

Disease control in cool-season grasses

New fungicides and disease prediction models highlight this year's cool-season disease control update.

by Gail L. Schumann, Ph. D.,
University of Massachusetts

■ Before the current wide selection of fungicides was available, cultural methods were the mainstay of disease management. Today, cultural practices are still the foundation of disease management. Keep in mind, however, that resistant cultivars and biological controls will always perform best when integrated into a sound cultural program.

Stress factors—Cultural practices have two primary goals:

- minimize turf stress
- minimize opportunities for disease-causing pathogens to infect turf.

Stress can be reduced with balanced fertility and special attention to nitrogen levels. Most turf diseases are described as being either "low nitrogen," (dollar spot, red thread, anthracnose) or "high nitrogen" (brown patch, pythium blight, leaf spot). Stress reduction alone can raise or lower disease severity.

Soil factors such as drainage, pH, compaction and thatch are directly and indirectly involved in disease severity. The patch diseases (necrotic ring spot, summer patch, take-all patch) and pythium root disease are all associated with these stress factors. On putting greens, raising the mowing height, even temporarily, will reduce these and other diseases.

Summer patch breakthrough—Recent research at Rutgers University offers a new approach to summer patch control.

Summer patch is caused by a fungus that infects the roots. Ammonium sulfate, which reduces soil pH, reduces summer patch in Kentucky bluegrass and annual

bluegrass. Ammonium fertilizers have been recommended for many years to reduce take-all patch of bentgrass, also caused by a similar root-infecting fungus.

Some factors—To achieve the second goal of minimizing disease-causing pathogens, temperature and moisture must be considered.

Many fungi grow best at certain temperatures, so the disease they cause often occurs at similar temperatures. Red thread and leaf spot are most common in cool weather, but pythium blight is observed only in very hot weather. Although turfgrass managers cannot control the weather, they can minimize moisture.

Fungi need water to live. The longer water remains on the leaf blade, the more severe most diseases will be. Here are some additional hints:

- For lawns and larger landscape areas, careful irrigation timing can minimize leaf wetness and reduce diseases. Pruning and thinning trees and other landscape plantings to increase air flow will help to dry turf quickly.

- Mow turf only when it is dry.
- On golf courses, remove dew by whipping or early morning mowing.

New fungicides—Two new fungicides are available for turfgrass. Flutolanil (Prostar 50WP, from AgrEvo) is labelled for diseases caused by basidiomycete fungi such as brown patch, fairy ring, gray snow mold, red thread/pink patch, southern blight and yellow patch.

Cyproconazole (Sentinel 40 WG, from Sandoz) is a new triazole fungicide in the sterol inhibitor (DMI) group. It has a broad label for many important turfgrass disease.

Some familiar fungicides will no longer be available for turfgrass managers after current supplies are exhausted. The makers of anilazine (Dyrene) and the mercury compounds will not seek re-registration.

Mercury compounds have been restricted-use products in a number of states. They were labelled only for snow mold on golf greens and tees.

Benomyl, which has been sold as Tersan 1991 and some other products, is

no longer available for use on turfgrass.

Fungicide resistance—Resistance to disease control products is still of concern, even though the problem occurs primarily on golf courses where repeated fungicide applications are made. Resistance has been observed mostly where fungicides from the same chemical family were used repeatedly and exclusively. The most significant problems have been with pythium blight (with metalaxyl), dollar spot and pink snow mold (with fungicides from several chemical groups).

Observations of dollar spot resistance on golf courses to the sterol inhibitor (DMI) fungicides is becoming widespread, especially where DMI fungicides were used exclusively for control. Resistance is usually observed as a shortened control interval. Cyproconazole, fenarimol, propiconazole, and triadimefon—all in the DMI fungicide family—are not suitable alternatives to prevent or delay DMI resistance.

If you want to mix or alternate fungicides from different chemical families, consult specialists in your area. Some long-term studies at Penn State should mean improved recommendations on the use of reduced-rate mixtures of fungicides for improved efficacy and resistance management.

Disease prediction models—Where repeated fungicide applications are routine, such as on golf course greens, using disease prediction systems with computerized weather stations may minimize fungicide applications. Disease prediction models are available for anthracnose, brown patch, dollar spot and pythium blight.

