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RECOMMENDATIONS FOR THE CONTROL OF DISEASES OF TURFGRASSES

Practically all important diseases of turfgrasses (about 200) are caused by fungi. One important disease, bacterial wilt and decline is caused by a bacterium. These largely microscopic, disease-causing organisms lack chlorophyll and consequently cannot manufacture their own food photosynthetically. Food is obtained from living or dead plants. Most fungi that live in turf feed on dead and decaying organic matter, such as dead grass roots, stems, and leaves, either in the soil or in the layer of thatch. These fungi are generally considered to be beneficial since they aid in thatch decomposition. Some of these fungi also attack living turfgrass under favorable temperature and moisture conditions. Disease-causing fungi may be found in large numbers on dead and decaying leaves and stems on grass that lacks vigor or is growing under stress conditions as well as vigorously growing grass. Most of these organisms are perpetual residents of turfgrass. Weakened or injured grass plants often lose much of their natural resistance to fungi and exhibit more disease than vigorous plants, but both can be attacked.

Because fungi need moisture to grow, infect, and reproduce, diseases are most common and destructive in prolonged wet weather or after frequent light showers or watering. Most fungi that attack turfgrasses are spread by microscopic spores, fragments of diseased leaves, and sclerotia carried on mowers, other turf equipment, shoes, and golf carts. Fungi are transported over long distances by air currents, splashing or flowing water, insects and other animals, seed, sod, or plugs; many are capable of growing short distances on plants or through soil. Fungi are often more damaging in overly fertilized turf than in moderately nourished or nutrient-deficient grass.

Intensively managed golf greens and tees or other fine turf areas require a much higher degree of maintenance and disease control than a highway shoulder or turf along an airport runway. Major diseases often cannot be ignored, but many minor ones are more unsightly than deleterious to the grass.

CULTURAL MANAGEMENT

Cultural practices that help reduce disease losses involve a series of management operations to provide the most favorable conditions possible for the healthy growth of grass, despite the presence of disease-causing fungi (Table 1). These help keep fungi in their place and largely prevent the damaging effect of such diseases as leaf spots and blights, melting-out, powdery mildew, rusts and smuts, Rhizoctonia diseases, Sclerotinia dollar spot, snow molds, red thread and pink patch, anthracnose, and seedling blights. Sound cultural management practices condition turf to withstand moderate traffic or other physical abuses and recover quickly from various injuries, insect attack, or disease. Weeds have difficulty competing in healthy vigorous turf. Turfgrass plants that are in poor health due to unfavorable growing conditions or

Further information concerning Turf and Ornamental Diseases can be obtained by contacting Nancy R. Pataky, Extension Specialist and Director of the Plant Clinic, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

poor cultural management practices outnumber plants that are attacked by fungal pathogens. Maintenance of quality turf requires a disease management program that integrates both cultural and chemical practices after seeding, sodding, sprigging, or plugging.

Table 1. Cultural Management Practices that aid in Controlling Turfgrass Diseases

Cultural management practice	Diseases partially controlled
Provide good surface and subsurface drainage when establishing a new turf area. Fill in low spots where water may stand. Before seeding, sodding, sprigging, or plugging, remove stumps, large roots, construction lumber, bricks, concrete, plaster, tin cans, and other debris. Uniformly mix into the upper 6 to 8 inches of soil all soil amendments, e.g., peat moss, calcined clay, etc. Test the soil reaction (pH) and follow the soil report. A pH between 6 and 7 is best (5.5 is best for reducing Fusarium patch and take-all patch).	"Helminthosporium" diseases, summer patch and necrotic ring spot (Fusarium blight), Rhizoctonia brown patch, Sclerotinia dollar spot, red thread and pink patch, Typhula blight, Fusarium patch, Pythium blight, fairy rings, take-all patch, downy mildew or yellow tuft, spring dead spot, seed rot, seedling blights, Physoderma brown spot, nematodes, algae, moss, chlorosis, wet wilt.
Grow locally adapted, disease-resistant grasses or combinations (blends and mixtures). Check with your nearest Extension office or Extension turf specialist for suggested grass species and cultivars to grow. See also Table 2 for disease resistance of some Kentucky bluegrass cultivars. In shaded areas, grow shade-tolerant cultivars or species.	"Helminthosporium" diseases, rusts, leaf smuts, summer patch and necrotic ring spot (Fusarium blight), Typhula blight, Fusarium patch, Sclerotinia dollar spot, powdery mildew, Pythium blight, anthracnose, take-all patch, nematodes, red thread, Septoria leaf spot, salt tolerance, traffic, spring dead spot, bacterial wilt and decline, winter injury, wet wilt.
Buy only top-quality sod, sprigs, plugs, or pathogen-free seed from a reputable dealer. Whenever possible, plant at suggested rates when the weather is cool and dry. The seedbed should be well prepared and fertile. Avoid overwatering, especially from planting to seedling emergence or plant establishment.	"Helminthosporium" diseases, Pythium blight, seed rot, seedling blights, leaf smuts, rusts, Sclerotinia dollar spot, summer patch and necrotic ring spot (Fusarium blight), Typhula blight, Fusarium patch, yellow patch, yellow ring, nematodes, bacterial wilt and decline.

