UNIVERSITY OF ILLINOIS EXTENSION
College of Agricultural, Consumer and Environmental Sciences

report on
PLANT
DISEASE

RPD No. 402
1995

DEPARTMENT OF CROP SCIENCES
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

TURFGRASS DISEASE CONTROL

Turfgrass disease control begins with a correct diagnosis of the disease. Diagnosis is based upon knowledge of the turfgrass, its adaptation, growing requirements, and expected problems, such as insects, diseases, and noninfectious disorders. When other possible causes are eliminated, then a disease problem should be considered.

Turfgrass diseases vary in severity from year to year and from locality to locality, depending on the environment (principally moisture, temperature, humidity, and grass nutrition), the relative resistance or susceptibility of the grass host, and the causal fungus. For disease to develop, all three factors must be present and in balance. For example, if the environment is favorable for a disease, and the disease-producing fungus is present, but the host plant is highly resistant, little or no disease will develop. Similarly, if the causal organism is present, and the host is susceptible, but the environment is unfavorable, disease usually does not appear. A disease results from the right combination of a susceptible grass plant, a virulent pathogen, and an environment favorable for infection and spread of the pathogen, plus the necessary time for the disease to develop.

We can put this relationship in the form of a simple equation:

Susceptible grass	+	Disease organism	
+		+	= DISEASE
Proper environment	+	Spread of pathogen and time to develop	

If any one of the above ingredients is lacking, disease will not develop. Effective disease control measures are aimed at breaking this equation in one of three basic ways: (1) by planting a mixture or blend of disease-resistant grass cultivars; (2) managing the turfgrass so the growth of the grass plants is favored and the growth of the pathogen(s) is not; and (3) the disease organism is killed or prevented from attacking the plant. Integrated disease control involves the use of all of these three approaches.

Let's discuss these three basic methods of control:

1. **By planting a mixture or blend of disease-resistant grass cultivars**. This is the ideal method of control. Grass breeders constantly are trying to improve disease resistance in grasses. Much progress has been made. We now have grass varieties that are somewhat resistant to Sclerotinia dollar spot, snow molds, "Helminthosporium" diseases, rusts, powdery mildew, summer patch and

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necrotic ring spot, spring dead spot, and other diseases. But this important control measure is still in its infancy. For some diseases like Rhizoctonia brown patch and Pythium blight, where the causal fungi are composed of an infinite number of biotypes or strains, the development of highly resistant or immune grass cultivars is remote and may never happen. Before such grasses can be developed and released, sources of resistance in wild or cultivated grasses must be found. Then comes the long (10 to 15 years), time-consuming process of working this resistance into otherwise desirable grasses.

2. **Managing the turfgrass so the growth of the grass plants is favored and the growth of the pathogen(s) is not**. Fungi that cause turf diseases require the same sort of environment that turfgrasses require: food, moisture, oxygen, and a favorable temperature. The basic concept in this method of control is to grow grass in an environment that will be unfavorable to the growth, multiplication, and spread of disease-producing fungi. This we can do by:

   a. Keeping the grass blades as dry as possible for as long as possible. Fungi, with the exception of powdery mildew, require free moisture on the grass plant for 3 to 12 hours or more to infect a plant. Poling, brushing, and hosing are means of removing dew and guttated water in which these organisms thrive.

      Water established turf thoroughly during a drought. Moisten the soil to a depth of 6 inches or more with each irrigation. Water as infrequently as possible. Avoid daily light sprinklings, especially in the late afternoon or evening, that result in grass blades remaining wet overnight. Another way to speed drying of the grass is to increase light penetration and air movement by selectively pruning or removing dense trees and shrubs that border the turf area.

      Poor surface and subsoil drainage causes compaction and soil aeration problems. Roots are stressed from lack of oxygen frequently causing disease problems. Still, humid air over a turf area causes disease problems because there is no wind to dry off the grass blades. If we could keep grass leaves dry, we would have few foliar disease problems. Root rots that cause wilt of golf greens in July and August are commonly brought on only by excessive watering in the root zone. Keeping the soil near the saturation point prevents normal root growth and favors the growth of organisms like Pythium, a common water mold. Proper water control is the single, biggest environmental factor in keeping disease in check on frequently watered and highly maintained turf areas.

   b. Grass cut at the proper height (1½ to 2½ inches for bluegrasses, ryegrasses, and fescues; 1/2 inch or less for bentgrasses, zoysias, and bermudagrass) usually has less disease than turf that is scalped. Without a sufficient green leaf area, to manufacture food to produce new leaves, roots, rhizomes, and stolons, the grass is definitely weakened. Grasses that are grown under artificial conditions in a lawn, park, fairway, cemetery, or golf green are more subject to attack by disease-producing fungi than they are in their natural environment. Healthy, vigorously growing adapted turfgrasses that are properly managed can still ward off most pathogen attacks.

