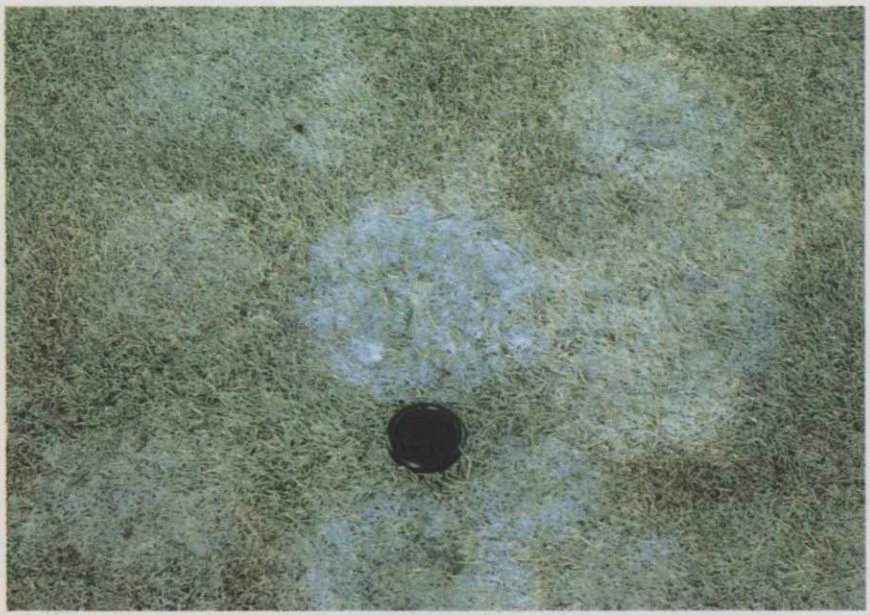
COOL-SEASON TURF DISEASES

by J.M. Vargas, turfgrass pathologist, Michigan State University



Typhula blight or gray snow mold.

Concepts about turfgrass diseases and their management have gone through many changes in the past few years, including the scientific names of the organisms that cause them.

These diseases, the organisms that cause them, and their cultural, biological, and chemical management tools are given in Table 1 (page 46).

The following will be a discussion of the latest developments on cool-season turfgrass diseases.

The patch diseases

There are a group of diseases that produce patches on desirable turfgrass species primarily by attacking the root system of the plants. This group of diseases was often mistakenly referred to as **Fusarium** blight in the past.

There are many other patch diseases of turf but they primarily attack the foliage, crowns, rhizomes, and stolons.

Summer patch

It has become increasingly evident over the past few years that summer patch, caused by *Phialophora graminicola*, is a primary disease of annual bluegrass during warm weather.

It can also be found on Kentucky bluegrass and fine-leaf fescues, but far less frequently.

On annual bluegrass, the initial symptoms are a yellowing of the turf in patches, usually 6 inches to one foot in diameter, followed by a thinning of the turf with the remaining turf turning bronze in color.

If warm weather persists all the turf in the patches may die. Most of the creeping bentgrass cultivars are resistant, and creeping bentgrass frequently can be seen recolonizing the centers of these patches.

Preliminary data indicate that soil temperature and soil moisture may be important in the development of this disease.

Excessive irrigation during hot periods or absence of irrigation following the hot period may make the diseases more severe.

Fungicides for the management of summer patch can be found in Table 2 (page 46). High rates of application are required to manage this disease and fungicides such as Tersan 1991, Fungo 50, and Cleary's 3336 will have to be drenched in to be effective.

Necrotic ring spot

It now appears that necrotic ring spot, caused by *Leptosphaeria korrae*, is the primary patch disease found on Kentucky bluegrass.

The symptoms can be observed throughout the growing season even though *L. korrae* appears to be most active during the cooler weather of the spring and fall. The plants that were infected by *L. korrae* in the cooler weather are in a weakened condition and are very susceptible to summer heat stress or drought stress.

Subjecting the necrotic ring spot plants to either of these stresses will lead to the death of the weakened plants and the recurrence of symptoms, even though the pathogen may not be active at this time.

The initial symptoms are patches 6 inches to two feet in diameter with straw- and red-colored blades intermingled in the patch.

Older patches may have green grass in their centers with the straw- and red-colored blades in the outer area of the ring, giving a frog-eye appearance. When symptoms appear in the warm weather, the red blades are often scarce.

Nitrogen is important for recovery of the patches caused by necrotic ring spot. Three to five pounds of actual nitrogen/1,000 sq. ft./season is necessary to promote recovery of necrotic ring spot patches.

Proper cultural practices are also important in patch recovery and in the prevention of new ones.

These include coring to relieve compaction and layers that result when sod of one soil type is laid on top of soil of another, which is common practice during the establishment of home lawns and commercial

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TABLE 1
The patch disease, casual organism and primary host.

Disease	Organism	Primary Host
Summer patch	*Phialophora graminicola*	Annual bluegrass
Necrotic ring spot	*Leptosphaeria korrae*	Kentucky bluegrass
Take-all patch	*Gaeumannomyces graminis*	Creeping bentgrass

Red thread on perennial ryegrass.

lawn properties.

