Disease control in cool-season turf

by GAIL L. SCHUMANN, Ph.D. /University of Massachusetts

Different years result in different disease problems. 1996 was a relatively cool and wet year in most northern areas, and the predominant diseases reflected that. The season began with a period of recovery from the severe snow mold in many areas.

Deep, lasting snows

In the fall of 1995, long lasting snow fell on turfgrass that had not yet gone dormant in many sections of the Northeast. This created perfect conditions for snow mold fungi. These fungi prefer moist conditions and refrigerator temperatures. Two different diseases are commonly found: Typhula blight (also known as gray snow mold) and Fusarium patch (also known as pink snow mold), but both diseases are more severe when snow covers green grass in moist soil for many weeks, especially where late-season, excess nitrogen applications have prolonged the growth of the grass.

Snow molds are different

Fusarium patch, in particular, is more severe at high soil pH. Fall lime applications can exacerbate this disease. Fusarium patch is also different from Typhula blight in that it is more likely to result in crown infection and the death of turfgrass plants. It can also become active with the first cool, wet weather of fall and last throughout cool, rainy springs even in the absence of snow. In the absence of snow, the primary symptom of Fusarium patch is small, greasy patches similar to those caused by Pythium blight in the heat of summer. The fungus can easily be streaked by mowers causing added injury and confusing symptoms.

Tip blight not severe

A stress disease most commonly observed in hot weather appeared in early summer at our research field plots in 1996. Leptosphaerulina blight is usually a minor tip blight which is mowed away once drier weather conditions prevail. The prolonged wet weather in early summer 1996 seemed to favor

<table>
<thead>
<tr>
<th>Fungicide Active Ingredients and Example Trade</th>
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<tbody>
<tr>
<td><strong>Active ingredient</strong></td>
</tr>
<tr>
<td>azoxystrobin</td>
</tr>
<tr>
<td>captan</td>
</tr>
<tr>
<td>chloroneb</td>
</tr>
<tr>
<td>chlorothalonil</td>
</tr>
<tr>
<td>cyproconazole</td>
</tr>
<tr>
<td>etradiazole</td>
</tr>
<tr>
<td>fenarimol</td>
</tr>
<tr>
<td>fenarimol + chlorothalonil</td>
</tr>
<tr>
<td>flutolanil</td>
</tr>
<tr>
<td>flutolanil + triadimefon</td>
</tr>
<tr>
<td>fosetyl-al</td>
</tr>
<tr>
<td>iprodione</td>
</tr>
<tr>
<td>mancozeb</td>
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<tr>
<td>maneb</td>
</tr>
<tr>
<td>mefenoxam</td>
</tr>
<tr>
<td>metalaxyl</td>
</tr>
<tr>
<td>metalaxyl + mancozeb</td>
</tr>
<tr>
<td>myclobutanil</td>
</tr>
<tr>
<td>PCNB</td>
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</tbody>
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FUNGICIDE ACTIVE INGREDIENTS AND EXAMPLE TRADE

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Trade names</th>
</tr>
</thead>
<tbody>
<tr>
<td>propamocarb</td>
<td>Banol (6L)</td>
</tr>
<tr>
<td>propiconazole</td>
<td>Banner Maxx (1.24MEC), Banner (41.8GL)</td>
</tr>
<tr>
<td>thiophanate-methyl</td>
<td>Cleary’s 3336 (50W, WSP, 4.5F), Fungo Flo, Fungo (50WSB), Proturf Systemic Fungicide (2.3G), Systec 1998 (4.5F)</td>
</tr>
<tr>
<td>thiophanate-methyl + chlorothalonil</td>
<td>Proturf Fungicide IX</td>
</tr>
<tr>
<td>thiophanate-methyl + chloroneb</td>
<td>Proturf Fluid Fungicide</td>
</tr>
<tr>
<td>thiophanate-methyl + iprodione</td>
<td>Duosan (80WP, 80WSP)</td>
</tr>
<tr>
<td>thiophanate-methyl + mancozeb</td>
<td>Lesco Thiram (75WDG), Spotrete (75WDG, 4F)</td>
</tr>
<tr>
<td>thiram</td>
<td>Bayleton (25DF, 1G), Accost (1G)</td>
</tr>
<tr>
<td>thiram + triadimefon</td>
<td>Proturf Fluid Fungicide III</td>
</tr>
<tr>
<td>triadimefon</td>
<td>Proturf Fluid Fungicide II</td>
</tr>
<tr>
<td>triadimefon + metalaxyl</td>
<td>Curalan (50DF, 4F), Touche (4F), Vorlan (50DF, 4F)</td>
</tr>
</tbody>
</table>

