European chafer grub is more damaging to turf in areas where both are found. Unfortunately, in upstate New York, European chafers are the most common grubs in home lawns and low maintenance turf. ■

European Chafer

The European chafer is slightly larger than the Japanese beetle grub, it feeds later into the fall and starts feeding again earlier in the spring. European chafer grubs feed most heavily on grass roots from August to November and from April to June. Even during the winter months grubs may resume feeding during warm spells. Turf damage caused by grub feeding is most severe under drought conditions when water-stressed grass plants cannot grow new roots to replace injured ones. In heavily infested areas, entire lawns may turn brown and die during prolonged periods of dry weather in the fall or spring.

Traditionally, lawn care companies and homeowners manage chafer grubs by making one or more insecticide applications annually. Turf managers seldom assess grub populations before making treatment decisions, despite the existence of damage thresholds. Insecticide applications are usually preventive or in direct response to turf damage. Our research indicates that most prophylactic applications of soil insecticides for European chafer control are wasted because most properties required no treatment. Insecticide applications for grub control could be greatly reduced if an efficient sampling plan and a reasonable set of rules for making treatment decisions (control decision rules) was available for turf managers.

We recently developed such a control decision rule for European chafer-infested residential turf sites. With this rule, mean density and

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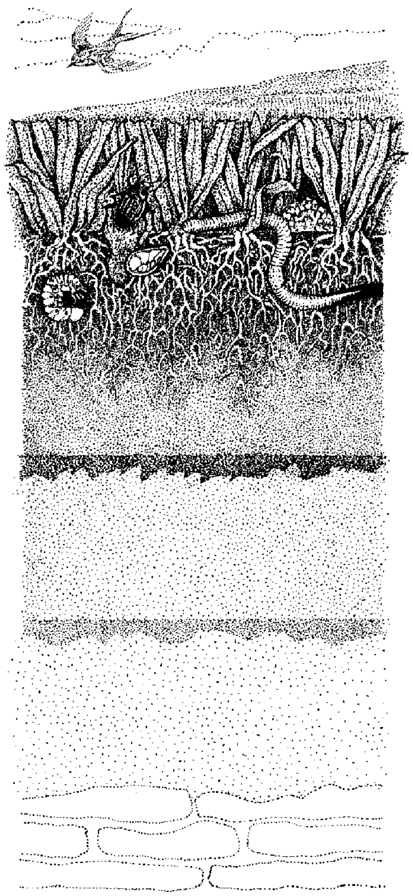

This Times

Short Cutts

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New York Turf and Landscape Expo November 8-11, 1994 Rochester, NY

Cornell Publications Available

Several Cornell publications are available on a range of topics. The following are available from the Department of Floriculture and Ornamental Horticulture, 20 Plant Science Building, Ithaca, NY, 14853.

Title	Cost
Weed Management Guide for Herbaceous Ornamentals	$1.25
Conducting a Bioassay for Herbicide Residues	Free
Woody Weeds of Nursery and Landscape	$1.00
Plan Before You Plant: A 5 Step Process for Developing a Landscape Weed Management Plan	$0.75
Weedy Grasses of the Northeastern U.S.	$1.25
Annual Bluegrass Biology and Control	$0.75
Turfgrass Weed Management–an IPM Approach	$1.00
Cornell Turfgrass Species and Variety Recommendations	Free

The following may be obtained from Cornell Media Services, Publications Distribution, Cornell Business and Technology Park, Buildings 7 and 8, Ithaca, NY 14853.

Title	Cost
1994 Pest Management Recommendations for Commercial Turfgrass	$2.50
Biological Control of Turfgrass Diseases (IB 220)	$5.00
A Guide to the Identification and Control of the Weedy Speedwells (IB 141IB229)	$6.25
Athletic Field Maintenance	$3.00

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Tunney to Keynote NYSTA Conference

The educational program for the 1994 New York Turf and Landscape Expo is set. This year's conference will be held November 8-11 at the Riverside Convention Center in Rochester.

The preconference seminar series includes the ever popular Back to Basics; Advanced Landscape Design; Weed and Disease ID and Control; and one GCSAA seminar.

