Top 5 diseases of cool-season turf

BY DR. PETER H. DERNOEDEN

Fungi cause most of the numerous turfgrass diseases. The occurrence and severity of any given disease depends on several factors including turfgrass species and sometimes cultivar(s) within a species; regional weather conditions; season; growing environment; and management level. Common cool-season turfgrass species used on athletic fields, such as Kentucky bluegrass, perennial ryegrass, and tall fescue, have some unique disease problems, but knowing the most common ones and when they occur makes diagnosis easier.

These occurrences also can be dependent in part on your region. For example, summer patch and necrotic ring spot are both important Kentucky bluegrass diseases with similar symptoms. But summer patch initiates in the summer (of course!) and is a more common problem in warmer and humid regions such as the transition zone (a region extending from Washington, DC to Kansas City). Conversely, necrotic ring spot is initiated in the autumn or spring and is more common in the upper Midwest, Rocky Mountain and Pacific Northwest states.

Growing environment and management level are important factors in determining disease incidence and severity. High maintenance collegiate or professional fields are more likely to be affected than school or park athletic fields because they generally have more restricted air circulation and shade problems, and also because they are more intensively managed. The turf is subjected to lower and more frequent mowing and higher inputs of fertilizer and water, and may be tarped at night or for long periods when rain threatens. This combination promotes disease whereas fields that receive little or no fertilizer or irrigation tend to lose density more to a combination of wear, poor recuperative potential, and weed invasion than from disease.

Many diseases are uncommon or affect a limited number of grass species in a few specific regions. But nationally there are five dominant diseases that all athletic field managers should be familiar with: dollar spot, brown patch, Pythium blight, summer patch, and rust. Here we present the weather conditions most conducive to the onset of each disease, key field diagnostic symptoms, and cultural and chemical control measures for the "Top Five."

1. Dollar spot

Dollar spot is the most common and economically important turfgrass disease worldwide. Its predisposing conditions are warm days, cool nights, and heavy dew formation, and it was named dollar spot because of the size of patches are about the size of a silver dollar on close cut putting greens. With coarser-textured grasses that are suited to higher mowing practices, such as Kentucky bluegrass or perennial ryegrass, the blighted areas are considerably larger and straw-colored patches range from 3 to 6 inches in diameter.

Affected patches frequently coalesce and involve large areas of turf. Grass blades often die back from the tip, and have straw-colored or bleached-white lesions that are shaped like an hourglass. This hourglass banding on leaves often is made more obvious by a narrow brown, purple, or black band, which borders the bleached sections of the lesion from the remaining green portions. Tip die-back of leaves is common and blighted tips appear tan to white in color, and also have a brown or purple band bordering dead and green leaf tissue. A fine, white or grayish-white, cobwebby mycelium may cover the diseased patches during early morning hours when the fungus is active and leaf surfaces are wet. Dollar spot is less common in tall fescue.

In cool-season grasses, dollar spot severity usually peaks in late spring to early summer and again in late summer to early autumn. In some regions, however, dollar spot can remain active between late April and early December.

Dollar spot tends to be most damaging to poorly nourished turf. Applying nitrogen (50% water-soluble plus 50% slow release) will stimulate growth and mask the disease. Most nitrogen should be applied to cool-season grasses in autumn. It is not a good idea to overstimulate turf in the spring and summer with high rates of nitrogen. Subsequent applications at low rates of water soluble nitrogen (i.e., 0.2 lb. N/1000ft2; 10 kg N/ha) in foliar-feeding programs (i.e., sprayer application) on a 2-week application interval throughout the season when the disease is active also helps to suppress it. Foliar feeding also helps the turf recover from normal wear injury from sporting events. Potassium, and to a lesser extent phosphorus, may help to reduce dollar spot so it is important to maintain a complete N-P-K fertility program.

Dollar spot in perennial ryegrass. Under ideal conditions, the dollar spot fungus can produce large amounts of white or whitish-gray foliar mycelium.