This results in short rooting during the warm weather (when the roots of the turfgrass plant are confined to the upper layer).

Coring and re-incorporating the soil back into the thatch will, over a period of years, alleviate the layering problem. It may also help manage any potential thatch problem, which is important in managing necrotic ring spot. Thatch has a poor moisture holding capacity, and turfs growing in a thick thatch are more susceptible to drought stress.

Light, frequent irrigation is also important in managing this disease. The theory that deep, infrequent irrigation is more beneficial to turf development is just that, a theory. Preliminary research data indicates that light, frequent waterings may be more beneficial to the turf. Such waterings on a daily basis, around midday, have certainly been shown to help manage necrotic ring spot. The turf appears to be benefitting culturally from the cooling of the turf and biologically from the build-up of beneficial micro-organisms in the moist thatch that may be antagonistic to *L. korrae*.

Lawn Restore, Green Magic, and Strengthen and Restore are products which appear to be supplying some biological management of necrotic ring spot. These products contain antagonistic micro-organisms (Lawn Restore) or their by-products (Green Magic, Strengthen and Restore). They have been effective in promoting the recovery of necrotic ring spot patches and preventing the development of new ones.

The key word is "management." These products are not a one-shot cure, but used systematicaly on a regular basis, they will manage this disease and provide a healthy turf.

In addition to the antagonistic micro-organisms and their by-products, these products contain the major and micronutrients necessary for a healthy turf.

Take-all patch

Take-all patch, caused by *Gaeumannomyces graminis* var. *avenae* was formerly known as *Ophiobolus* patch caused by *O. graminis*.

This disease was originally thought to be confined to the Pacific Northwest. It has now been reported throughout the United States and Canada wherever creeping bentgrass is grown.

Lowering the pH through the use of sulfur still appears to be the best way to manage this disease.

A word of caution: the granular sulfur products have been observed to cause injury to the turf the season following application. This injury initially resembles dollar spot. The sprayable sulfurs are just as effective and do not have the bad side effects.

OTHER DISEASES

Dollar spot

Dollar spot was considered a disease which occurred primarily on golf courses. However, with the introduction of the new perennial ryegrasses, it is becoming an important problem on home lawn turfs.

The disease was originally believed to be caused by *Sclerotinia homoeocarpa*, but is now believed to be caused by two other organisms, a *Lanzia* spp. and a *Moellerodiscus* spp.

Identification of the two fungi as dollar spot's cause helps explain some of the confusion that has existed about the occurrence of this disease.

It has been, and still is, considered both a cool-weather and warm-weather disease. Two different fungi appear to have caused a disease with similar symptoms. This means that you can have dollar spot at any temperature between 60 to 85 degrees F.

An easy, reliable method to distinguish the difference between these two fungi in the field is thus needed.

Fortunately, dollar spot caused by both fungi appears to be reduced by adequate nitrogen levels. For the most part, they are also managed by the same fungicides, although the question is raised whether to some fungicides might not be due to the differential sensitivity of the two fungal species causing this disease.

TABLE 2
Turf Disease and Controls.*

Disease	Causal Agent	Hosts	Biologial and Cultural Control	Chemical Control
Anthracnose	*Colletotrichum graminicola*	Annual bluegrass Fine-leaf fescue Kentucky bluegrass Perennial ryegrass	Adequate nitrogen. Cool grass by syringing.	Maneb plus zinc sulfate, chlorothalonil, benomyl, thiophanate-methyl, thiophanate, thiophanate-methyl + mancozeb, triadimefon
Brown patch	*Rhizochtonia solani*	All major turf-grass species	Reduce nitrogen. Remove "dew." Increase air movement.	Mancozeb, maneb + zinc sulfate, chlorothalonil, anilazine, cycloheximide + thiram, benomyl, thiophanate-methyl, thiophanate, thiram, thiophanate-methyl + maneb, cadmium compounds, thiophanate + thiram, PCNB, iprodione, vinclozolin
Dollar spot	*Lanzia spp.* *Moellerodiscus spp.*	Annual bluegrass Bahiagrass Bermudagrass Centipedegrass Colonial bentgrass Creeping bentgrass Fine-leaf fescues Kentucky bluegrass Perennial ryegrass St. Augustinegrass Zoysiagrass	Increase nitrogen. Remove "dew."	Benomyl, thiophanate, thiophanate-methyl, chlorothalonil, anilazine, cycloheximide + PCNB, cadmium compounds, thiophanate + thiram, thiram, thiabendazole, benomyl, iprodione, thiophanate-methyl + maneb, vinclozolin, triadimefon, fenarimol
Summer patch	*Phialophora graminicola*	Annual bluegrass Kentucky bluegrass	Light, daily watering during the summer.	fenarimol, thiophanate-methyl, thiophanate, triadimefon, iprodione, benomyl
Helminthosporium Diseases	*(Dreschlera)*			
Brown blight	*D. siccans*	Ryegrass	Remove clippings. Raise cutting height. Plant resistant cultivars. Moderate spring nitrogen. Daily irrigation.	Mancozeb, chlorothalonil, cycloheximide, anilazine, maneb + zinc sulfate, cycloheximide + thiram, cycloheximide + PCNB, iprodione, vinclozolin
Leaf blotch	*D. cynodontis*	Bermudagrass Kentucky bluegrass
Melting-out	*D. poae*	Fescue Creeping bentgrass
Net-blotch	*D. dictyoides*	Bermudagrass
Red leaf spot	*D. erythrospila*	Bermudagrass
Stem and crown necrosis	*D. specifera*	Bentgrass, fine-leaf fescue, Kentucky bluegrass
Zonate Eye spot Leaf spot	*D. gigantea* *Bipolaris sorokiniana*	

Brown patch

Brown patch was a disease believed to occur primarily on golf courses. However, again, with the introduction of the new improved perennial ryegrasses into home lawn turfs, it is also becoming a problem on home lawns.