Highlights of the conference program include the keynote address on the morning of November 9 by Jim Tunney. Mr. Tunney is a nationally recognized motivational speaker and former NFL referee. Following Mr. Tunney's address, the trade show will open. Here you will have the chance to see what's new in turf equipment and supplies, and to catch up with old friends.

Featured speakers on the program include Dr. Trey Rogers, Dr. Noel Jackson, Dr. Pat Vittum, Dr. Jim Murphy, Ed Wandtke, and others. Special sessions include a Management Session for Golf Course Owners, and IPM and ASTM Standards sessions for school grounds personnel.

Be sure, then to mark these dates in your calendar. If you would like more information on the program or on exhibiting, call NYSTA at (800) 873-TURF.

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Scanning the Journals

A review of current journal articles

High mowing was of greater significance than nitrogen level or herbicide rate in maintaining tall fescue cover.

The ability of heat-tolerant perennial ryegrass to withstand heat stress is associated with the ability to express at least one HSP gene sequence.

Researchers in Virginia found materials with potential use for Kentucky bluegrass production in saline environments.

Weed Management in Tall Fescue

Researchers at the University of Maryland, College Park, conducted a study to determine how weeds and tall fescue (*Festuca arundinacea*) quality are influenced by mowing, nitrogen and herbicides. Smooth crabgrass (*Digitaria ischaemum*) and white clover (*Trifolium repens*) infestations were compared in plots of Rebel II tall fescue. Plots received one of three herbicide treatments (dithiopyr, pendimethalin, fenoxaprop) or no herbicide treatment. Three mowing heights were compared (1 1/4", 2", 3 1/2") as well as high and low nitrogen inputs.

Smooth crabgrass encroachment was the primary factor affecting overall turf quality and final cover ratings of Rebel II tall fescue. In the absence of herbicide use, smooth crabgrass reduced turf cover when mowed at either 1 1/4" or 2". Plots mowed at 3 1/2" resisted smooth crabgrass invasion and maintained 100% tall fescue cover, even in nonherbicide-treated plots.

Researchers concluded that high mowing (3 1/2") was of greater significance than nitrogen level or low herbicide rate use in maintaining tall fescue cover with a minimum of smooth crabgrass. Where low mowing is required, however, data show that herbicide use is justified where smooth crabgrass is a chronic problem. Conversely, data showed that white clover was more invasive in high cut turf. White clover ratings were lowest in dithiopyr and fenoxaprop-treated plots.

(From: P.H. Dernoeden, M.J. Carroll, and J.M. Krouse. 1993. Weed Management and Tall Fescue Quality as Influenced by Mowing, Nitrogen, and Herbicides. Crop Science 33:1055-1061.)

Screening Perennial Ryegrass Cultivars for Heat Tolerance

The accurate evaluation of thermal tolerance among turfgrasses is important. Heat-tolerant cultivars are more competitive during high temperature stress and therefore are more desirable. Evidence suggests that heat shock proteins (HSP) may be involved in differences in thermal tolerance among perennial ryegrass (*Lolium perenne* L.) cultivars, and researchers at Ohio State University conducted laboratory assays to study the feasibility of developing a rapid and reliable characterization of thermal tolerance in perennial ryegrass.

Thermal-tolerant and thermal-sensitive cultivars were germinated and heat treatments were applied; HSP genes were used to evaluate thermal tolerance. The results indicated that the ability of a heat-tolerant perennial ryegrass cultivar to withstand heat stress is associated with an enhanced ability to express at least one HSP gene sequence. It is suggested that this enhanced expression could be used to develop an accurate laboratory screening procedure for improved thermal tolerance.

(From: J.A. DiMascio, P.M. Sweeney, T.K. Danneberger, and J.C. Kamalay. 1994. Analysis of Heat Shock Response in Perennial Ryegrass using Maize Heat Shock Protein Clones. Crop Science 34:798-804.)

Alleviation of Salinity Stress in Kentucky Bluegrass

Water relegated for use in turfgrass irrigation is often high in soluble salts. High levels of salinity can be detrimental to seedling development and plant growth. Experiments conducted at Virginia Polytechnic Institute in Blacksburg, VA looked at the potential of applying selected substances (including seaweed extracts, triazole fungicides, plant growth regulators and chelated iron) to Kentucky bluegrass to alleviate the effects of saline irrigation.