Note: trade names of products commonly available in the Northeast are included for convenience. No endorsement is implied, nor is discrimination intended against similar materials. Use of certain fungicides is restricted in certain states or areas. Each product has specific use rates and intervals. Read and follow label specifications.

FOLIAR DISEASES- CULTURAL AND CHEMICAL MANAGEMENT

These diseases all begin with infection of the leaf blades. Minimize the time water remains on leaf blades through dew removal, proper irrigation timing, and pruning of landscape plants for air movement.

Diseases generally worse under low nitrogen conditions

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cultural control</th>
<th>Fungicidal control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracnose</td>
<td>Reduce compaction, raise mowing height.</td>
<td>azoxystrobin, chlorothalonil, cyproconazole, fenarimol, propiconazole, thiophanate-methyl, triadimefon</td>
</tr>
<tr>
<td>Dollar spot</td>
<td>Reduce compaction, raise mowing height.</td>
<td>mancozeb, maneb, myclobutanil, PCNB, propiconazole, thiophanate-methyl, thiram, triadimefon, vinclozolin</td>
</tr>
<tr>
<td>Red thread</td>
<td>Reduce compaction, irrigate.</td>
<td>azoxystrobin, chlorothalonil, cyproconazole, fenarimol, flutolanil, iprodione, mancozeb, myclobutanil, propiconazole, thiophanate-methyl, triadimefon, vinclozolin</td>
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### Foliar Diseases - Cultural and Chemical Management

These diseases all begin with infection of the leaf blades. Minimize the time water remains on leaf blades through dew removal, proper irrigation timing, and pruning of landscape plants for air movement.

**Diseases generally worse under LOW nitrogen conditions**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cultural control</th>
<th>Fungicidal control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rust</td>
<td>Reduce compaction, irrigate.</td>
<td>chlorothalonil, cyproconazole, mancozeb, maneb, myclobutanil, propiconazole, triadimefon</td>
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</tbody>
</table>

**Diseases generally worse under HIGH nitrogen conditions**

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<thead>
<tr>
<th>Disease</th>
<th>Cultural control</th>
<th>Fungicidal control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown patch</td>
<td>Raise mowing height.</td>
<td>azaoxystrobin, captan, chlorothalonil, cyproconazole, fenarimol, flutolanil, iprodione, mancozeb, maneb, myclobutanil, PCNB, propiconazole, thiophanate-methyl, thiram, tiarylmefon, vinclozolin</td>
</tr>
<tr>
<td>Snow molds:</td>
<td></td>
<td>for fusarium only: mancozeb, thiophanate-methyl</td>
</tr>
<tr>
<td>Fusarium patch (pink)</td>
<td>Allow turf to go dormant, remove snow where practical, avoid lime where fusarium is a problem.</td>
<td>typhula blight only: chloroneb; flutolanil; both snow molds: azaoxystrobin, chlorothalonil, cyproconazole, fenarimol, iprodione, PCNB, propiconazole, triadimefon, thiram, vinclozolin</td>
</tr>
<tr>
<td>Typhula blight (gray)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bipolaris and Drechslera</td>
<td>Mow at height recommended for turf species.</td>
<td>azaoxystrobin, captan, chlorothalonil, iprodione, mancozeb, maneb, myclobutanil, PCNB, propiconazole</td>
</tr>
<tr>
<td>Leaf spots</td>
<td>Avoid surface drainage; do not mow or irrigate when disease is active.</td>
<td>azaoxystrobin, chloroneb, etradiazole, fosetyl-AL, mefenoxam, metalaxyl, propamocarb</td>
</tr>
<tr>
<td>Yellow patch</td>
<td>Improve drainage.</td>
<td>azaoxystrobin, flutolanil, propiconazole</td>
</tr>
<tr>
<td>(cool-season brown patch)</td>
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**Root Diseases**