The disease occurs under hot, humid conditions. It can be culturally managed by reducing the amount of nitrogen applied just prior to the advent of warm weather, and by increasing air circulation by removing and/or pruning trees or shrubs.

Pythium blight

Pythium blight was also a disease primarily occurring on golf courses, but, like dollar spot and brown patch, it is becoming more of a home lawn problem with the incorporation of the improved perennial ryegrasses into home lawn turfs.

There still seems to be some controversy over how many species of *Pythium* are involved in this disease. But regardless of how many or how few there are, they do tend to cause rapid loss of turf in hot, humid weather. Unlike many diseases where only the foliage is damaged and recovery occurs quickly, *Pythium* blight usually kills the plant. This means recovery in the infected areas will be slow because it will have to come from rhizomes or stolons that fill in from outside the spots or by germination of annual bluegrass or broadleaf

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TABLE 2 *continued*

Disease	Causal Agent	Hosts	Biological and Cultural Control	Chemical Control
Take-all patch	*Gaeumannomyces graminis*	Creeping bentgrass Kentucky bluegrass Velvet bentgrass	Reduce soil pH. Avoid liming, Use acidic fertilizers. Sulfur.	fenarimol
Pythium blight (cottony blight)	*Pythium spp.*	Perennial ryegrass Creeping bentgrass Annual bluegrass	Improve soil drainage. Increase air circulation.	chloroneb, ethazol, metalaxyl, propamocarb
Red thread	*Laetisaria fuciformis*	Creeping bentgrass Colonial bentgrass Bermudagrass Annual bluegrass Perennial ryegrass Fine leaf fescues	Increase nitrogen.	anilazine, iprodione, triadimefon, vinclozolin, chlorothalonil
Pink patch	*Limonomyces roseipellis*	Perennial ryegrass Creeping bentgrass Fine leaf fescue	Increase nitrogen.	Try red thread fungicides
Snow molds *Typhula* blight *Fusarium* patch	*Typhula spp.* *Fusarium nivale*	Annual bluegrass Colonial bentgrass Creeping bentgrass Fine-leaf fescues Kentucky bluegrass Perennial ryegrass Tall fescue Velvet bentgrass	Avoid early fall nitrogen fertility that leads to lush growth.	Mercury compounds, PCNB products, chlorothalonil, chloroneb. These products may have to be used in combination for effective snow mold management. Benomyl, iprodione or mancozeb will control *Fusarium* patch where it occurs alone.
Necrotic ring spot	*Leptosphaeria korrae*	Kentucky bluegrass	Nitrogen to promote recovery. Light daily irrigation. Lawn Restore, Green Magic, Strengthen & Restore.	iprodione, fenarimol, benomyl, thiophanate, thiophanate-methyl

**The order in which fungicides are presented does not imply the order of their effectiveness.*

weeds when the cool weather of the fall returns.

Cultural management of *Pythium* blight consists of reduced nitrogen levels just prior to the advent of warm weather and improved drainage. Concerning the latter, in marginal areas of the cool season grass regions, *Pythium* blight is only a problem in areas of poor soil drainage, where water stands for prolonged periods.

In regions where severe *Pythium* blight damage occurs, it is always most severe in poorly drained soil areas. So good *Pythium* blight management begins with improving soil drainage.

As far as chemical management is concerned, two systemic fungicides, metalaxyl and propamocarb hydrochloride, are available to manage the disease for up to three weeks. They appear to be slower acting than chloroneb or ethazol.

Little spread of the disease occurs after these systemic fungicides are applied, although the mycelium of the fungus may remain evident on the previously infected tissue for a couple of days. No actual resistance to these two fungicides has been reported, but the possibility exists.