Results showed that application of two seaweed extracts and two triazoles increased bluegrass salt tolerance as evidenced by enhanced shoot and root growth. These treatments also protected green pigmentation and were associated with increased leaf water content. Researchers conclude that selected materials have potential use for Kentucky bluegrass production in saline environments.

(From: D.A. Nabati, R.E. Schmidt, and D.J. Parrish. 1994. Alleviation of Salinity Stress in Kentucky Bluegrass by Plant Growth Regulators and Iron. Crop Science 34:198-202.)

Predicting Grub Populations

continued from cover

Results suggest that grub sampling is an economical alternative to preventative grub treatments for both lawn care companies and homeowners.

site characteristics such as lawn age and grass species composition are used to indicate whether a site is likely to harbor a damaging (high density) patch of European chafer larvae. Based on our data, using this rule would eliminate pesticide use on roughly 65% of the sites.

Research Data

Following is a description of our research involving European chafers in home lawns, and a discussion of the practical implications for lawn care companies and homeowners.

More than 300 residential lawns were intensively sampled for grubs in the Rochester NY area, in cooperation with a local lawn care company. Data included extensive grub counts and estimates of site characteristics for each property. Golf course cup cutters were used to remove soil cores (11 cm diam.) that were examined for the presence of white grubs. Cores were taken every 10 ft in a grid pattern. Numbers and species of grubs were recorded as well as soil type, terrain, lawn age, shade, thatch, and grass species composition for both the front and rear lawn (see Figure 1).

Our results indicate that European chafers were the predominate species found. Although 1990 was generally considered a “hot year” for grubs, our mapping revealed that only 18% of the lawns required treatment (see Figure 2). This was agreed upon by both the lawn care company and researchers. Decisions were based on the presence of patches of high numbers of grubs that could cause damage. Generally, lawns requiring treatment had an average of at least 0.2-0.4 grubs per sample (2-4 per ft^2).

When comparing grub densities to site characteristics, we found that high grub populations were strongly associated with front lawns, high proportions of Kentucky bluegrass, young lawns,

Figure 1

Grub Distribution Pattern Example

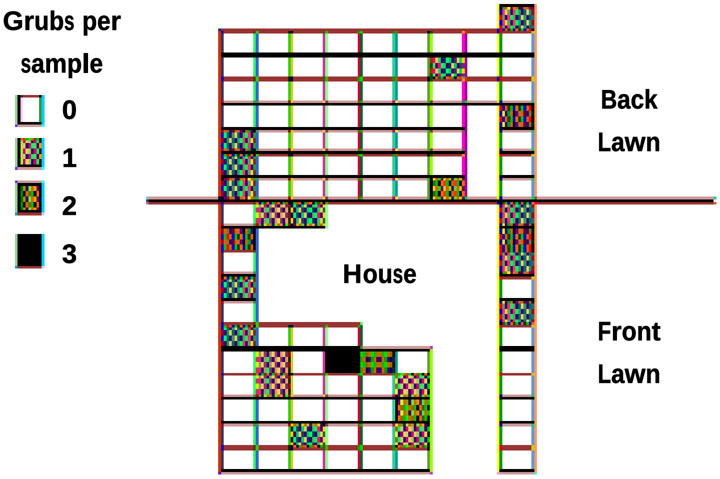
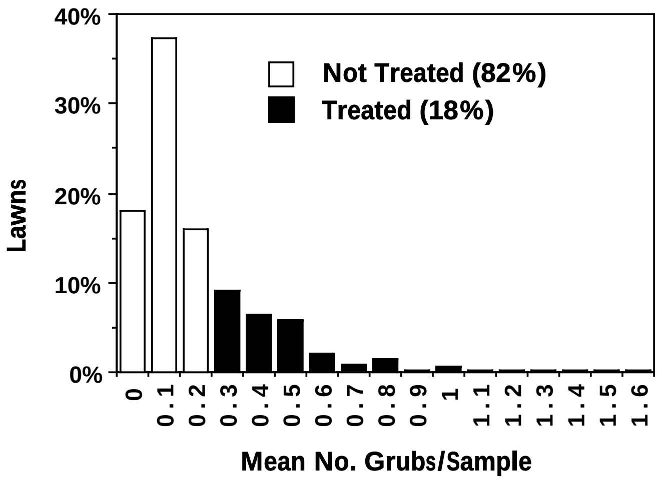
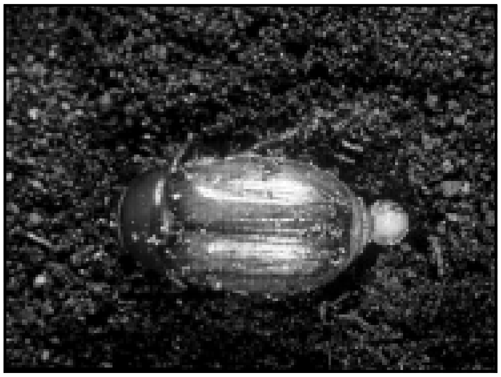