Raising mowing height is effective to minimize dollar spot injury. Mowing early in the morning will speed surface drying, and has been linked to a significant reduction in the disease. Removing morning dew and leaf-surface exudates by dragging fields with a hose also can be beneficial. Using wetting agents,

which reduce leaf wetness periods, may help to reduce dollar spot severity.

Thatch layers and soil compaction promote dollar spot and other diseases, so core aeration, topdressing, vertical cutting, and other practices that alleviate soil compaction and control thatch should assist in reducing severity. These practices are best performed during disease-free periods when turf is actively growing.

Avoid light and frequent irrigation, especially when programming overhead irrigation systems for nightly applications. It's important however to maintain adequate soil moisture because dry soil conditions can promote the disease. Irrigate deeply to root zone depth during early morning hours, but avoid excessive soil moisture. Check NTEP results and avoid using highly susceptible cultivars.

Ultimately, effective dollar spot suppression is going to involve combining those cultural practices that are known to suppress dollar spot into a fungicide program (see sidebar). In particular, nitrogen should be added to the spray tank (i.e., 0.1 - 0.2 lb. N/1000ft2 from a water-soluble N-source like urea) each time a fungicide is applied. It is important to mow early in the morning to speed drying. Fungicide-treated turf, however, should not be mowed for at least 12 and preferably 24 hours after spraying. Obviously, removing plant tissues containing fungicides dilutes the total concentration of the product. Returning clippings is helpful, if they do not interfere with play because they help to recycle nitrogen and other nutrients.

Brown patch in perennial ryegrass. The edges of the circular patches are covered by a whitish-gray foliar mycelium.

2. Brown patch

Also known as Rhizoctonia blight, brown patch is a common summertime disease of cool-season turfgrasses. Predisposing conditions are high night temperatures, high humidity, and long periods of leaf surface wetness.

All cool-season turfgrasses are attacked, but the most susceptible species are perennial ryegrass and tall fescue. Symptoms vary according to host species. On closely mown turf, affected patches are roughly circular and range from 3 inches to 3 feet or greater in diameter. The outer edge of the patch may develop a 1-2 inch wide smoke ring. This ring is blue-gray or black and is caused by mycelium in the active process of infecting leaves. On high-cut turf, smoke rings may not be present and patches may have an irregular rather than circular shape.

Close inspection of leaf blades reveals that the fungus primarily causes a blight or dieback from the tip, which gives diseased turf its brown color. R. solani produces distinctive and often greatly elongated lesions on tall fescue leaves. The lesions are a light, choco-

Chemical management of Top 5

Dollar spot: Fungicides commonly used include: Banner MAXX; Bayleton; Chipco 26GT; Cleary's 3336 and Fungo; Curalan and Touche; Daconil Ultrex, Echo, Concorde, Manicure, and others; Eagle; Rubigan; and Chipco Triton. Tank mixing a fungicide with 0.1 to 0.2 lb. nitrogen per 1000ft2 (5 to 10 kg N/ha) from urea is recommended. The nitrogen stimulates growth, enabling plants to produce tissue faster than the fungus can cause disease, and helps to speed recovery of injured plants.

Brown patch: Preventive applications of Chipco 26 GT; CL 3336 or Fungo; Touche or Curalan; Daconil Ultrex, Echo, Concorde, Manicure; Fore Rainshield; Endorse; Medallion; Compass; and Heritage effectively control brown patch. Sterol inhibitors (SI) such as Banner MAAX, Bayleton, Eagle and Chipco Triton also are effective when applied preventively, however, they perform best when tank mixed with a contact fungicide (e.g., Daconil, Fore, Medallion). For curative control, it is best to tank-mix a contact fungicide with one of the aforementioned penetrants.