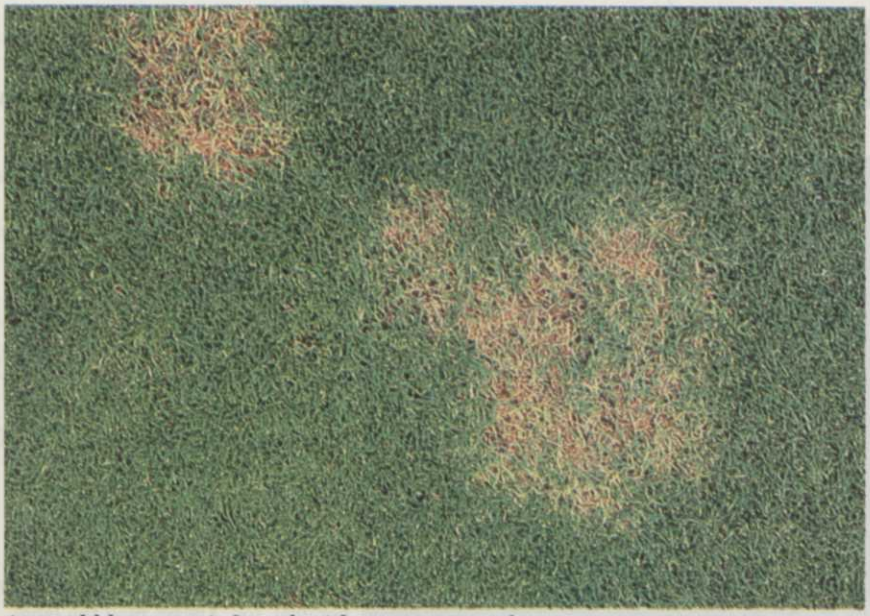
It would be wise, therefore, to follow each systemic fungicide application with a contact fungicide (chloroneb or ethazol) application so if resistance does occur following a systemic fungicide application, the contact fungicide will prevent the resistant strain from devastating the turf.

Anthracnose

Anthracnose, caused by *Colletotrichum graminicola*, is primarily a disease of annual bluegrass, although it will attack the fine-leaf fescues, perennial ryegrasses, and seaside creeping bentgrass.

Annual bluegrass dies from anthracnose during heat-stress periods of the summer, and not due to heat alone, as was once believed. If proper cultural management is followed and effective fungicides are used, annual bluegrass will survive the summer heat stress period like any other perennial.

One good cultural practice consists of deep, vertical mowing early in the spring, as soon as growth is initiated for the season. This will allow for the



Annual bluegrass infected with summer patch.

production of new, juvenile growth which should be more resistant to heat stress. Coring should follow a week or two later for good root growth.

A second coring cultivation should be done following heavy seedhead production in the late spring to provide an optimum medium for maximum root growth (the coring holes) in the few remaining weeks prior to the heat stress period.

If only one coring operation a year can be done, this is the time to do it, because over 70 percent of the annual bluegrass roots disappear during heavy seedhead production.

A third coring operation should be done when the cool nights of late summer and early fall return. Light nitrogen applications should be made, i.e. ½ pound actual nitrogen per 1000 sq. ft. in June, July, and August for a healthier annual bluegrass plant and to reduce the amount of inoculum produced by *C. graminicola* for subsequent infection during the remainder of anthracnose season.

Finally, one of the effective fungicides mentioned in Table 2 should be used to assure healthy turf. A computer model has been developed which predicts the occurrence of anthracnose based on average daily temperatures and continuous hours of leaf wetness. Fungicides for the management of anthracnose can now be applied when the disease occurs, instead of on a calendar basis.

The snow molds

There are two prevalent snow molds in the U.S., *Typhula* blight (gray snow mold) and *Fusarium* patch (pink snow mold).

Gerlachia (Fusarium) Patch: Fusarium patch, caused by *Fusarium nivale*, becomes a problem in the fall when the temperature drops into the low 60s or lower, and continues at these levels through the spring. Disease activity may continue until the daytime temperature climbs back in the 70s.

It is usually first noticed in the shaded areas of greens, tees and fairways. *Fusarium* patch does not need snow cover to become active, only cool, wet weather. Annual bluegrass is especially susceptible to *Fusarium* patch. In the spring, the disease is often mis-diagnosed as copper spot, because of the small copper colored spot that it causes.

However, copper spot is a disease that occurs in warmer weather. Keeping the nitrogen at low levels during the time when *Fusarium* patch may be active is important in helping manage the disease.

Typhula blight: *Typhula* blight is caused by two species, *Typhula incarnata* and *T. ishikariensis*. *T. incarnata* is the primary species in the eastern U.S. and in southern and mid-regions of the Midwest and western U.S.

*T. ishikariensis*is most prevalent in the more northern snow mold regions, especially where prolonged periods of permanent snow (two or more months) exist in the midwestern and western U.S.

The two *Typhula* species are easily distinguished from each other when observed soon after the snow melts. *T. incarnata* produces grayish spots in the turf, with scattered, fairly large, brown sclerotia evident, whereas *T. ishikariensis* spots have a reddish cast to them and contain numerous small, dark black sclerotia.

Nitrogen is important for recovery of the patches caused by necrotic ring spot.

Typhula blight only occurs under snow cover. It does not occur in the cool, wet weather of fall and spring, except under leaf piles.

Knowing which species you have is important in chemically managing the disease. Many fungicides, including the mercuries, chloroneb, PCNB, triadimefon and chlorothalonil, will manage *Typhula* blight caused by *T. incarnata*. They do not all manage *Typhula* blight caused by *T. ishikariensis*. The picture also is more confusing state by state.

For example, in Michigan the mercuries, PCNB, and chlorothalonil will manage both species, but triadimefon and chloroneb will not manage *Typhula* blight caused by *T. ishikariensis*.

In northern Wisconsin and Minnesota, combinations of the mercuries and PCNB are required to manage both species. You should check with your local turfgrass experts to find out which fungicides are effective in your area.