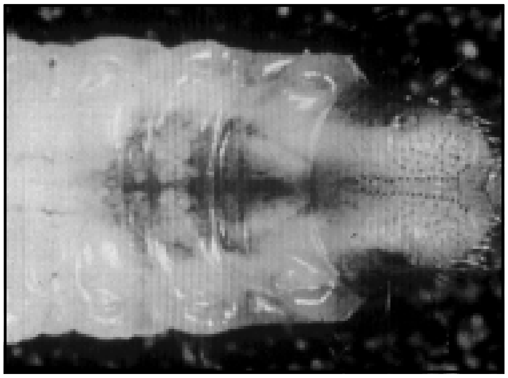
Figure 2

Grub Populations & Treatment Decisions in Home Lawns





The European chafer is the primary scarab beetle in upstate New York.



The rastal pattern of the European chafer is used for identification.

and lawns in open (non-shady) areas. A risk assessment scheme was developed based on these factors, allowing turf managers to assess how likely an area is to have high grub populations before deciding to sample (see Table 1). Lawns 5-20 years old had the greatest number of grubs in risk categories 4-9. Lawns older than 20 years had the greatest number of grubs in risk categories 5-9.

This risk assessment system can be used to determine whether a site should be sampled or not. Low risk properties would not require sampling or treatment. Moderate and high risk lawns would be sampled and treatment decisions based on the outcome. Currently, we advocate sampling a minimum of 20 soil cores from these lawns. Samples should be representatively gathered throughout the lawn. Statistical analysis of our data suggest that an average of 0.25 grubs per 11 cm diameter turf plug could be used as a threshold value for decision making. When mean densities are close to this threshold level, an additional 20 samples should be taken. Use of this sampling scheme and decision rule should result in few treatment errors and could lead to considerable reductions in pesticide use.

Results suggest that grub sampling is an economical alternative to preventative grub treatments for both lawn care companies and homeowners. In 1994, we will be validating the risk assessment model, sampling plan and treatment threshold. These studies will be conducted on 100 lawns located in four sites in the Finger Lakes region. Results will be reported at the annual NYSTA conference and in a future edition of *CUTT*.

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NYS IPM Program
Mike Villani
Dept. of Entomology/NYSAES
Jan Nyrop
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Table 1. Risk Analysis

Risk Rating*	Shade	Kentucky Bluegrass
1	>60%	<30%
2	>60%	30-60%
3	30-60%	<30%
4	30-60%	30-60%
5	>60%	>60%
6	30-60%	>60%
7	<30%	<30%
8	<30%	30-60%
9	<30%	>60%

*Higher numbers = greater risk of high grub populations

Our research indicates that most prophylactic applications of soil insecticides for European chafer control are wasted because most properties required no treatment.

Summer Patch

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varieties of Kentucky bluegrass is perhaps the best strategy for controlling summer patch. Mixtures of these grasses provide the most effective control.

Systemic fungicides are effective in controlling summer patch. They should generally be applied 2-3 times at monthly intervals, beginning in the spring. Late season applications should help turf recover once symptoms appear. Fungicides must be applied with sufficient water so that they are carried down to the root zone where they can be absorbed by the plant. Without this drenching, control is much less effective and more costly. Certain contact fungicides, particularly chlorothalonil, may enhance disease development and should be avoided in sites with a history of severe summer patch problems.