Pythium blight: While fungicides are not generally used on most athletic fields, they are considered a necessity for stadium athletic fields in many regions. Terramec SP and Koban continue to be the preferred fungicides for curative control of Pythium blight, but they provide control for only 3-5 days. Subdue MAXX can be used either preventively or curatively. Banol and Chipco Signature are other fungicides that provide good, residual Pythium blight control. The latter are most effective when applied as preventive treatments. Heritage also is labeled for preventive control of Pythium blight, but may provide shorter residual control than other preventive fungicides.

Summer patch: Preventive applications of Banner MAXX, Bayleton, Compass or Heritage are most effective. Curative applications of CL 3336 or Fungo 50 drenches may provide a satisfactory level of control on close-cut Kentucky bluegrass. Where summer patch is a chronic problem, fungicides should initially be applied in early to mid-May, and every 3-4 weeks thereafter until late August. Fungicides are ineffective if turf is allowed to enter drought-induced dormancy.

Rust: Banner MAXX, Bayleton, Chipco Triton, Heritage and Eagle effectively control rust diseases in a single spring or autumn application. Contact fungicides are not very effective and multiple applications are required to reduce rust injury.

late-brown color, and are bordered by narrow, dark-brown bands. On perennial ryegrass and Kentucky bluegrass, smaller leaf lesions are produced and tip dieback commonly occurs. During early morning hours, when the disease is active, a cobweb-like mycelium or white tufts of hyphae can develop in sparse to huge amounts on leaves laden with dew. Late in the season, distinctive circular patches may not appear. In perennial ryegrass, for example, the turf may simply exhibit a non-uniform thinning out and there may be little or no foliar mycelium evident in the morning.

High maintenance fields are more likely to be affected than school or park fields because often they battle more restricted air circulation and shade problems.

Brown patch develops when day temperatures rise above 85 degrees and relative humidity is high. A night temperature above 68 degrees and periods of leaf surface wetness exceeding 10 hours are the most critical environmental requirements. This disease becomes extremely severe in cool-season grasses during prolonged, overcast wet periods in summer as long as average daily temperatures remain above 68. R. solani, however, can be quite active at lower temperatures if relative humidity is high and there are long leaf wetness periods at night.

Proper cultural management strategies help to minimize brown patch severity and should ease the need for frequent fungicide applications. Fertility and timing of fertilizer applications impacts brown patch significantly. In particular, autumn applications of a slow release nitrogen (N) source to cool-season grasses results in less brown patch the following summer, when compared to spring applications of water soluble N. Furthermore, autumn applied slow release N plus phosphorus (P) and potassium (K) lowers brown patch severity the following summer when compared to autumn applied water soluble N plus P and K. Applications of high rates of N in the spring or summer can intensify brown patch. However, foliar feeding with low N rates (0.1 to 0.2 lb. N/1000ft2; 5-10 kg N/ha) intermittently throughout the summer does not appear to enhance brown patch. Indeed, some studies suggest that foliar feeding on some occasions may reduce brown patch severity.

Irrigation timing also impacts brown patch severity. Irrigating at dusk intensifies brown patch whereas irrigation during early morning hours reduces it. Evening irrigation intensifies brown patch by providing for a longer leaf wetness duration. Conversely, early AM irrigation does not extend the leaf wetness period and knocks R. solani foliar mycelium off leaves. Using wetting agents as well as dragging speeds leaf drying and may help to reduce disease activity. Frequent irrigation that results in saturated soil conditions favors brown patch, particularly in shaded sites with poor air circulation.

Brown patch is more intense in dense, high cut turf when compared to lower mowing in more open stands. However, under high disease pressure conditions, mowing height appears to have little impact on brown patch severity. Generally, mowing high within the recommended range for the species helps turf to better tolerate summer stresses, diseases, insect pests and helps to reduce weed invasion. Hence, for numerous agronomic reasons, it is generally best to maintain the highest possible mowing height in the summer. If possible, improve drainage and air circulation, reduce thatch and alleviate soil compaction.

Pythium foliar mycelium in seedling turf. Pythium blight and brown patch are destructive to both seedlings and mature turf.