Cultural practices which enhance root growth will reduce the effects of these diseases including aeration, improved drainage, and higher mowing heights. Fungicides are most effective when used preventively.

<table>
<thead>
<tr>
<th>Notes</th>
<th>Fungicides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try brief mid-day irrigation in hot weather, use resistant cultivars.</td>
<td>Preventive: azaoxystrobin, cyproconazole, fenarimol, myclobutanil, propiconazole, Curative: thiophanate-methyl</td>
</tr>
<tr>
<td>Improve drainage, raise mowing height.</td>
<td>Fungicides that are effective for Pythium blight may be helpful, but check labels for legal uses.</td>
</tr>
<tr>
<td>Maintain 5.8-6.0 soil pH in root zone, raise mowing height in hot weather.</td>
<td>Preventive: azaoxystrobin, cyproconazole, fenarimol, myclobutanil, propiconazole, triadimefon, Curative: thiophanate-methyl</td>
</tr>
<tr>
<td>Maintain 5.8-6.0 soil pH in root zone, most common in newly planted bentgrass.</td>
<td>Preventive: azaoxystrobin, fenarimol, propiconazole, triadimefon</td>
</tr>
</tbody>
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ROADS - PARKING LOTS - PATIOS - WALKWAYS - GOLF CART PATHS - TRAP AND BUNKER LININGS

- Dilute & Spray onto loose soil
- Mix It into the soil
- Compact the soil
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find that fungicides are necessary in severe cases.

**Gray leaf spot in warm temps**

The hot, stressful weather in the summer of 1995 led to the destruction of perennial ryegrass fairways in the mid-Atlantic states. *Pyricularia grisea* causes gray leaf spot of both ryegrass and tall fescue in hot weather and appears to be a new threat to these turfgrasses.

Gray leaf spot was reported in Kentucky in late August of 1996, but the relatively cool season probably prevented major epidemics. Turfgrass managers should learn more about this potentially damaging disease if 1997 brings hotter weather.

**Rust in high, moist turf**

The last weeks of August in the Northeast brought a surprising dry spell of weather which slowed turf growth. Even though there was little rainfall, some days were foggy and moist for many hours. This resulted in severe rust outbreaks, especially in lawns and other turf areas that are not mowed frequently.

Rust is easily diagnosed by the presence of pustules of powdery orange spores. These begin to show up 10 to 14 days after spores have infected the leaf blades. This explains why rust is uncommon on frequently mowed turf. The leaf blades are mowed away before the rust has a chance to develop. Rust may weaken plants, but rarely kills them. In northern areas, the spores will not survive winter, so the turf should begin spring with a fresh start.

**Fungicide news**

Some new fungicides and new formulations of fungicides are available for the coming season. When new formulations are produced, it is important to read the revised labels carefully for new application recommendations and new rates. For example, Daconil Weather Stik is formulated at a 6F rate, which has a higher concentration of the active ingredient, chlorothalonil, than Daconil 2787 which is a 4F.