Table 1. (continued)

Cultural management practice	Diseases partially controlled
Provide nutrients when the turf is actively growing. Fertilize (supply nitrogen, potash and phosphorus), according to local recommendations and soil tests. Recommendations will vary with the grasses grown and their use. Avoid overstimulation with fertilizer, especially with a water-soluble, high-nitrogen material, in hot weather. A high level of potassium (potash) helps suppress disease development. A fall fertilizer application to dormant turf 1 to 2 weeks following the final mowing can take the place of an early spring fertilizer application. Slowly released forms of nitrogen fertilizer are recommended.	"Helminthosporium" diseases, powdery mildew, rusts, Rhizoctonia brown patch, Sclerotinia dollar spot, fairy rings, Typhula blight, Fusarium patch, Pythium blight, summer patch and necrotic ring spot (Fusarium blight), leaf smuts, red thread and pink patch, anthracnose, Nigrospora blight, take-all patch, seed rot, seedling blights, Ascochyta and Septoria leaf spots, downy mildew or yellow tuft, leptosphaerulina leaf blight, spring dead spots, nematodes, algae, chlorosis, moss slime molds, bacterial wilt and decline, wet wilt, winter injury.
Mow frequently at the height recommended for the area, season, and grasses grown. Avoid scalping. Remove no more than 1/3 of the leaf height at one cutting. Keep the turf cut in late fall until growth stops. Keep the mower blades sharp.	"Helminthosporium" diseases, powdery mildew, Rhizoctonia brown patch, Sclerotinia dollar spot, Typhula blight, Fusarium patch, rusts, summer patch and necrotic ring spot (Fusarium blight), red thread and pink patch, Ascochyta and Septoria leaf spots, bacterial wilt and decline, slime molds, wet wilt, winter injury, scalping.
Water established turf thoroughly during droughts. Moisten the soil to a depth of 6 inches at each irrigation. Repeat every 7 to 10 days if the weather remains dry. Water as infrequently as possible to allow gaseous exchange between soil and atmospheric air. Avoid frequent light sprinklings, especially in late afternoon or evening. Daily watering may be needed in certain cases to prevent wilt and symptoms of summer patch and necrotic ring spot (Fusarium blight), Nigrospora blight, and where parasitic nematode populations are high.	"Helminthosporium" diseases, Rhizoctonia brown patch, rusts, Sclerotinia dollar spot, red thread and pink patch, powdery mildew, Pythium blight, summer patch and necrotic ring spot (Fusarium blight), leaf smuts, fairy rings, Nigrospora blight, nematodes, seed rot, seedling blights, Physoderma brown spot, anthracnose, take-all patch, Ascochyta and Septoria leaf spots, leptosphaerulina leaf blight, slime molds, algae, moss, wet wilt, winter injury.