Melting out

This disease is often incorrectly referred to as leaf spot. To be correct, melting out caused by *Dreschlera poae* (formerly *Helminthosporium vagans*), is a cool-season disease of Kentucky bluegrass that occurs in the cool, wet weather of the spring.

The disease starts out as spots on the leaf blades and, in a two- to three-week period, rapidly moves down the leaf sheath and into crowns and roots.

The entire grass plant is often killed

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Necrotic ring spot on Kentucky bluegrass.

or severely damaged during this period, which is where the term melting out arises. The entire stand of Kentucky bluegrass seems to melt away.

Leaf spot, on the other hand, is a warm weather disease of many grass species, caused by the fungus *Bipolaris sorokiniana* (formerly, *Helminthosporium sativum*).

Ignore the idea... that the lawn doesn't need watering because we just had a heavy rain.

There are many Kentucky bluegrass cultivars that are resistant to melting out, the first of which was Merion.

Some of the newer Kentucky bluegrass cultivars—Parade, Baron, Cheri, Majestic, etc.—have some resistance to melting out, although it is not the same excellent resistance Merion had.

Consequently, stands of some of the newer Kentucky bluegrass cultivars may be thinned by melting out in the spring, allowing for invasion by crabgrass, quackgrass, tall fescue, and/or broadleaf weeds. This means cultural, biological and chemical management practices to reduce the severity of melting out will have to be incorporated into your turf management programs.

Helminthosporium melting out is one of the oldest, most-written-about turfgrass diseases. Unfortunately, much of what has been written about the disease, is based on "folk lore" and not on good scientific data.

First, much of the older literature refers to melting out and having a "leaf spot stage" in the spring during the cool, wet weather and a "melting-out stage" in the spring during the hot weather of the summer.

But, anyone who is familiar with the disease knows all the damage is done during the cool, wet weather of spring. With the arrival of warm weather, the turf begins to recover.

Secondly, practically all the literature advises against the application of spring nitrogen, because it will increase the severity of *Helminthosporium* melting out.

It appears the research that lead to this erroneous conclusion was based on greenhouse data and not field data.

At Michigan State University, data from the last four years suggests that just the opposite is true. Nitrogen in the spring actually reduces the severity of *Helminthosporium* melting out.

We recommend two nitrogen applications during the spring period to help manage *Helminthosporium* melting out, each between ½-1 pound of actual nitrogen/1000 sq.ft.

The third management practice is biological in nature. It consists of daily irrigation to keep the mat or thatch moist and to encourage the build-up of antagonistic micro-organisms that prevent the fungus *D. poae* from sporulating, germinating, or infecting.

These antagonistic micro-organisms may even possibly destroy *D. poae*. While the causes have not been discovered, the results have shown a dramatic reduction in the amount of *Helminthosporium* melting-out, where light, daily irrigation has been applied.

The actual concept may be hard to grasp since the disease occurs under cool, wet weather conditions, but apparently just a few days without rain allows the top of the thatch to become dry and allows the *D. poae* fungus to grow and infect these grass plants.

Remember, the key to having the daily irrigation program work is daily irrigation. You have to ignore the idea that the lawn doesn't need watering because we just had a heavy rain. You aren't irrigating the turf, you're irrigating the thatch to keep it moist.

This is not to say we have eliminated the need for fungicides in managing this disease. That may some day be a reality, but much more research needs to be done on the mechanisms involved in biological and cultural management of *Helminthosporium* melting out.

In the meantime, there are many excellent fungicides for the management of *Helminthosporium* melting out listed in Table 1. Also, remember, following good cultural and biological practices will help improve the disease management obtained with the fungicides.

For people in the lawn care industry, there are now three excellent fungicides which will manage *Helminthosporium* melting out during the three to four weeks it is normally a problem in the spring; iprodione, vinclozolin, and chlorothalonil.

There is a possibility that anilazine may also manage the disease for the desired period of time, although more research is needed.

Remember, maintaining adequate levels of nitrogen will make these fungicides more effective.

Red thread

Red thread was believed to be caused by *Corticium fuciforme*, but new evidence has shown the correct name to be *Laetisaria fuciformis*. Also, the disease complex formerly referred to as

red thread has been split into two diseases: red thread and pink patch.

Red thread is an especially serious problem on slow-growing turf, whether growing slowly from lack of adequate nutrition, irrigation, or the cold weather.

New perennial ryegrasses are highly susceptible to red thread and with more of these varieties being used in home lawn turfs, this disease is becoming more and more important.

Red thread can be recognized by the red to coral pink stroma present on the foliage. The stroma appear fleshy and gelatinous when the turf is moist, later drying to become thin and thread-like. The lawn may appear as though it is infected with *Helminthosporium* or dollar spot, when viewed from a distance.

Adequate nitrogen and irrigation will manage the disease on Kentucky bluegrass and fine-leaf fescues and help reduce the severity of this disease on perennial ryegrass.

However, perennial ryegrasses are so susceptible to red thread that fungicides will be necessary to manage the disease when severe outbreaks occur.

Pink patch

This disease was formerly grouped under red thread, which was believed to be caused by *Corticium fuciforme*. Pink patch is now considered a separate disease caused by *Limonomyces roseipellis*.