There are now five DMI (sterol-inhibitor) fungicides available—cyproconazole (*Sentinel*), fenarimol (*Rubigan*), myclobutanil (*Eagle*), propiconazole (*Banner*), and triadimefon (*Bayleton*). It is important to know the chemical group or family of all fungicides you use. Repeated

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AquaCure Aquatic Herbicide provides effective control of many aquatic weed species, including American pondweed (*Potamogeton nodosus*), Hydrilla (*Hydrilla verticillata*) and Brazilian Elodea (*Egeria densa*).
use of fungicides from the same chemical group can result in fungicide resistance. Banner Maxx and Subdue Maxx have been reformulated from emulsifiable concentrates, which are oil-based, to microemulsion concentrates. Banner Maxx has some new diseases added to its label including take-all patch. Subdue Maxx has a new active ingredient, mefenoxam, which is an isomer of the previous ingredient metalaxyl. Chipco Aliette Signature (fusetyl-Al) has also been reformulated to allow more compatible tank-mixing with other fungicides.

Azoxystrobin (Heritage) is a newly registered fungicide with a different chemistry from existing fungicides. University research reports have shown excellent control of many important turfgrass diseases including anthracnose, brown patch, red thread, snow molds, and summer patch. Heritage also has activity against Pythium blight which is unusual in a broad-spectrum fungicide. Turf managers should be aware that this fungicide, like many current products, has potential for resistance with repeated use and does not control dollar spot. At this time, it is registered only for golf courses, not lawn care.

Aeration, drainage a good defense

It is always difficult to predict potential disease problems for the coming season. Many midwestern states have had record snowfall, while the Northwest has received record-breaking storms of rain and snow. In many parts of the Northeast, it has been a mild, almost non-existent winter. The groundhogs in those areas seem to be right in their predicitions for an early spring. If the weather warms up quickly, we may see early problems with summer diseases and more time for potential heat stress. Some of our most difficult diseases to control are stress-related. Concentrate on spring aeration programs and improving drainage where it is needed. Try to give the turf optimal growing conditions to help it withstand any potential weather-related stresses that may come later on. LM

The author is an associate professor of turfgrass pathology at the University of Massachusetts. Charts and photographs courtesy Dr. Schumann.
Fungal diseases in turf pose significant problems and have economic importance. Before beginning your warm-season disease control program, review the following list of the various symptoms.

By JANELL STEVENS JOHNK, PH.D.

Diseases play a major role in determining the success or failure of turfgrass. Early recognition and proper identification are essential for successful disease management.

Proper variety selection, fertilization, site maintenance, and cultural practices reduce disease pressure and increase the effectiveness of pesticide applications. Pesticides alone cannot control most diseases. No amount of pesticide controls plant disease if good cultural practices aren't in place.

Too often, a single disease is dealt with, while a single plant species or cultivar may be attacked by many diseases throughout its growing season. Before accepting recommendations of cultivars, cultural practices, and pesticides, consider the impact these recommendations could have on other diseases occurring throughout the season.

Symptoms, factors, strategies

Fungal diseases are the most significant turfgrass diseases and have economic importance due to the threat they pose to large areas of turfgrass.

The following list of turfgrass diseases outlines symptoms, environmental factors favoring disease and management strategies for the most common southern turfgrass diseases.

**Brown Patch** *(Rhizoctonia solani)*

- In cool-season grasses, brown patch primarily causes a blight, or dieback, of the leaf tip. In warm-season grasses, brown patch fungus attacks the base of the leaf sheath. On closely-mowed turf, patches are roughly circular. And under high humidity, a "smoke ring" of water-soaked dark leaves and fungal mycelium may be present around the outer margin of the diseased area. On higher-mowed turf, smoke rings usually aren't present and patches often have irregular rather than circular shapes.

- Brown patch is a common summertime disease of cool-season turf, yet it occurs during transition periods in warm-season turfgrasses. Extensive damage can occur during cool, wet periods prior to winter dormancy or breaking spring dormancy. Brown patch infection takes place long before symptoms are evident. Careful timing of preventive fungicide applications is critical.

**Management strategies**

1. Use minimal nitrogen applications since nitrogen increases susceptibility.
2. Improve soil drainage.
3. Apply deep and infrequent irrigation.
4. Drag, pole, or mow early in the morning to speed leaf drying and reduce disease activity.