Table 1. (continued)

Cultural management practice	Diseases partially controlled
Increase light penetration and air movement to the turfgrass area and speed drying of the grass surface by selectively pruning or removing dense trees, shrubs, and hedges bordering the turf area. When landscaping, space plantings and other barriers properly to avoid too much shade and increase air movement across the grass.	"Helminthosporium" diseases, Typhula blight, Fusarium patch, Rhizoctonia brown patch, Sclerotinia dollar spot, rusts, red thread and pink patch, powdery mildew, seed rot, seedling blights, Pythium blight, Septoria and Ascochyta leaf spots, slime molds, algae, moss.
Remove excess thatch in early spring or fall when it accumulates to 1/2 inch for higher-cut grasses, 1/8 inch for fine turf. Thatch control will reduce essentially all diseases. Use a vertical mower, power rake, or similar dethatching equipment. These machines may remove much live grass when used in areas with a thick thatch. Core aerification and light top dressing can also be used to reduce thatch.	"Helminthosporium" diseases, Pythium blight, rusts, summer patch and necrotic ring spot (Fusarium blight), Typhula blight, Fusarium patch, Sclerotinia dollar spot, red thread and pink patch, anthracnose, fairy rings, leaf smuts, yellow ring, yellow patch, nematodes, take-all patch, algae, slime molds, moss, wet wilt, winter injury.
Core (aerify) compacted turf areas one or more times per year during the spring or fall period of active turf growth, using a hand aerifier or power machine. Eliminate foot and vehicle traffic by putting in walks, fences, shrubbery, patios, parking areas, etc.	"Helminthosporium" diseases, Pythium blight, rusts, summer patch and necrotic ring spot (Fusarium blight), Typhula blight, Fusarium patch, Sclerotinia dollar spot, Rhizoctonia brown patch, anthracnose, spring dead spot, algae, moss, compaction, wet wilt, winter injury.
Follow suggested insect and weed control programs for the area and grasses being grown. Some insects transmit disease-causing fungi; weeds may harbor them.	Applies to practically all diseases. This area has not been studied extensively by plant pathologists.

When the cultural practices outlined in Table 1 do not check the development of turfgrass diseases, a preventive fungicide program may be needed.

CHEMICAL CONTROLS

Before using any fungicide, you should know what diseases are likely to develop in your turf. The fungicides to use depend on several factors, such as the type of grass being grown, disease problems expected, acreage to be sprayed, budget, available manpower and equipment, and cost of chemicals. Other factors could include the local distributor or dealer and the chemical companies he works with, past

experience with turf fungicides, and whether or not nearby flowers, trees, and shrubs need to be treated for foliar diseases.

Turf disease problems vary greatly, depending on the grass or grasses being grown and the cultural management program (Table 2).

Table 2. Modern Kentucky Bluegrass Cultivars Adapted to Illinois and Reported to be Moderately to Highly Resistant (R)[a] to one or More Diseases

Kentucky Bluegrass Cultivars	"Helminthosporium" diseases	Leaf smuts	Leaf and stem rust	Summer patch & necrotic ringspot	Sclerotinia dollar spot	Typhula blight	Septoria leaf spot	Red thread
A-20	R	R	R	R	R		(b)	R
A-34 (Bensun)	R	R	R	R				
Adelphi	R	R	R	R	R	R	R	R
Baron	R	R	R	R	R	R		R
Bonnieblue	R	R	R	R	R	R		R
Brunswick	R	R	R	R	R			
Cheri	R	R	R	R	R		R	
Enmundi	R		R	R	R			R
Enoble	R							
Fylking	R	R	R				R	
Geronimo	R				R			R
Glade		R	R	R		R		
Majestic	R	R	R	R	R		R	R
Monopoly	R	R		R		R		R
Nugget	R	R	R			R	R	R
Parade	R	R	R	R	R		R	
Plush	R	R	R		R			R
Rugby	R	R	R	R	R			
Sydsport	R	R	R		R		R	
Touchdown	R	R		R			R	R
Vantage		R		R	R			
Victa	R	R	R	R				R

a A resistant (R) rating does not mean that a particular cultivar will be resistant in all locations every year. Due to the presence of physiological races or strains of the various fungi that cause these diseases, a cultivar may be susceptible in one locality and highly resistant in another. This is especially true of powdery mildew and is the reason we omitted this disease from our ratings.

b A blank under a given disease does not necessarily indicate susceptibility. In some cases it means that no data are available on which to evaluate the relative susceptibility or resistance to a particular disease.