A new brown patch prediction system from the University of Massachusetts uses air temperatures, soil temperatures, duration of high relative humidity and rainfall to predict brown patch outbreaks. Predictions are cancelled when air temperatures fall below 60° F within 48 hours of a prediction. Fungicide applications according to this forecasting system were reduced in university trials in Massachusetts, New Jersey, and Georgia compared to calendar spray schedules. A

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Table 1.

Disease control for cool-season turf

Disease name	Cultural control	Chemical control
Anthracnose	Fertilize, aerate, raise mower height, less water on leaf blades.	chlorothalonil, cyproconazole, fenarimol, propiconazole, thiophanate-methyl, triadimefon
Brown patch (rhizoctonia blight)	Avoid excess nitrogen and water; minimize water on leaf blades.	captan, chloroneb, chlorothalonil, cyproconazole, fenarimol, flutolanil, iprodione, mancozeb, maneb, PCNB, propiconazole, thiophanate-methyl, thiram, triadimefon, vinclozolin
Dollar spot	Fertilize, aerate, minimize water on leaf blades; use resistant cultivars.	chlorothalonil, cyproconazole, fenarimol, iprodione, mancozeb, maneb, PCNB, propiconazole, thiophanate-methyl, thiram, triadimefon, vinclozolin
Fairy ring	Core and water; mask symptoms with N or iron; in severe cases, remove soil or fumigate.	flutolanil, (See specialist for information on fumigants)
Fusarium leaf blight, crown and root rot	Avoid drought, minimize water on leaf blades; reduce thatch.	fenarimol, iprodione, mancozeb, thiophanate-methyl, triadimefon
Leaf spot melting out	Avoid excess N and water, minimize water on leaf blades, raise mowing height; use resistant cultivars.	captan, chlorothalonil, iprodione, mancozeb, maneb, PCNB propiconazole, vinclozolin
Necrotic ring spot	Avoid water and fertility stress, aerate. Reduce thatch; use resistant cultivars.	fenarimol, cyproconazole, iprodione, thiophanate-methyl
Powdery mildew	Improve air flow, reduce shade; avoid excess nitrogen.	fenarimol, cyproconazole, mancozeb, propiconazole, triadimefon
Pythium blight	Avoid excess N; improve drainage. Don't water at night or mow in wet weather.	chloroneb, ethazol, fosetyl-AI, mancozeb, metalaxyl, propamocarb
Pythium root rot	Improve drainage, areate, raise mowing height.	ethazol, propamocarb
Red thread/pink patch	Fertilize, avoid low pH, minimize water on leaf blades. Use resistant cultivars.	chlorothalonil, cyproconazole, fenarimol, flutolanil, iprodione, mancozeb, propiconazole, thiophanate-methyl, triadimefon, vinclozolin
Rust	Fertilize, aerate, avoid water stress and minimize water on leaf blades. Use resistant cultivars.	chlorothalonil, cyproconazole, flutolanil, mancozeb, maneb, PCNB propiconazole, triadimefon
Slime molds	Minimize water on leaf blades. Hose or rake away mold.	no fungicide necessary
Snow molds		
Typhula blight (gray snow mold)	Let turf go dormant; mow until growth stops; minimize length of snow cover.	chloroneb, chlorothalonil, cyproconazole, fenarimol, flutolanil, iprodione, PCNB, propiconazole, thiram, triadimefon, vinclozolin
Fusarium patch	Same as Typhula blight control.	chlorothalonil, cyproconazole, fenarimol, iprodione, PCNB, propiconazole, thiophanate-methyl thiram, triadimefon, vinclozolin
Stripe smut	Buy smut-free seed. Avoid excess N in spring; avoid water stress in summer. Use resistant cultivars.	cyproconazole, fenarimol, flutolanil, propiconazole, thiophanate-methyl, triadimefon
Summer patch	See necrotic ring spot. Raise mower height, lower pH with ammonium.	cyproconazole, fenarimol, propiconazole, thiophanate-methyl, triadimefon
Take-all patch	Improve drainage, lower pH with ammonium fertilizers; raise mower height; avoid P and K deficiency. Avoid using lime.	fenarimol
Yellow patch	Minimize water on leaf blades; avoid excess N. Reduce thatch.	flutolanil
Yellow tuft	Avoid excess N; minimize water on leaf blades; improve drainage. Mask symptoms with iron.	metalaxyl

NOTES: List reflects current pesticide labels. Check with your local specialists for specific recommendations. No product endorsement is implied, nor is discrimination intended against any materials. Every effort has been made to provide correct, complete and current information. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. State restrictions also vary. These recommendations are not a substitute for pesticide labelling. Read and follow label instructions.