**Dollar Spot** *(Sclerotinia homoeocarpa)*

Dollar spot is most severe on bermudagrass and zoysiagrass. It appears as small, circular, straw-colored spots about the size of a silver dollar. On grasses maintained at higher mowing heights, patches are larger and irregularly shaped. Grass blades die from the tip back and have straw-colored spots shaped like hourglasses with distinctive reddish-brown to purplish margins.

- Several fungicides control dollar spot, but don't rely only on sterol inhibitors which can lead to resistance.

**Management strategies**

1. Avoid drought stress by irrigating deeply during early morning hours so foliage dries quickly.
2. Maintain a balanced fertility program.
Gray leaf spot
(Pyricularia grisea)

Leaf spots first appear on St. Augustinegrass as tiny brown spots with purplish margins. As spots enlarge, they become diamond shaped. Lesions may completely consume leaves and girdle stolons resulting in a scorched appearance. Gray leaf spot occurs during hot, humid weather. It is more severe in newly-established turf and in shady locations with poor air circulation.

Management strategies:
1) Irrigate early in the morning to allow foliage to dry quickly.
2) Avoid excessive nitrogen applications during hot, humid weather.

Rust
(Puccinia spp.)

Rust infects zoysiagrass and overseeded ryegrass. From a distance, affected turf has a yellowish to reddish-brown appearance. Red, black, orange, or yellow pustules are found on diseased leaves. Rust damages poorly-nourished turf or turf grown under low mowing heights. Prolonged periods of overcast weather or shaded environments favor disease. Generally, rust-affected turf needs no treatment and can be effectively maintained with good cultural practices.

Management strategies:
1) Maintain a balanced fertility program.
2) Apply deep and infrequent irrigation.
3) Increase mowing height and frequency.

Helminthosporium complex;
Leaf spot / melting out
(Bipolaris sorokiniana, Exorothis rostrata)

Bipolaris sorokiniana causes leaf spots and crown and root rots of bermudagrass and zoysiagrass. In spring and fall, distinctive purplish-brown spots with tan centers appear on older leaves. During warm, wet weather the spots increase in size to encompass the entire width of the blade, causing a dieback from the tip. Disease progresses to crown and root rots during the summer. Once the crown is invaded, called “melting out,” spots with purplish margins can be seen on the stolons.

Exorothis rostrata causes a leaf spot on St. Augustinegrass and bermudagrass. However, these diseases are rarely severe and can be managed culturally.

Management strategies:
1) Use resistant varieties.
2) Mow frequently at proper heights to reduce leaf spot phase.
3) Avoid high nitrogen fertilization.
4) These fungi produce many spores when the thatch layer is frequently wet, so irrigate deeply and infrequently.

Pythium-cottony blight, grease spot, crown and root rot
(Pythium spp.)

While more of a problem on cool-season grasses, Pythium spp. also may cause root rots in warm season grasses. Root-infecting Pythium spp. generally are more severe in shaded areas, low spots or near surface water where air circulation is poor. Root rots occur during or following long cool periods when soils are excessively wet.

Management strategies:
1) Irrigate early in the day to avoid moist foliage at night.
2) Improve drainage and increase air circulation.
3) Fungicides generally are not used in lawn care for Pythium blight control. However, they are considered necessary in golf course management. To avoid the build-up of fungicide resistant fungi, rotate fungicides and apply in tank-mix combinations whenever feasible.

Spring dead spot
(Leptosphaeria spp., Gaeumannomyces graminis var. graminis,
Ophiobolus herpotricha)

Spring dead spot occurs on bermudagrass grown in transition zones. Hybrid bermudas are more susceptible than other types. The longer the period of winter dormancy and the colder the temperature, the more damage spring dead spot can cause. Circular patches of bleached, dead grass appear as the turf breaks dormancy in the spring and plants in affected areas have short, rotted root systems. Plants are easily pulled or lifted from the ground. Nodes and stolons become infected and show a brownish discoloration and rott ing.