3. Pythium blight

This disease likes hot and humid weather and primarily is hosted by perennial ryegrass and tall fescue.

A general misconception is that Pythium blight is a common, widespread disease. Although Pythium spp. can cause damping-off of any seedling species, it seldom attacks mature athletic field turf comprised of Kentucky bluegrass. Pythium blight is most likely to attack perennial ryegrass grown under the intensive management (i.e. frequent night irrigation, low mowing and high nitrogen fertility) conditions commonly found in stadium athletic fields. Pythium blight also damages tall fescue, particularly in the transition zone and in the Southeast.

In perennial ryegrass and tall fescue, infected foliage develops an oily or dark-gray color, and leaf blades have a water-soaked appearance. Initial symptoms are small, gray, wilted and water-soaked dead spots. Blighted spots also may have an orange center and a gray colored outer periphery. As the disease intensifies, spots, patches, or rings of blighted turf increase in size, coalesce and large non-uniformly shaped areas die. Leaf blades collapse, mat together, and turn brown.

When this disease is active, a cottony web of grayish mycelium may be seen on or in the canopy during early morning hours when leaves are wet. Pythium spp. is capable of producing an abundance of mycelium in just a few hours. Mycelium bridges leaf blades and is responsible for the cottony appearance. The fungus primarily spreads through the turf canopy by rapid mycelial growth or by movement of mycelial fragments and motile spores (zoospores) in rain or irrigation water. Pythium spp also are effectively spread by equipment that is driven across wet foliage that is covered with mycelium. Managers often have mistaken the presence of foliar mycelium as being Pythium blight, when in many cases the pathogen is R. solani. It is important to get a rapid diagnosis from a lab if you are unsure of the disease.

Pythium blight develops rapidly during nighttime and is among the most destructive turfgrass diseases. During periods of high relative humidity, night temperatures above 70 degrees F and abundant surface moisture, the disease progresses with remarkable speed. Huge areas of turf can be destroyed within 24 hours, particularly if there are thundershowers at night. This disease often is first observed in shaded, poorly drained, and low lying areas or where there is poor air circulation. Pythium blight is especially severe when turf (including Kentucky bluegrass) is covered with tarps in the summer.

Water management greatly influences disease severity so irrigate early in the day to avoid moist foliage at nightfall. Improving water and air drainage by clearing brush and trees will help reduce disease development, but these cultural measures often are expensive and difficult to achieve. Avoid the application of nitrogen fertilizers at rates exceeding 0.5 lb. N/1000ft2 (25 kg N/ha), which stimulate growth and tissue succulence during summer stress periods. Foliar-feeding nitrogen (i.e., 0.1 to 0.2 lb. N/1000ft2; 5 - 10 kg N/ha) intermittently in the summer probably does not predispose turf to Pythium blight.

An autumn fertilization program using a complete N-P-K fertilizer improves turf vigor and density. Cultural

practices, however, likely will have only minimal beneficial effects on Pythium blight suppression during high disease pressure periods. Watering early enough in the day to insure dry leaf surfaces at nightfall may help to reduce the rate of pathogen spread. It is important to check under tarps frequently for the development of Pythium blight as well as other diseases.

Summer patch in close cut Kentucky bluegrass. Patches may appear as tan colored dead spots 3 to 6 inches in diameter and as large circular patches.

4. Summer patch

With its primary host Kentucky bluegrass that is 2 years old or older (though it may appear the summer following sodding), summer patch is found in high temperature stress, moist soil, and low mowing conditions. It does not attack perennial ryegrass or tall fescue.

Symptoms initially appear as wilted, gray-green, or pale-green areas of turf. These areas rapidly turn into straw-brown, dead patches that initially may resemble those of dollar spot. Unlike the diseases above however, there will be no foliar mycelium as the pathogen attacks roots and eventually stems. These patches soon increase in size and may become crescent-shaped or remain circular. Fully developed patches appear as depressions in the turf and generally range from 6-18 inches in diameter.