Like red thread, it is primarily a cool weather disease which is more severe under conditions of low fertility. It primarily attacks the above ground portions of the grass plant.

The disease is first evident along the margins of the leaf blades, as small, irregularly-shaped blotches of pink. Eventually, the entire width of the blade may take on a pinkish cast. The pink mycelium never becomes as pronounced as the stroma of the red thread fungus.

Pink patch has been known to be a problem on perennial ryegrass and fine-leaf fescue for some time. It has recently been found to be a problem on creeping bentgrass, in particular, Penneagle. This is probably due to the fact that Penneagle is more susceptible than the other creeping bentgrasses and to the trend toward lower rates of nitrogen on golf course greens.

When pink patch occurs on closely mowed turf, the patches are anywhere from a few inches to two feet in diameter.

If you don't have a dissecting scope or microscope handy to distinguish the two diseases, place a sample of the diseased turf in a plastic bag with a moist paper towel and seal it. In a few days, if the patches are caused by pink patch, pink tufts resembling cotton candy will appear on the infected grass blades.

Increasing the amount of nitrogen will help reduce the severity of pink patch. No fungicide data exists for the management of this disease. If it becomes a problem, you may wish to try one of the fungicides recommended for red thread. **WT&T**

DISEASES OF WARM SEASON TURF

by Don Blasingame, extension plant pathologist, Mississippi State University

Managers of southern turf not only fight diseases of six different warm season turf species, but also diseases of overseeded cool season turf species.

Although most southern turf diseases are caused by fungi, agents such as bacteria, viruses, and nematodes, can cause serious problems to certain grasses.

Southern turf managers can't depend solely on fungicides for disease control. Good variety selection, proper fertilization, and appropriate cultural practices are very important in disease control.

No amount of fungicide will compensate for poor fertility and cultural practices.

Brown patch

Brown patch is the most common turf diseases occurring in the Southeast. Although St. Augustine and zoysiagrass are the most susceptible species, even the more tolerant centipedegrass, bermudagrass and ryegrass are frequently damaged by this fungus.

Brown patch is favored by warm, moist weather combined with cool nighttime temperatures. Therefore, in certain areas of the South, brown patch can and does occur any month of the year.

In the upper regions of the South, the most favorable conditions for brown patch development occur from late April through mid-October.

Symptoms of brown patch on warm season grasses are different than the symptoms of the disease on cool season turf. Even though the grass is usually killed in a circular pattern, many times the smoke ring is not seen on southern turf.

Under certain conditions the fungus may cause a gradual thinning of the turf over a rather large area instead of killing in a circular pattern.

There are several factors that tend to make the grass more susceptible to brown patch. One is the excessive ap-

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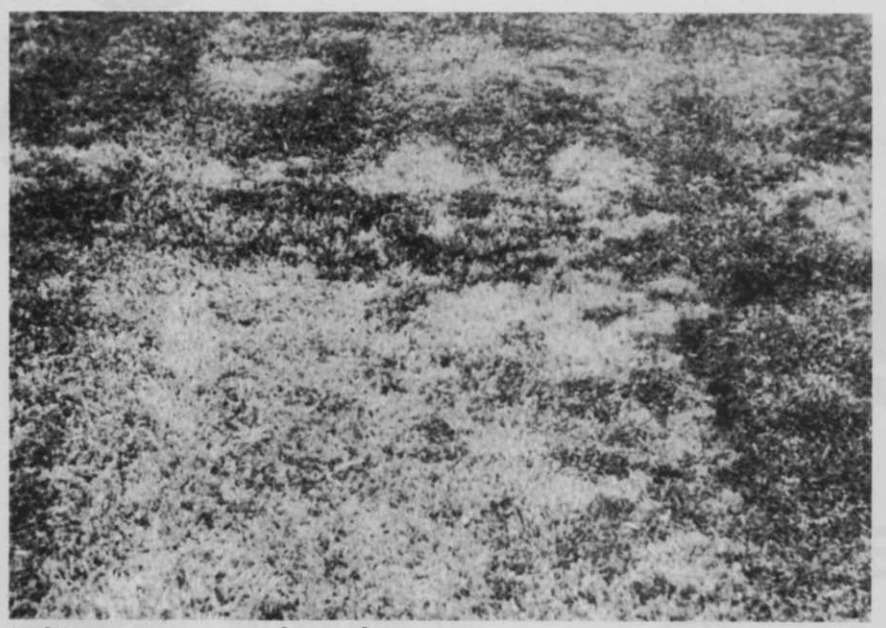
A developed case of fairy ring on centipede grass.

Rust on zoysiagrass.



Melting out on common bermudagrass.

plication of nitrogen fertilizer. The resulting lush growth is readily attacked.

Another is watering late in the afternoon and allowing the grass to remain wet for long periods of time. Excessive accumulation of thatch also creates a favorable environment for development of brown patch and many other diseases.

Fungicides are best used on a preventative schedule. Once symptoms develop, control can be difficult.

Dollar spot

Dollar spot is common on many species of grasses, including bermudagrass, zoysiagrass, and annual and perennial bluegrasses.