Management strategies:
1) Improve surface and subsurface drainage.
2) Prevent thatch build-up.
3) Avoid overwatering.
4) Maintain a balanced fertility program.
5) Preventive fungicide applications may slow disease development.

Fairy rings
(called by various soil-inhabiting fungi)

Fairy rings are caused by many fungi that grow in thatch and soil. They may appear as circles or arcs of dark green, fast-growing grass. Nutrients are released as fungi consume dead organic matter. Fairy rings also may appear as circles or arcs of dead grass. The massive build-up of fungal mycelium forms a hydrophobic barrier preventing water infiltration. This causes the turf to suffer from drought stress. Fairy rings may persist and increase in size over many years.

Fairy rings are difficult to control due to the impermeability of infected soil. The fungi grow deep in the soil, making chemical control generally ineffective. Symptom suppression is the most practical management approach.

Rust in a zoysiagrass lawn. The disease thrives in under-nourished turf.

Take-all Root Rot (Patch)
(Gaeumannomyces spp.)

Most warm-season grasses are susceptible to take-all root rot, sometimes called bermudagrass decline. Take-all root rot fungus generally is active during the rainy season. However, symptoms often don’t appear until the affected turf experiences stress, such as high temperatures and dry weather. Patches are irregularly shaped

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Briefs from academia

**University of Rhode Island:** Bridget Ruemmele, K. Field and S. Legare have tested golf shoes with metal or plastic spikes, textured soles and alternative spikes in replicated plots on silt loam and modified sand bentgrass greens. Volunteers walked each of four designated patterns up to 48 repetitions each per plot per day. Significant differences among golf shoe treatments for many evaluation criteria were observed.

**Michigan State University:** Studies on nitrogen injections into turf using the Toro Hydroject water injection aerifier on fairways and putting greens have been conducted by Drs. Karcher and Rieke since 1994. Nitrogen was applied on seven dates during the growing season at 24-day intervals. Plots injected with urea had consistently higher clipping yields, nitrogen content in leaf tissue and color ratings than when urea was surface applied. In 1995, ammonium nitrate was used as the N source, with very similar results. Therefore, suggest Karcher and Rieke, it is likely that factors other than ammonia volatilization increase nitrogen efficiency when applications are made via injection.

**University of Florida:** Drs. Al Dudeck, Jerry Sartain, J.L. Cisar and L.E. Trenholm have studied bermudagrass responses to nitrogen and potassium during establishment. “FloraDwarf” and “Tifdwarf” varieties were evaluated. Nitrogen consistently increased turfgrass growth, however response to potassium differed by cultivar and season. Greater K response occurred in the fall study, reports the research team.

Nematodes feed on turfgrasses by puncturing plant cells with a hollow, tube-like structure, and then injecting enzymes into the cells. Nematodes can damage turfgrasses by themselves, or in conjunction with an infectious fungus. Above-ground symptoms of nematode damage include:

- Wilting under moderate moisture stress;
- Slow recovery of wilted turf after rain or irrigation;
- Thinning or gradual decline of turf.

Because nematodes are not distributed evenly in soils, damage rarely appears in uniform areas. Roots damaged by nematodes are usually short and dark colored, with few lateral or ‘feeder’ roots. They may be rotted because of secondary fungal activity. Sometimes the root tip is swollen. The damaged root system will not hold soil together when a core or plug is lifted.

**Management strategies**

1. Use clean seed or sod and topdressing soil.
2. Clean equipment of all dirt, especially when moving from an area infested with nematodes.
3. Irrigate more frequently to compensate for reduced root systems.
4. Nematicides reduce nematode numbers but don’t completely eradicate them from the soil.

The author is extension plant pathologist, Texas A&M University at Dallas. Watch for her article on disease control in warm-season ornamentals in the June issue.

LM Photos by Janell Johnk.

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