   c. Another means of decreasing the stress from attack by pathogens is through properly balanced soil nutrition. Sclerotinia dollar spot, red thread and pink patch, pink snow mold or Fusarium patch, gray snow mold or typhula blight, Pythium blight, powdery mildew, rusts, Rhizoctonia brown patch, summer patch and necrotic ring spot, anthracnose, and other diseases are less

serious when a moderate and uniform level of soil nutrients is maintained in the root zone. This may mean more lighter applications of fertilizer and keeping the three major nutrients, nitrogen, potash, and phosphorus, in balance. When nitrogen is high in relation to potash and phosphorus, stress may occur and disease could follow, especially in hot weather. A high level of potassium helps control Rhizoctonia brown patch, Sclerotinia dollar spot, Fusarium patch, Typhula blight, red thread and pink patch, Pythium blight, and "Helminthosporium"-caused diseases.

d. **Eliminating the thatch or mat in which disease organism survive**. Removal helps to starve out these fungi and forces them to compete unfavorably with the multitude of beneficial bacteria and fungi in the soil, many of which are antagonistic to or even parasitic on the disease-producing fungi that attack grass. Elimination of thatch has cut the fungicide budget of many golf clubs in half, but preventing thatch build-up is a better approach.

The principal means of control here is chemical. We can apply a soil fumigant, (e.g., methyl bromide, chloropicrin, Vorlex, or Vapam Soil Fumigant) to the turf area before planting and kill fungi, nematodes, insects, and weed seeds all at once. The expense is fairly high, and it must be done by a certified applicator, but more and more chemical control is being used before seeding or sodding golf greens, turfgrass nurseries, athletic fields, and even home lawns. Generally a polyethylene cover is placed over the treated area for a day or longer to retain the fumes of the fumigant. The only problem with this method is that disease and nematode problems may become more severe later because of lack of competitive fungi, bacteria, and nematodes in the treated area. Once a disease-producing organism is introduced (blown, washed, or tracked) into a treated area, there is no biological check and balance.

This brings us to the use of turf fungicides that are applied on a preventive schedule, before the disease strikes. Generally these are not required on a well-managed home lawn, sod farm, recreation area, or roadway. We suggest that you follow the manufacturer's directions on the package label for rates to use, interval between applications, compatibility with other chemicals, grasses on which the chemical is to be used, and safe use and handling. The method of application is also very important. Use at least 3 to 5 gallons of spray per 1,000 square feet to adequately wet the grass blades, thatch, and top 1/4 inch of soil. Use 1 to 3 gallons of spray against such diseases as powdery mildew, red thread and pink patch, Septoria leaf spot, and rusts that attack only the grass blades. Other diseases, such as Sclerotinia dollar spot, Rhizoctonia brown patch, Pythium blight, "Helminthosporium" melting-out, and snow molds, attack the crown and root area before growing on and over the grass surface. Here 5 gallons per 1,000 square feet is adequate. For diseases like Rhizoctonia brown patch, where the causal fungus is known to survive in the soil in a resistant stage, 10 gallons would probably do a better job. For control of summer patch, necrotic ring spot, and leaf smuts, a drench using 1/2 to 1 inch of water (300 to 600 gallons of water per 1,000 square feet) is needed to move the fungicide down into the root zone.

High pressure spray applications are not necessary. Twenty-five or 30 pounds of pressure per square inch will provide good coverage in the right spray mix. It is much more important that the fungicides be applied uniformly. In most cases, the best way is to use a multi-nozzle boom and apply the chemical equally in two directions. The time interval between spray applications should vary with temperature, expected disease, grass condition, chemical used, and amount of rainfall or irrigation. The spray interval may be as short as five days in hot, wet weather or as long as two weeks if the weather is cool and dry. Some fungicides give some protection for a week to 10 days, even when 4 to 6 inches of water have fallen

as rain or have been applied by a sprinkler. Another chemical may last only five days under similar conditions. The problem is complex and one that you have to work out based upon your knowledge of the chemical and its past performance, the problem turf area involved, past fungicide and other records, and knowledge of the factors that cause a particular disease to flourish. It is only through adequate record keeping that you can hope to determine why a certain fungicide failed or did a good job. All the fungicides in the world cannot compensate for a poor turf management program.

The pest control equipment you use is also important, especially on a golf course. How fast can you complete a spray application? If Pythium strikes, is this fast enough? These are questions you have to answer for yourself. The important thing with any equipment is to get uniform coverage of the grass. You may have to put in a small amount of a commercial spreader-sticker or surfactant to insure wetting the grass blades and to obtain better penetration of the thatch and soil surface. The success or possible failure that you will have with fungicides, however, depends on how well you put together the pieces of the overall turfgrass disease control picture.