

PRINCIPLES OF DIAGNOSIS AND MANAGEMENT
OF TURFGRASS DISEASES

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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 resulting disease or sickness can be thought of as the evidence shown by the plant (the symptoms) that something is wrong. This is the same situation that occurs in human disease. For example, the disease-causing bacterium *Streptococcus* produces the symptoms (rash, sore throat, and fever) that physicians diagnose as the disease, scarlet fever. Since three factors combine to cause the disease (disease causer, susceptible grass, favorable environment for the disease causer to attack): (1) we must observe all three factors to gather information for diagnosis of the problem, and (2) we can combat the disease by changing any 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 insects 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, since the best result that can be hoped for in this situation is nothing lost except time, effort, and money. A worse possibility is that 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 information. What were the temperature, the light intensity, and the moisture condition 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 turf 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 disease 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 important factors in identifying particular

diseases. Diseases appear variously as spots, patches, rings, or circles, or may be unpatterned. Certain diseases never appear as rings, while others always appear as rings. Symptoms to look for on individual plants include leaf spots, leaf blighting, wilt, yellowing, stunting, and root 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 blighting is rot that has no definite form. Leaf blighting can be any size or shape, and often will affect the entire leaf.

Certain 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 pink or red antlerlike threads that typify the disease. When the causal fungus can be seen, its appearance is often the most important clue for identification.

Disease Management on Turfgrasses

Because the three components of disease development all have a role in the onset of turf disease, management of disease on turfgrass involves manipulation of these three--the environment, the grass, and/or the disease-causing organism--to favor the grass and inhibit the causal fungus. The environment can be altered in many ways, depending on the disease to be managed. For example, some diseases require free water for development. Effective strategies to reduce free water include morning irrigation, removal of dew, and 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 diseases. For example, certain varieties of Kentucky bluegrass are resistant to spring leaf spot, a disease devastating on many Kentucky bluegrass turfs. Varietal resistance to other common diseases of bluegrass is available. For diseases to which varietal resistance is not available, it may be possible to seed a grass that is resistant to a prevalent disease problem. For example, ryegrass may replace bluegrass in an area damaged by summer patch, 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.

In selecting grasses for turf establishment or renovation, it is always preferable, where possible, to use mixtures of different grasses or blends of different varieties, rather than seeding a single species. 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 toxic 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 chemicals 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.

Planning An Effective Disease Management Program

With rising prices and declining budgets, many people who manage turf are faced with reduced purchasing power. Planning an effective disease management program, therefore, involves not only "doing the works" but selecting cost-effective disease control strategies. The financial, environmental, and aesthetic costs of the disease management strategies must be taken into consideration. Following is a checklist for planning a disease management program.

1. Make an accurate diagnosis of a suspected disease problem. The person responsible for turf areas must recognize the clues that are important in the turf environment, on the turf stand, and on the plants themselves. Once a disease problem has been accurately identified, it is also essential that the mechanics of the disease are understood. Knowledge of where the fungus is coming from and where it is attacking the grass, the environmental conditions favoring its attack, future course of the disease, probable consequences of corrective action--each is an important factor in disease management decisions. The wise turf manager considers all aspects of the disease problem before making decisions about control tactics.

Accurate disease records will allow the turf manager to compile a disease history of the turf areas for which he or she is responsible. With this information, disease outbreaks can be anticipated and appropriate preventive measures taken.

2. Consider all avenues of disease management when dealing with particular disease problems. Frequently, the only course of action considered by the turf manager is using a fungicide, but other methods of disease management may be effective. In cases where fungicides are required, their effectiveness can be maximized by combination with environmental manipulation and use of disease-resistant grasses. Most disease situations on home lawns and landscape turf can be adequately managed without fungicides. Disease on many golf course areas can be managed with little or no fungicide use, providing other appropriate disease management techniques are employed. Greens are the areas on golf courses where fungicides for disease control are most often required, since very little disease can be tolerated on putting surfaces. This situation, however, is the exception rather than the rule, and

manipulation of fertilizer, water and light, and use of disease resistant grasses can provide excellent disease management for many other turfgrass areas.

3. Establish acceptable disease tolerance levels for various turf areas. Disease damage can be less objectionable on some areas than on others. Golf greens and tees must be kept relatively free of disease, but some disease can be tolerated on fairways, and the highest disease levels are acceptable on roughs. Athletic fields subjected to intense wear should be relatively disease-free to ensure maximum recovery from wear. Most home lawns and landscape areas, however, can sustain intermittent disease damage. In all areas where some amount of disease can be tolerated, the potential of particular diseases to kill large areas of turf must be remembered. Helminthosporium diseases, take-all patch diseases, and Pythium blight can cause severe and disfiguring damage to turf. Where these diseases have caused serious loss, steps should be taken to prevent recurrences.

4. Measure the cost-effectiveness of all procedures. Evaluate each disease management practice in light of what your dollars produce. Carefully evaluate the effectiveness of disease treatments. Leave some areas untreated for comparison. Be sure that you have utilized all methods to minimize disease damage. Environmental manipulation and overseeding with resistant grasses usually cost less than fungicide applications and they are usually more effective over the long term.

Consider using fungicides as curative, rather than preventative, measures. Treat only problem areas. Avoid applying fungicides routinely. Rely on your past experience; try to anticipate outbreaks. Preventive use of fungicide treatments can be a costly substitute for careful routine examination for beginning signs of disease.

5. Work as closely as possible with property owners or club managers. Be sure that your priorities agree with theirs. When a treatment or a change in procedure will have a noticeable effect, be sure they are notified ahead of time. Where there are several approaches to a disease problem, present the options and consequences to them. They will probably rely on your professional judgment in the end, but it is important that they understand the factors that entered into the ultimate disease management decision.