Source: Dr. Schumann

Table 2.

Scientific and trade names of turfgrass fungicides

Scientific name	Contact/Systemic	Common trade name
captan	C	Captain 80WP
chloroneb	C	Pro-Turf Fungicide V, Teremec SP, Terraneb SP
chloroneb + thiophanate methyl	C+S	Pro-Turf Fungicide IX
chlorothalonil	C	Echo, Daconil 2787, Thal-o-nil
cyproconazole	S	Sentinel
ethazol	C	Koban, Terrazole
fenarimol	S	Rubigan
fenarimol + chlorothalonil	S+C	Twosome
flutolanil	S	Prostar
fosetyl-al	S	Aliette
iprodione	S+C	Chipco 26019 Chipco Flo, Proturf Fungicide X
mancozeb	C	Dithane, Fore Fore Flo, Mancozeb
maneb	C	Maneb, Maneb Plus Zinc
metalaxyl	S	ProTurf Pythium Control, Subdue
metalaxyl + mancozeb	S+C	Pace
PCNB	C	PCNB, ProTurf FF II, Penstar, Terraclor
propamocarb	S	Banol
propiconazole	S	Banner
thiophanate-methyl	S	Cleary's 3336, Fungo, ProTurf Systemic Fungicide SysTec 1998
thiophanate-methyl+ chlorothalonil	S+C	ConSyst
thiophanate-methyl + mancozeb	S+C	Duosan
thiram	C	Spotrete, Thiram
triadimefon	S	Bayleton, Lebanon Turf Fungicide, ProTurf Fungicide
triadimefon + metalaxyl	S	ProTurf Fungicide VII
triadimefon + thiram	S+C	ProTurf Fluid Fungicide II
vinclozolin	S	ProTurf Fluid Fungicide III, Curalan, Touche, Vorlan

Not all products are available in all states. Some products available only to licensed pesticide applicators. This list is presented for information only. No endorsement is intended for products listed, nor criticism meant for products not mentioned.

Source: Dr. Schumann

Disease control in warm-season grasses

Turfgrass disease is caused by fungi, bacteria, viruses or nematodes.

Balance chemical applications with cultural controls, in the interest of efficiency and economy.

by Bruce Martin, Ph. D.,
Clemson University

■ The wide variety of warm-season turfgrass diseases makes it imperative that chemical applications be based on correct diagnosis, in the interest of efficiency and economy.

Turf managers should strive to use integrated systems of disease management compatible with good turf horticultural practices. Pesticide applications should only be used to supplement the overall integrated pest management system.

Brown patch—Caused by *Rhizoctonia* fungi, brown patch is most commonly caused by *R. solani*, although other species have been implicated. Overall, brown

patch is the most common and damaging warm-season turf disease. It attacks bermuda, St. Augustinegrass, centipede-grass and zoysia.

Its symptoms appear in spring, as the turfgrass breaks out of dormancy, or in the fall, as the turfgrass nears dormancy.

Individual patches of diseased turf may develop to 20 or more feet in diameter. Shoots along the outer border of patches usually are yellow due to rotted leaf sheaths near the soil surface.

Control practices include good drainage and judicious irrigation practices. Avoid high nitrogen fertilization at those times when the disease is likely to appear. Several labeled fungicides provide good control when applied on a preventive fall schedule when symptoms first appear.