Eric Nelson
Dept. of Plant Pathology

Turfgrass IPM Program

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a 58% reduction in Japanese beetle grubs. However, these same nematode species were ineffective in large scale studies. Results of this year's work and similar results from past years suggest that further research needs to be conducted on the interaction and effects of soil type and climate on the nematodes.

The Turfgrass IPM program is a national leader in the IPM effort. In 1993, the program continued its commitment to develop a strong research and extension base. Working with the industry, the program achieved another prosperous season.

The continuing success of the Cornell IPM program make it one of the best examples of partnerships that span growers; managers; research and technology-transfer centers; and legislative and other governmental bodies. For more information contact your local Cooperative Extension agent, or contact the IPM Program, New York State Agricultural Experiment Station, Geneva, NY 14456; telephone (315) 787-2353 for the *1993 Annual New York State IPM Report* and the *1993 Ornamentals Report Pertinent to the IPM Effort at Cornell University*.

Rod Ferrentino,
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Muck vs. Mineral Grown Sod: The Controversy Continues

The data shows that in the short term, there may be an advantage to using mineral sod. In the long term, however, it appears that the soil type on which the sod is grown will have no influence on rooting.

Sodding is a popular method of turfgrass establishment, especially where a rapid turfgrass cover is desired. While sod can be produced on several different soil types, high organic or muck soils are especially well suited for producing a crop. The dark soils tend to heat up quickly, they are very fertile, and perhaps most important, the sod is very lightweight. For years there has been much controversy over how well muck-grown sod will transplant onto mineral soil. Research conducted at Michigan State nearly 30 years ago found that there were no transplanting problems. Despite this, doubt about transplanting muck sod on mineral soil still looms in the minds of many people.

Last year, with support of the Orange County Black Dirt Sod Growers Association, we conducted a sod transplant study at Cornell. Our objectives were to look at the influence of soil type, and sod age and thickness on sod rooting.

We identified sod sources of similar varietal makeup grown on mineral (Saratoga Sod Farms, Saratoga, NY) and muck (DeBuck Sod Farms and Pine Island Turf, Pine Island, NY) soils. While sod ages varied some, we included young and old sod, cut at a normal thickness, and a thicker sod (about 1/2 inch soil). The soil was transplanted to a mineral, sandy loam.

One square foot frames were made, to which a piece of vinyl window screen was attached, and reinforced to the bottom. Eye screws were attached to four corners of the frame. After the soil was prepared, a piece of sod was cut to fit in the frame, and the frame with sod placed on the soil. Rooting was assessed twice by attaching the frame to a winch connected to a load cell. The winch allowed us to pull the sod frame off the ground, while the load cell measured the amount of force required to do so. The greater the force required, the better the sod was rooted.

There appear to be no long-term disadvantages to using muck sod.

The experiment was repeated twice, once in late spring (June 17) and again in the fall (September 17). Rooting measurements were made at 2 and 4 weeks after transplanting for the spring planting, and at 3 and 5 weeks in the fall.

The results of the experiments can be found in Table 1. It took greater force to pull up the mineral-grown sod in the first rooting measurement after transplant. In other words, the mineral sod had greater rooting in the first couple of weeks after transplanting. This was consistent for both transplant dates. At the later rooting measurement, however, there was no significant difference between the two soil types. Again, this was consistent for both the transplant dates.

The data shows that short term, there may be an advantage to using mineral sod. Long term, however, it appears that the soil type on which the sod is grown will have no influence on rooting; we saw no difference in sod rooting with soil type. You should realize that the soil was properly prepared prior to laying the sod, and that we kept it irrigated for the duration. The success of any sod installation requires that you do the same.

We observed a rooting difference due to sod thickness in the spring planting, but not in the fall. The thinner cut sod provided better rooting in the spring planting.

Finally, sod age appears to have little effect on sod transplant rooting, at least based on our results. The table shows a rooting difference with age for the first sampling date in both tests. These differences, however, are more reflective of the soil type the sod is grown, rather than the age of the sod.