Plants at the periphery of affected patches display a yellow, bronze or copper color when the disease is active. The yellow or copper-colored plants at the edge of patches only remain evident for a few days, and they are most conspicuous under low mowing. Healthy turf may persist in the center of patches producing rings or "frog-eye" symptoms. In some regions, the frog-eye symptom is only occasionally observed, while the circular patch with only a few or no living plants in the center is more common. Patches may coalesce, and large, non-uniformly shaped areas of turf can be destroyed within 10-20 days. There are no distinctive leaf lesions associated with this disease, but leaves generally die-back from the tip. Necrotic ring spot produces symptoms similar to summer patch. Generally, summer patch is most prevalent in sunny sites, whereas necrotic ring spot produces distinctive frog-eye symptoms in both shaded and sunny sites.

Environmental conditions play a significant role in the predisposition of turf to the disease. Summer patch generally appears in late June or early July when daytime air temperatures above 88 degrees prevail. It is most severe on sunny, exposed sites or other heat-stressed areas such as those adjacent to paved running tracks.

Mysteriously, the disease may flair up following rainy periods in late summer and September. Low and frequent mowing and light and frequent irrigation are the primary factors leading to severe outbreaks of summer patch. Other predisposing factors include: spring applications of high levels of nitrogen fertilizer, using nitrate forms of nitrogen (e.g., calcium nitrate, sodium nitrate, and potassium nitrate), accumulation of thatch, frequent summer thunderstorms, and soil compaction. The most important environmental factors required for development are for the soil to be moist and root zone temperatures exceeding 78 degrees.

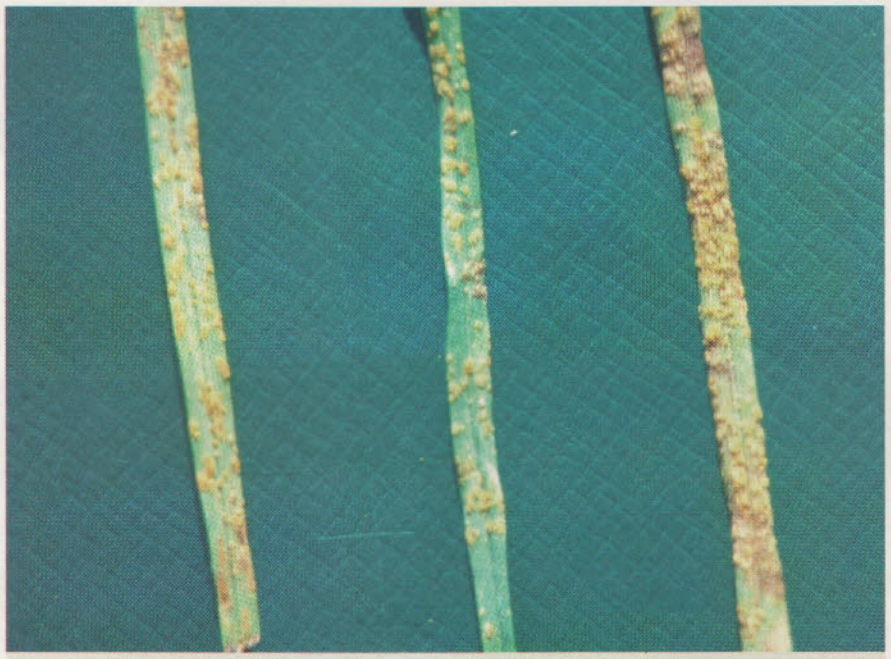
Low mowing and frequent irrigation are the major cultural practices that exacerbate summer patch. Increase mowing height to 3 inches in late spring, and apply water deeply and only at the onset of wilt effectively reduces summer patch severity. Use slow release acidifying nitrogen fertilizers, such as sulfur-coated urea. Soil acidification with ammonium-based N-sources such as ammonium sulfate also reduces disease severity over time.