The new fungicide, Prostar, has shown

Disease control products for warm-season grasses

DISEASE	FUNGICIDE	Oz./1000	Interval (Days)
BROWN PATCH (warm-season turf)	Daconil 2787F	3-11	7-14
	Daconil 90WDG	1.75-6.5	7-10
	Prostar 50WP	2-3	14-21
	Bayleton 25WP	1-2	15-30
	Banner 14.3 EC	2-4	10-21
	Rubigan AS	1.5	7-14
	Chipco 26019 50WP	1.5-2	14-21
	Chipco 23.3%F	3-4	14-21
	Fore 37%F	6.4	7
	Fore 80WP	4	7
	Terraclor 75WP	16	21-30
	Terraclor 10G	7.5 lb.	21-30
	Curalan DF	1-2	14-28
	Clearys 3336 50WP	2	7-10
DOLLAR SPOT	Daconil 2787F	3-11	7-14
	Daconil 90WDG	1.75-6.5	7-14
	Banner 14.3EC	0.5 to 2	7-28
	Bayleton 25WP	1-2	30
	Curalan 50 WP	1-2	21-28
	Curalan DF	1-2	21-28
	Rubigan AS	0.75-1.5	14-21
	Chipco 26019 50WP	1.5-2	14-21
	Chipco 26019 23.3% F	3-4	14-21
	Fore 80WP	6-8	7-14
	Clearys 3336 50WP	1	14-28
	Vorlan DF	1-2	14-28
	Vorlan Flo	1-2	14-28
SPRING DEAD SPOT	Rubigan AS	4-6	Sept.-Oct.-Nov.
GRAY LEAF SPOT	Daconil 22787F	3-11	7-10
	Daconil 90WDG	1.75-6.5	7-10
	Banner 14.3%EC	2	14
LEAF SPOT	Daconil 2787F	3-11	7-10
	Daconil 90WG	1.75-6.5	7-10
	Chipco 26019 50WP	1.5-2	14-21
	Chipco 23.3%F	2-4	14-21
	Banner 14.3%EC	1-2	14-28
	Curalan 50WP	1-2	14-28
	Curalan Flo	1-2	14-28
	Vorlan DF	1-2	14-28
	Vorlan Flo	1-2	14-28
	Fore 37%F	6.4	7-14
Fore 80WP	4	7-14	
PYTHIUM DISEASES	Aliette 80WP	4-8	14-21
	Koban 30WP	2-4.5	5-10
	Subdue 2e	1-2	10-21
	Subdue 2G	12.5-25	10-14
	Banol 6E	1.3-4	7-21
FAIRY RINGS	Prostar 50WP	6	30
NEMATODES	Mocap 10G	4.6 lb.	6 months
	Nemacur 10G	2.3 lb.	6 months
	Nemacur 3E	9.7 fl. oz.	6 months

NOTE: Oz./1000 = ounces applied per 1000 sq. ft.

Source: Dr. Martin

promise for brown patch control.

Dollar spot—Dollar spot occurs on bermudagrass, zoysiagrass and occasionally centipedegrass and St. Augustinegrass. Favored by warm, humid weather, it is more severe on nitrogen-deficient turf

with dry soil.

On closely mowed turf, patches of about one to two inches in diameter develop. On higher cut turf, patches may exceed five or more inches in diameter.

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Insect control, South

Using a variety of techniques is best for consistent control of insect pests in the southern U.S.

by Pat Cobb, Ph.D.,
Auburn University

■ The big three—grubs, mole crickets and fire ants—continue to pose the most problems for landscape managers in warm-season areas, particularly in the Southeast.

Your own most important turf insect pest depends on your location and the grasses you manage. Mole crickets are considered primary pests in Florida, south Georgia and Gulf states in the Southeast. Grubs and fire ants are of great importance in Texas; chinch bugs in Louisiana; grubs in California.

To cope with these insects and others, landscape managers are relying more on diversified control techniques. Besides the standard chemical controls, turf professionals continue to increase their efforts to culturally and biologically manage insect pests.

Insect pest management on turf in the South is a year-round job. Although actual control efforts can extend from March through November in some areas, most southern turf managers consider insect control to be a part of a total management scheme for growing grass.

Each year brings with it a unique set of conditions that contribute to the development of turf pest problems.

Seasonal influence—Spring rains or drought can greatly influence pest populations.

Insect eggs, such as those of soil pests, need some moisture to survive. Excess moisture, (saturated soil), however, over a period of several weeks can drown grub and mole cricket eggs and prevent hatching.