In summary, we could not see any long term disadvantages to using muck grown sod. Proper soil preparation and post transplant care are very important in the success of a sod planting. Be sure that you properly prepare the soil prior to establishment, make sure the soil is moist when laying the sod, and be sure to water frequently until the sod is firmly rooted.

Norman W. Hummel, Jr.,
Dept. of Floriculture and Ornamental Horticulture

Table 1. The Influence of Soil Type, Thickness, and Age on Sod Transplant Rooting.

Test 1: Spring Planting	2 weeks	4 weeks
	kg/sq ft	
Soil Type		
Organic	17.8 b	60.2 a
Mineral	29.3 a	60.3 a
Sod Thickness		
Thin	23.8 a	66.6 a
Thick	23.3 b	53.0 b
Sod Age		
9 mo. (mineral)	34.9 a	58.7
18 mo. (organic)	15.0 d	58.4
30 mo. (organic)	20.7 c	62.0
34 mo. (mineral)	23.8 b	61.9
Test 2: Fall Planting	3 weeks	5 weeks
	kg/sq ft	
Soil Type		
Organic	18.9 b	31.2 a
Mineral	23.7 a	34.7 a
Sod Thickness		
Thin	22.4 a	32.7 a
Thick	20.2 a	33.2 a
Sod Age		
12 mo. (mineral & organic)	20.6 b	31.5 a
24 mo. (organic)	18.7 b	33.1 a
36 mo. (mineral)	25.2 a	35.7 a

New York's Turfgrass IPM Program

1993 Highlights, Part 2

In the last issue (CUTT Spring '94), IPM Research Summaries and Highlights were presented together with a brief overview of the Cornell Turfgrass IPM Program. This article will look at IPM Implementation and Demonstration Summaries and Highlights for 1993.

IPM Implementation Summaries and Highlights

In 1993 turfgrass scouting procedures were implemented at 25 golf courses in four regions in the state (Western New York, Rochester, Westchester, and Long Island). The procedures were designed and tested by Cornell University faculty. The golf courses were monitored weekly for disease and insect occurrences, weed mappings were drawn during the season, and nine courses received a thorough grub sampling. In 1993, weed scouting techniques were refined and used in all IPM funded projects. These procedures were the focus of two superintendent training sessions and a new Cornell fact sheet, *Turfgrass Weed Management—An IPM Approach.* Seven new IPM scouts were trained and approximately 600 people attended various hands-on training sessions during the season.

According to superintendents in Rochester, the golf course IPM program has demonstrated since 1988 that monitoring could reduce the reliance on pesticide applications, while still maintaining turf quality. Others in all parts of the state commented that the information gained from scouting improves their pest management decisions and that scouting is well accepted by environmentally sensitive golfers.

As in 1992, the use of pesticides by superintendents on the Western New York Golf Course IPM Program was well below the average number of acre treatments used by superintendents who treated on a preventative basis. This represents an impressive 54% reduction in spray usage. In addition to pesticide reductions the Western New York Program had three courses where either the superintendent or the assistant superintendent participated in the weekly scouting. There is growing support by local golf course associations for the program. Half of the Western New York Program was funded by the local association; individual courses increased monetary support to approximately one-third.

Nine golf courses were intensively sampled for grubs in 1993 using procedures developed and tested at Cornell. The courses were located in Erie, Westchester and Nassau Counties. Sampling results suggested a full course treatment for only one of the nine courses sampled. Without this information, most superintendents might treat all fairways at an expense of $3,000-10,000. Sampling costs approximately $300, demonstrating a clear benefit.

In Orange County a new cost-share program was begun between the Water Quality Improvement Program and the Turfgrass IPM Program. Through this program IPM was expanded into the production of sod. From existing golf course scouting procedures a scouting guideline was designed for scouting sod. It is too early to determine the effects of the effort.