Symptoms of dollar spot are different on certain warm season grasses than those noted on cool season grasses.

On finer textured grasses, such as bermudagrass and zoysiagrass, the disease kills grass in small patches two to three inches in diameter. Under severe conditions, these patches may coalesce so that the turf has a mottled appearance. Blades of grass at the outer edges of the infected area develop tan spots with reddish brown margins.

On coarser warm season grasses, turf is killed in larger patches ranging up to a foot in diameter.

Dollar spot is prevalent during periods of mild weather during the spring and fall.

Unlike brown patch, dollar spot is retarded by high levels of nitrogen. Still, turf managers should consider the impact of high nitrogen on brown patch and other diseases.

Watering should be performed only in the early morning so the foliage can dry quickly. Fungicides can be used to help bring the disease under control once it gets established.

Leaf spots

A number of fungi cause leaf spots on many southern grasses. Regardless of the causal agent, leaf spots and their control on southern grasses are similar.

Helminthosporium leaf spots (*Bipolaris* spp.)—Bermudagrass and ryegrass are most severely affected by helminthosporium infections, although the fungus can survive on centipedegrass and St. Augustine.

Infection can occur over a wide range of temperature, but usually is more severe at 70 to 95 degrees F. Milder temperatures in the spring and fall are more favorable for infection.

Helminthosporium causes small, dark-colored spots or flecks on the leaves and sheaths. Leaf spots are usually more numerous near the collar of the leaf blades. Severely affected leaves wither and die and the turf frequently becomes brown and thin.

Symptoms on overseeded ryegrass are altogether different. Although leaf spots may occur, this same helminthosporium can cause severe crown rot. This causes a yellowing and discoloration of the grass and a general thinning of the turf.

Fertilize with adequate levels of nitrogen and potassium if helminthosporium diseases become a problem. With careful management, apply fungicides recommended for helminthosporium blight control.

Gray leaf spots—St. Augustine is the primary host for gray leaf spot. The disease occurs throughout the lower South during warm, humid weather.

Spots on the leaf blades are the most visible, but sheath and stem lesions also occur. Leaf spots begin as olive green to brown, water-soaked spots as small as a pinhead. These enlarge rapidly and form a circular to elongate lesion that is brown to ash colored with purple margins.

The disease occurs during moderate to warm weather accompanied by high relative humidity. Severity of the disease is enhanced by applications of nitrogen fertilizer. It is more a problem in shaded areas where the grass remains wet from dew.

Treatment with a fungicide may become necessary if the disease outbreak is severe and accompanied by prolonged periods of wet favorable weather.

The fungicides chlorothalonil, mancozeb, and cycloheximide plus thiram have been found to be effective in controlling gray leaf spot.

Rust

Rust or *Puccinia* species infect a number of grasses grown in the South, including ryegrass, zoysiagrass, bluegrass, fescue, bermudagrass, and St. Augustine.

Zoysiagrass and bluegrass are the most often infected grasses.

Susceptibility depends on the variety. Fungus infection is favored by minimum and maximum temperatures of 50 to 70 degrees F. respectively. For this reason, the disease does not usually cause severe damage over an extended period. It is likely to be more severe in shaded areas during rainy, humid weather. Affected turf will appear unthrifty and begin to thin.

The disease is characterized by the presence of pustules on the leaf blades. These pustules range from bright orange to cinnamon-brown in color depending upon the species of fungus present.

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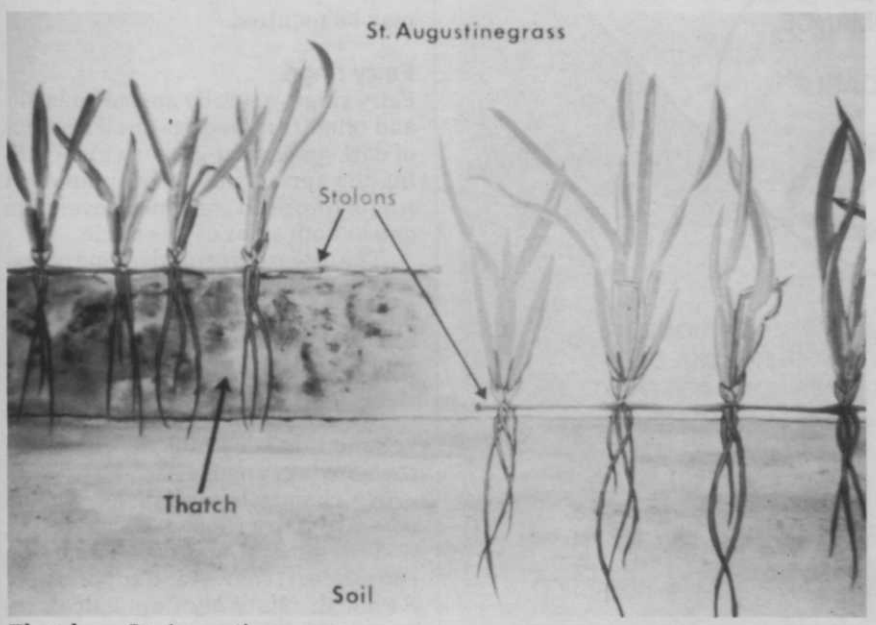

Thatch on St. Augustine grass.