The blizzard of March 13, 1993,
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Insecticides for warm-season turf

INSECT PEST	INSECTICIDES*	TIMING	APPLICATION
Mole crickets	**Crusade 5G; Mainstay Mocap 10G; Oftanol 2 or 5G Orthene TT & O Pageant DF; **Triumph 4E Turcam 2.5G; Dursban bait	Map spring tunneling activity for treatment when nymphs hatch. <i>Do not use Oftanol more than two consecutive years in the same areas</i> ; apply Oftanol no later than when hatching begins. Crusade/Mainstay, Mocap and Turcam should be applied 4-6 weeks after first hatch. Apply Pageant two weeks after first observed hatch; Orthene or Dursban bait, 6-8 weeks after first hatch.	Irrigate the day before treatment or as lab recommends if dry conditions exist. Follow label for post-treatment irrigation directions. Treat late in the day.
Sod webworms	B.t. products **Crusade 5G or Mainstay **Diazinon Dursban Turf Insecticide or Pageant DF Prolox or Dylox Orthene TT&O **Tempo 2 **Triumph4E	Tropical sod webworm is the major species in Florida, and has spread in some seasons along the Gulf Coast into south Texas. In Florida, populations usually do not build up until June in the south, July in central and August in northern Florida and mid-coastal areas.	Delay mowing or irrigation for 24 hours after treatment or as label specifies.
Two-lined spittlebugs	**Diazinon Orthene TT&O Pageant DF	Treat when nymphs are present in spittle masses in the turf. Infestations usually begin in shady areas.	Water before treatment. Dethatching when recommended may improve control and disrupt spittlebug habitats. Treat late in the day.
Chinch bugs	**Crusade 5G or Mainstay **Diazinon Dursban Turf Insecticide Oftanol Orthene TT&O Pageant DF Scimitar **Tempo 2 **Triumph 4E	Replace turf with resistant or non-susceptible variety. More a problem in dry weather. Monitor St. Augustinegrass weekly, concentrate on sunny areas. Spot treat infested areas if possible.	Granules may be effective in heavily thatched turf.
Grubs	**Crusade 5G or Mainstay **Diazinon Dylox or Prolox **Mocap 10G Oftanol **Merit **Triumph 4E Turcam 2.5G	Summer treatments are best; most pest species have hatched by early to mid-August. Grub treatments may be effective through early fall, depending on location, species and soil moisture conditions. Map areas suspected to be infested and spot-treat to reduce treated areas. <i>Do not use Oftanol more than two consecutive years in same site.</i>	Irrigate the day before treatment to move grubs up in the soil. Follow label watering instructions.
Billbugs adults	**Diazinon Dursban or Pageant Dylox or Prolox Sevin **Triumph 4E	Treat when adults are numerous in early summer.	Follow label watering instructions carefully.
larvae	Exhibit **Merit **Triumph 4E	Treat in late March-April or July-August when larvae are present.	
Ground pearls	none	Follow recommended fertilization, irrigation, mowing, disease and nematode practices. Grass will in many cases "outgrow" damage.	n/a
Imported fire ants	<i>baits:</i> Affirm, Ascend, Amdro, Award or Logic <i>contact mound treatments:</i> **Diazinon; Dursban; Orthene fire ant products.	Apply baits in afternoons when worker ants are seen foraging. Do not disturb mounds before treatment.	For high traffic areas, apply bait broadcast. If Affirm or Award is used, treat visible mounds with a contact insecticide 2-3 days later.

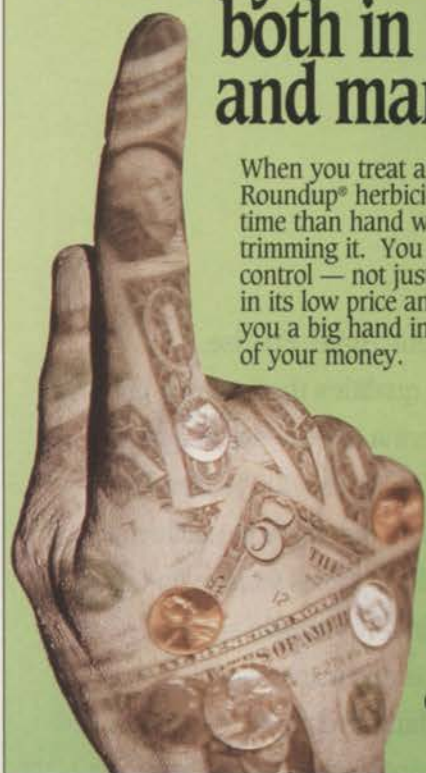
*Some recommended insecticides

Label restriction: **Mocap 10G is labelled for commercial turf (golf courses, sod farms) only. **Diazinon** is not labelled for use on golf courses or sod farms. **Triumph 4E** is restricted to certain soil types and several application techniques must be followed. It is labelled for use on lawns, sod farms and golf courses (only tees, greens and aprons). A maximum of one application per year is permitted to the higher surface insect rate and a maximum of two applications per year at least 60 days apart for the lower surface insect rate. **Tempo** is for home lawns only. **Merit** is not for sod farm use. **Crusade** is for golf courses and sod farm use. Check all labels to confirm site usage.

