WHAT IS TURFGRASS DISEASE?

Disease or sickness in turfgrasses, as in other plants, develops from an interaction between a susceptible plant, a disease-producing organism (usually a fungus), and an environment favorable for the disease-causing organism to attack. The sick turfgrass plant then gives evidence that something is wrong -- and the evidence of disease that we can see -- we call symptoms. This is the same situation that occurs in human disease. For example, the disease-causing bacterium, *Streptococcus*, produces the symptoms (fever, sore throat, and rash) that physicians diagnose as the disease, scarlet fever. The diagram above depicts the three factors that interact to cause the "explosion" that we call turfgrass disease. Scientists who work with turfgrass diseases (turfgrass pathologists) sometimes use a disease triangle to illustrate the concept of disease. The three sides of the disease triangle represent the three factors that interact to produce turfgrass disease: the disease-causer, the susceptible grass, and a favorable environment.

DISEASE TRIANGLE

Since three factors combine to cause turfgrass disease:

1. WE MUST OBSERVE ALL THREE FACTORS TO GATHER INFORMATION FOR DIAGNOSIS OF THE PROBLEM.
2. WE CAN **COMBAT THE DISEASE** BY CHANGING ANY OR ALL OF THESE THREE FACTORS.

**THE IMPORTANCE OF CORRECT DIAGNOSIS**

The first step in turfgrass disease management is the identification of the true nature of the problem. Diseases are only one cause of turf loss, and disease control measures will do nothing to alleviate damage from other causes such as insect attack or drought stress. It is therefore essential to determine whether the problem is disease, and, if so which disease? Disease management strategies that are effective against one disease may have no effect on or may even worsen another disease. This is particularly true when, because of incorrect diagnosis, the wrong fungicide is selected. The best result that can be hoped for in this situation is nothing lost except time, effort, and money. A worse possibility is the disease problem may be increased by application of an inappropriate chemical.

The three disease factors (grass, disease-causer, and environment) provide the sources of information for diagnosis. The environment during the onset of the disease problem is one source of diagnostic information. What were the temperature, the light intensity, and the moisture conditions just prior to and during disease development? The nature of the disease site is also important. Air and water drainage, soil conditions, sun/shade, slope, and nearness of other plantings or buildings all may be important in development of turfgrass diseases. Prior chemical applications, including pesticides and fertilizers, to the site may be contributive. Heavy thatch accumulation and poor mowing practices that stress the turf may trigger or amplify certain disease problems in turf areas.

The nature of the **symptoms on the grass** is a very important source of diagnostic information. Two kinds of symptoms should be looked for in diseased turfgrass areas -- symptoms on the stand and symptoms on individual plants. Stand symptoms are the visible patterns of the disease on the planting. They are extremely important in disease diagnosis on turf areas because different diseases affect turfgrass stands differently, and the visible differences
are often critical factors in identifying particular diseases. Diseases can appear on the stand as spots, patches, rings, circles, or may be unpatterned. Certain diseases never appear as rings, while other always appear as rings. Symptoms to look for on individual plants include leaf spots, leaf blighting, wilt, yellowing stunting, and root discoloration or rot. Leaf spots can be very good diagnostic clues since the leaf spots of different diseases are usually unique in shape, color and size. Leaf blighting is different from these unique leaf spots because leaf blighting is rot of the leaf that has no definite form. Leaf blighting can be any size or shape, and may involve the entire leaf.

Certain life stages of turfgrass disease-causers can be seen without magnification. The fungi that cause most turfgrass diseases are microscopic, but in stripe smut, powdery mildew, and rust diseases, the spores of the causal fungi pile up in such numbers that they become visible as black, white, or orange powder on grass leaves. In red thread disease, the fungus sticks together and forms the pick or red antlerlike threads that typify the disease. When the causal fungus can be seen, its appearance is often the most important clue for diagnosis.

**DISEASE MANAGEMENT ON TURFGRASSES**

Because the three components of disease development all play a part in the onset of turfgrass disease, disease management on turfgrasses involves manipulation of these three -- the environment, the grass, and/or the disease-causing organism -- to favor the grass and inhibit the causal fungus.