Conversely, nitrate forms (i.e., calcium, potassium or sodium nitrate) of nitrogen and limestone applications should be avoided as they can intensify summer patch. Using limestone to raise soil pH in concert with the use of ammonium sulfate, however, does not intensify summer patch. Most of the annual usage of nitrogen fertilizer should be confined to the autumn months. Core aeration alleviates damage in compacted soils, but aeration should be performed in the spring or autumn when the disease is not active. On sunny days, when soils are wet, it is not uncommon for temperatures in the upper 2 inches of soil to exceed ambient air temperature. Irrigating during sunny periods will elevate soil temperature because water efficiently absorbs and conducts heat. Hence, avoiding excessive wetting of soil on hot and sunny days is important.

5. Rust

Kentucky bluegrass and perennial ryegrass are the primary hosts, during prolonged periods of overcast weather or shaded environments. There are many species or biotypes (known as races) of rust fungi that attack nearly all turfgrasses. Stem rust of Kentucky bluegrass and crown rust of perennial ryegrass are the most common and important.Rust-affected turf exhibits a yellowish or reddish-brown appearance from a distance. Close inspection of diseased leaves reveals conspicuous red, black, orange or yellow pustules. These powdery pustules are comprised of huge numbers of spores. Rusts produce several types of spores and these fungi have complicated life cycles. During extended sunny periods, rust affected plants generally appear healthy. Kentucky bluegrass turf simultaneously infected with stripe smut and rust can be severely thinned-out in late summer.

Rust diseases most commonly are observed during cool, moist, and overcast periods of late summer and autumn. They are most damaging to poorly nourished turf and turf grown under a low mowing height or in shade. In most regions of the U.S., rusts do not often cause serious turf damage. However, in some environments marked by long periods of wet and overcast weather, such as coastal areas from Northern California to Canada, the rusts are chronic and debilitating diseases.



Yellow-orange pustules of the rust fungus on perennial ryegrass leaves.

In most regions, rust affected stands can be effectively maintained by employing sound cultural practices. A complete N + P + K fertility program is most often preferred to fungicides in situations where rust is damaging poorly nourished turf. Irrigate early in the day to insure leaf dryness before nightfall, irrigate deeply but infrequently, increase mowing height and frequency. By increasing mowing frequency, leaves bearing immature spores are removed and this reduces the potential for more leaf infections. **ST**

Dr. Peter H. Dernoeden is a Professor of Turfgrass Science at the University of Maryland.

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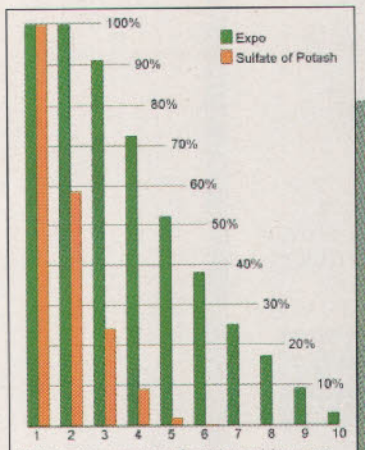

Plot showing percentage of potash remaining versus inches of water applied to identical columns of media loaded with identical quantities of potash from Expo or potassium sulfate

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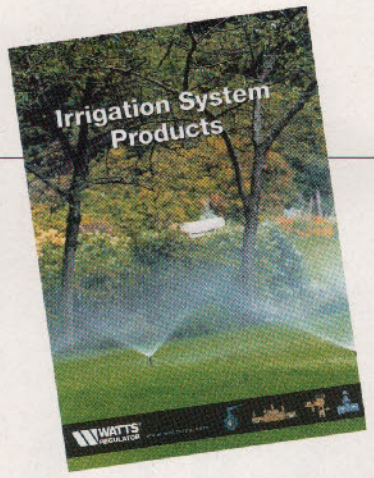

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