Certain varieties of ryegrass are extremely susceptible to rust, and sometimes severe damage can occur. Zoysiagrass, especially Meyer and Emerald, are most severely infected by rust.

Fertilize to stimulate grass growth, mow on a four- to five-day schedule, and catch clippings. If necessary, a fungicide may be applied to help reduce the amount of disease present.

Triadimefon, chlorothalonil, mancozeb, and cycloheximide are effective in controlling rust.

Spring dead spot

Spring dead spot is a serious disease of bermudagrass in certain parts of the upper Sunbelt. It is found generally on bermudagrass or zoysiagrass under high maintenance.

Damage to the turf apparently occurs during the dormant season. When greenup occurs in the spring, areas a few inches to several feet in diameter appear where the sod is completely dead.

Spring dead spot's causal agent has not been identified. The only control procedures recommended are good cultural practices and limiting the use of nitrogen fertilizer, especially late in the growing season.

Research has shown that fungicides can limit the damage. However, at the present time only Benomyl and PCNB are labeled, and these may be limited uses in certain states.

St. Augustine decline

St. Augustine decline (SAD) is caused by a virus. The symptoms are a mosaic- type chlorosis of the leaf blades that resemble nutrient deficiency or mite feeding. Evidently there are several strains of the virus since there is a great range in damage to St. Augustine.

To this point, the disease has only been recorded in Arkansas, Texas, Louisiana, and Mississippi. No chemicals are available for the control of SAD.

Fungicides are best used on a preventative schedule. Once symptoms develop control can be difficult.

Several varieties of St. Augustine, however, are resistant to the virus. These can be planted in areas where the disease is a potential problem.

Floratam was the first variety release with resistance to SAD. It is also resistant to chinch bugs. It has poor cold tolerance and should be used only in the lower South.

Seville is resistant to SAD and is more shade tolerant than common St. Augustine. Raleigh has both SAD resistance and good winter hardiness.

Downy mildew

Downy mildew of St. Augustine was first described on common St. Augustine in Texas in 1969. Since then the disease has spread and has been identified in Arkansas, Louisiana, and Mississippi.

Downy mildew appears as white, raised, linear streaks that develop parallel to the mid-veins of the leaf. Streaks appear in the spring and remain throughout the summer, giving the leaves a yellow appearance with some death toward the tips.

Severe disease occurs in grass grown in flood plains or poorly drained areas.

The white-streak symptom is easily confused with the virus disease, St. Augustine decline. However, the virus symptoms are more yellow in color and more mottled than striped.

Downy mildew has been difficult to control with most common turf fungicides. Good drainage is recommended for cultural control.

Pythium blight

Pythium blight can be a devastating disease on overseeded ryegrasses. Bermudagrass and other warm season grasses can be affected to a lesser degree.

An abundance of moisture is required for pythium blight development. In addition, the disease is favored by warm temperatures.

Affected grass is killed rapidly in spots 2-4 inches in diameter. These spots may develop into streaks so that large areas of turf are damaged.

During early stages of development, the affected grass appears wilted and greasy. At times the affected turf spots may have a cottony appearance due to the abundant growth of the fungus. For this reason, the disease is frequently referred to as cottony blight.

Certain species of pythium can also cause root rot on turfgrasses. Due to the restricted root function, the plants become chlorotic and the turf begins to thin.

On overseeded grasses the disease can be limited by using treated seed and delaying the overseeding until as late as possible during the fall. Water as little as possible during periods of favorable activity. The perennial ryegrasses are not as susceptible as annual. Under severe disease pressure, chemical control

may be required.

Fairy rings

Fairy rings generally appear in lawns and other turf areas as circles or arcs of dark green, fast-growing grass during the spring and early summer. A ring of thin dead grass may develop on one or both sides of this circle.

The disease is caused by one of several soil-inhabiting fungi that commonly produce mushrooms. Mushrooms that sometimes appear in the ring are the fruiting bodies of these fungi. Stimulation of the grass is due to the release of nutrients from the organic breakdown of the thatch by the growing fungus.

No chemicals are labeled for the control of fairy ring.

Two general approaches may be considered: removal and suppression. Although relatively impractical, removal of infected soil and grass to a depth of 12 inches or more in a band several feet on each side of the infected area and replacement with clean soil is one solution.

Another approach is to suppress the disease. For low maintenance grass areas, increase the water and fertilization program to stimulate the declining grass inside the ring. Symptoms of fairy ring can be masked by pumping large quantities of water into this area.

Slime molds

Slime molds are a group of organisms that cover above-ground plant parts with a dusty gray-black or dirty yellow mass.

When you look closely at this growth, you see small round balls scattered over the plant. If you rub these between your fingers, a sooty powder emerges. This consists of spores of the fungus.

Slime molds normally live in soil where they feed on decaying organic matter. When the mold is ready to reproduce, it grows up on to the grass blades so that the spores may be spread greater distances.

Slime molds do not feed on living plants. They only use them to assist in the distribution of spores during reproduction.

Slime molds occur during wet weather throughout the spring, summer and fall. They disappear rapidly as soon as it becomes dry. Chemical control is usually not necessary.

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