**MANAGEMENT TRIANGLE**

The environment can be altered in many ways, depending on the disease to be managed. For example, some disease require free water for development. Effective strategies to reduce free water include morning irrigation, removal of dew, reduction in amount and/or frequency of irrigation. Water manipulation can be a valuable tool in disease management. Improved air and water drainage, improved soil conditions by aeration, thatch reduction, manipulation of light conditions, regulation of fertilization levels, and proper mowing practices may be appropriate methods for reducing damage from particular diseases and ensuring vigorous turf for recovery from disease damage.
When establishing new turf areas or when renovating disease-damaged turf, it is important to select grasses that are resistant to diseases known to be common in the use area or that have damaged the existing stand. The seeding of disease-resistant grasses is an excellent way to minimize turf loss from disease. For example, certain varieties of Kentucky bluegrass are resistant to spring leaf spot, a disease that is devastating on many Kentucky bluegrass turfs. Varietal resistance to other common diseases of bluegrass is available. For diseases to which varietal resistance is weak or not available, it may be possible to seed a grass species that is resistant to a prevalent disease problem. For example, ryegrass may replace bluegrass in an area damaged by necrotic ring spot, or bluegrass might replace ryegrass in an area where Pythium blight is a problem. Disease severity can often be reduced by appropriate changes in the grass that is being grown. It is bad practice to continue to replant the same grass that has been killed by the same disease year after year -- if there is another option.

In selecting grasses for turf establishment or renovation, it is always preferable, where possible, to use mixture of different grasses or blends of different varieties, rather than seeding a single kind of grass. Seeding mixtures or blends produces a diverse population of grass plants. Such turf is usually more successful in surviving stress and attack by disease. It doesn't take much imagination to envision what would happen in a uniform planting if a disease occurred that was able to cause severe disease on the planted species. Diversity in a planting almost always increases odds of survival.

The third method of disease management is reduction of the causal organism by applying chemicals that will either kill the organism or keep it from growing. Most fungicides do not actually kill fungi; they work by preventing growth. Again, it is important to have identified the causal organism correctly, so that an appropriate fungicide can be selected. Arbitrary selection and application of fungicides without knowledge of the disease cause can do as much harm as good. Using the wrong fungicide wastes money and may involve the risk of exacerbating the disease, as well as causing other unwanted side effects.

With rising prices, declining budgets, and increasing environmental awareness, those who manage turfgrasses are faced with the necessity of making reasonable and defensible choices. Planning an effective disease management program, therefore, involves not only spraying something, but selecting cost-effective and environmentally sound disease control strategies. The financial, environmental, and aesthetic costs of disease management strategies must be taken into consideration, and it is only sensible to consider all avenues of disease management when dealing with particular disease problems.
# Disease, Diagnosis, and Management Triangles

## For Eleven Common Diseases of Cool Season Turfgrasses

### Disease Triangle

<table>
<thead>
<tr>
<th>Disease</th>
<th>Diagnosis</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Snow Mold</td>
<td>Typhula spp.</td>
<td>No control measures possible.</td>
</tr>
<tr>
<td>PINK SNOW MOLD</td>
<td>Fusarium nivale</td>
<td>Apply fungicides in late fall before snow cover.</td>
</tr>
<tr>
<td>SPRING LEAF SPOT/MELTING-OUT</td>
<td>Helminthosporium vagans (Drechslera poae)</td>
<td>Apply fungicides on susceptible Kentucky bluegrasses when leaf spots appear in spring.</td>
</tr>
</tbody>
</table>

### Diagnosis Triangle

<table>
<thead>
<tr>
<th>Signs</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small brown to black sclerotia imbedded in infected and killed leaves.</td>
<td>Gray snow mold.</td>
</tr>
<tr>
<td>Occasionally, leaves of affected grass will appear pink from large number of spores produced on them.</td>
<td>Pink snow mold.</td>
</tr>
<tr>
<td>No signs present.</td>
<td>Spring leaf spot/melting-out.</td>
</tr>
</tbody>
</table>

### Management Triangle

<table>
<thead>
<tr>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spraying with copper.</td>
</tr>
<tr>
<td>Spraying with chlorpyrifos.</td>
</tr>
<tr>
<td>Spraying with vinclozolin.</td>
</tr>
<tr>
<td>Spraying with pyraclostrobin.</td>
</tr>
<tr>
<td>Spraying with mancozeb.</td>
</tr>
</tbody>
</table>

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DISEASE TRIANGLE

Fairy Ring

Basidiomycete spp. (mushroom fungi)

Fairy Ring

Various Basidiomycete spp.

Fairy Ring

Limited & erratic success with soil fumigation fungicide drenches

DIAGNOSIS TRIANGLE

Symptoms: Fungal strands or mycelium in the soil and/or patch at the outer edge of the ring

MANAGEMENT TRIANGLE

Irisochromatidium solani

Brown Patch (Rhizoctonia Blight)

Rhizoctonia solani

Brown Patch (Rhizoctonia Blight)

Applying fungicides to protect susceptible grasses

Brown Patch (Rhizoctonia Blight)

Apply fungicide at first sign of disease

PYTHIUM BLIGHT

Pythium aphanidermatum

Pythium blight

Pythium aphanidermatum

Pythium blight

Apply fungicide at first sign of disease

Resistance has been a problem

SUMMER PATCH

Magnaporthe poae

Summer patch

Magnaporthe poae

Summer patch

Preventive, monthly fungicide applications, beginning in early May

WATER IN [propiconazole]