Source: Dr. Pat Cobb

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DISEASE WARM from page 26

Characteristic leaf lesions are tan with distinct reddish-brown or purplish margins. Leaves may become girdled.

Practices that reduce disease severity include using balanced fertility, early morning irrigation (when needed) during periods of high humidity, and regular mowing at the correct height of cut. Several fungicides provide good control, but are generally unnecessary in lawns.

Spring dead spot—Spring dead spot occurs in transition zone areas of the United States. It is common in Piedmont and mountain areas in the Carolinas and Georgia, but rare in the coastal regions of these states. Several fungi have recently been implicated as possible causal agents of this disease.

Dead circular areas of turf two or three feet in diameter are present in the spring as the bermudagrass breaks dormancy. Patches may occur in circles with healthy grass in the center, giving a "doughnut" appearance, and may persist over the summertime. Patches of diseased turf may persist for several years.

Generally, the disease develops in three- to six-year-old turf. Excess thatch, late summer nitrogen applications, and low temperatures in winter have been implicated as predisposing factors for spring dead spot development.

Maintain a balanced fertilization program and proper thatch management and avoid high rates of late summer nitrogen applications. Some control has been obtained with Rubigan applications made in September and October.

Gray leaf spot—Gray leaf spot appears in hot, humid weather. It's more severe in newly-established turf, in shady spots with poor air flow. It is commonly found in St. Augustinegrass.

Infections occur on all above-ground plant parts and begin as small brown spots with a distinct brown to purple border surrounding the infected tissue. Lesions may become numerous and expand to completely consume leaves and girdle stolons. Prolonged disease may leave turf looking scorched.

Improve air movement and light penetration and irrigate as needed during early morning hours to promote maximum drying during the day. Avoid high nitrogen fertilization during those periods favorable for disease development.

Daconil has given good chemical control.

Leaf spot—*Bipolaris sorokiniana* causes leaf, crown and root disease of bermudagrass and zoysiagrass during warm, wet weather in mid-summer. The diseases start as leaf spots, and may progress to crown and root rots. *Exserohilum rostrata* has been reported to cause a leaf spot of St. Augustinegrass and bermudagrass. Centipedegrass infection is rare.

On bermudagrass or zoysiagrass, small brown lesions appear on leaf blades and sheaths and may expand to larger irregular straw-colored lesions. Gradual browning and thinning occurs over a period of weeks or months.

Avoid high nitrogen fertilization and watering practices that provide long periods of wet or humid conditions.

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Frequent mowing at proper heights helps reduce the leaf spot phases of this disease.

Pythium diseases—Warm-season grasses may be affected by pythium disease. Some *Pythium* species cause general decline by infection of roots. St. Augustinegrass is susceptible during prolonged warm, wet periods. Poor surface and subsurface drainage favors development of *Pythium* fungi, and encourages development of algae in areas where disease has weakened the grass.

Provide good drainage and remove tree limbs to increase air movement and light penetration. Some fungicides specifically for *Pythium* fungi have provided additional control.

Fairy rings—These appear as rings or arcs of green stimulated turf which may be accompanied by declining grass and mushroom formation. Problems develop when mushroom mycelia accumulate in the soil and cause the soil to become dry.

Fairy rings may persist and increase in diameter over the years. The fungi feed on old roots, stumps or thatch. Newly-built putting greens may develop infestation after only a few years or even months.

Control measures that have shown limited success include tilling and fumigation or irrigation to saturate the soil for several hours and over several days. It may be futile to attempt to control rings occurring around trees. In this case, consider landscaping the areas with non-turfgrass plants.

There has recently been some success with suppression

in putting greens using Prostar fungicide.

Nematodes—Turf that is heavily infested with damaging nematode species appears unthrifty; weeds invade weak or dead areas. Infested areas tend to wilt prematurely, even when adequate soil moisture is available.

Integrated management uses several methods to suppress the nematodes and maintain the turfgrass so that it can withstand some level of infestation. Although valuable, nematicides provide temporary suppression of nematode levels.

Two nematicides are available and may only be used in commercial turf areas, such as sod farms or golf courses.

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