IPM Demonstration Summaries and Highlights

IPM turfgrass demonstrations are under way in many regions in the state. In Rochester, on Long Island and at the Cornell Turfgrass research plots, demonstration trials have been set up to compare different turfgrass management programs. Conventional lawn care programs have relied heavily on pesticides to maintain acceptable turf. In recent years two alternative management programs, organic and integrated pest management, have been promoted to reduce pesticide use while maintaining quality. These demonstration projects will compare conventional, organic, IPM, and no maintenance programs. Overall quality, health, and pesticide usage will be measured. The Long Island demonstrations were initiated in 1993. Preliminary results from the second year Cornell and Rochester demonstrations show that in the spring the conventional program quality was better than the organic and IPM approaches. As the season progressed the IPM and organic plots produced acceptable quality and used less pesticides than the conventional program. A field day was held at the Cornell Turfgrass Research plots in June. The demonstration was a featured segment of the field day program, attended by about 450 turf managers from around the state.

Other demonstrations included a fairway renovation and conversion to endophytically enhanced perennial ryegrass in Western New York. These grasses will be more drought and pest tolerant that the preexisting turf cover. A similar demonstration is set up on the Cornell University golf course.

To reduce the reliance on chemical insecticides three alternative insect controls were tested. Three entomogenous nematodes were tested to control white grubs and cutworms on golf course turf. In small scale plots the nematodes provided

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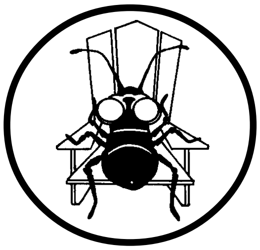
IPM Corner

The Turfgrass IPM program is a national leader in the IPM effort. In 1993, the program continued its commitment to develop a strong research and extension base. Working with the industry, the program achieved another prosperous season.

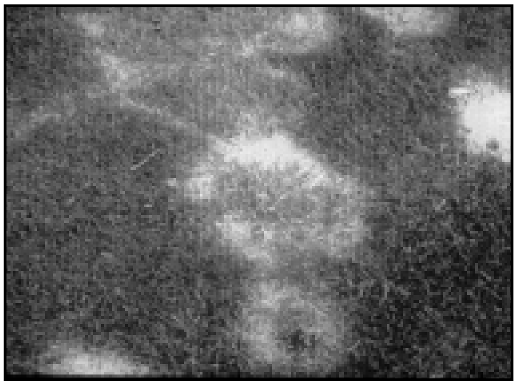


Pest Watch

A number of turfgrasses are resistant to summer patch. Therefore, resodding or overseeding affected areas with tolerant varieties of perennial ryegrass, tall fescue or Kentucky bluegrass is perhaps the best strategy for controlling summer patch.

Recognizing and Managing Summer Patch

Of all the patch diseases, summer patch is one of the most dreaded and destructive. Summer patch is caused by the root-infecting fungus *Magneporthe poae*. Symptoms often appear similar to other root and crown diseases; and other environmental and insect problems of turf. Even more confusing is that plant infection and symptom expression do not necessarily occur simultaneously, making control strategies more difficult to implement.



"Frog eye" patch is a classic summer patch symp-

Symptoms first appear later in the season, well after periods of peak root infection. Aboveground damage appears in July and August during hot (85-95˚) weather immediately after a prolonged wet period. Generally, stresses induced by chemical, physical or environmental factors will enhance the symptoms. Drought stress, however, does not significantly influence the development of symptoms.

Initial symptoms appear as small patches of thinning, dead or dying turf that look like symptoms of anthracnose or Pythium root rot. During initial stages of disease development, patches range in size from 1-3 inches. In more advanced stages, patches may be up to 12 inches in diameter. Patches at this stage may appear as a donut shape, with healthy turf in the center. Diseased turf within the patch has a yellow or reddish-brown to straw-colored tan appearance depending on the grass species, temperature and moisture conditions. Under severe conditions and high levels of disease incidence, patches may coalesce to form large areas devoid of turf.

A key element in managing summer patch is the alleviation of stress. Also, promoting a vigorous root system will reduce disease severity. For example, mowing turf at heights recommended for the particular variety are advised. Excessively low cutting heights, particularly during periods of heat stress, may greatly enhance symptoms of summer patch. Fertilization with slow-release forms of fertilizers are also recommended as are deep and infrequent irrigations. Other practices such as aerification, syringing to reduce heat stress, improving drainage, and reducing compaction and thatch will help alleviate symptoms of summer patch.

A number of turfgrasses are resistant to summer patch. Therefore, resodding or overseeding affected areas with tolerant varieties of perennial ryegrass, tall fescue or resistant

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