LAWN-TYPE GRASSES

One or more broad-spectrum turf fungicides, such as Daconil, Chipco 26019, and Vorlan may be used to maintain a lawn-type grass, such as a home or industrial lawn, municipal or state park, airport, athletic turf, school or church grounds, cemetery, sod farm, fairways and tees, highway shoulders, or median strip. All of these control "Helminthosporium"-caused diseases and Sclerotinia dollar spot as well as other less important grass diseases.

If **powdery mildew** is a problem on Kentucky bluegrass in the shade, you may wish to add Banner or Bayleton to the above listing.

If **rusts** are serious in warm to hot weather, Fore, Banner, Bayleton, and Daconil provide good to excellent control.

Snow molds (Fusarium patch and typhula blight) damage turf in shady areas and where snow is slow to melt. Products that give good control include Bayleton, Chipco 26019, and Rubigan. Fungo and Vorlan control Fusarium patch but not Typhula blight while Daconil controls Typhula blight but not Fusarium patch.

Summer patch and necrotic ring spot (formerly called Fusarium blight) are becoming more severe each year, especially in sunny droughty areas where the turf has a thick thatch. Banner and Rubigan applied as preventives give good to excellent control where thatch has been removed, nitrogen is applied, and turf is thoroughly watered during dry periods. Bayleton and Chipco 26019 are other good preventive fungicides but one of these products should be combined with Fungo or Cleary 3336 to control both diseases.

Seed decay (rot and seedling blights) are unusual problems and develop only with poorly germinating seed, seed planted in an excessively wet seedbed, and/or unseasonable temperatures. Purchase or treat seed with Captan or Thiram plus Koban or Apron FL. Apply the same fungicides at early seedling emergence and repeat at 5- to 7-day intervals. Most turf fungicides do a good job of postemergence disease control, either alone or mixed with Koban, Terrazole, Chipco Aliette, or Subdue.

Leaf smuts (largely stripe smut and flag smut) are not a major concern in Kentucky bluegrass and creeping bentgrass turf areas. The only materials that provide lasting (or eradicative) control are systemic fungicides (Banner, Bayleton, Fungo, Rubigan). These materials must be applied in late fall, just before the grass goes into dormancy. These products need to be drenched into the soil. Take two applications, 14 to 21 days apart. Carefully follow the manufacturer's directions on the container label.

If you stock only one broad-spectrum turf fungicide, choose between Daconil, Chipco 26019, or Vorlan. When other disease problems are expected, supplement the broad-spectrum product with one or more disease-specific chemicals.

Bentgrass

If you are growing bentgrasses on golf or bowling greens, low-cut tees, fairways, or other areas, choose a broad-spectrum fungicide to control "Helminthosporium" diseases, Sclerotinia dollar spot, and Rhizoctonia brown patch (e.g., Daconil, Chipco 26019, Vorlan).

In hot humid weather, when *Pythium* is active, Chipco Aliette, Banol, Subdue, Koban, or Terrazole do an excellent job, but free water must first be eliminated. In hot or very humid weather, one or more fungicides effective against *Pythium* are often mixed with Daconil, Fore, Chipco 26019, Vorlan, Bayleton, Cleary 3336, or Fungo to give a more broad-spectrum disease control.

Snow molds damage turf in shady areas, where snow is slow to melt and no protective fungicide has been applied. Golf course superintendents who are certified can use Calo-clor or Calo-Gran (both are restricted products) on golf course greens, tees, and aprons. Otherwise, use one of the products mentioned for snow mold control under Lawn-type Grasses.

Where **Sclerotinia dollar spot** is a serious problem on creeping bentgrass, even where the turf has been adequately fertilized, the systemics (Bayleton, Rubigan, Vorlan, Cleary 3336, Fungo) provide the longest and best protection, but be alert for evidence of resistant strains of the dollar spot fungus. Using a systemic fungicide in combination with Chipco 26019 or Daconil should solve the resistance problem.

Leaf smuts are an uncommon problem. For control, see leaf smuts under Lawn-type Grasses above.

Effective chemical control of turf diseases depends on a rapid and accurate diagnosis. Experienced golf course superintendents, sod growers, lawn care company personnel, and other turfgrass managers can usually recognize or predict the occurrence of common diseases and hence promptly initiate proper chemical controls. Homeowners, however, are usually unable to diagnose turf diseases until substantial damage has occurred.

The use of fungicides is generally discouraged in most home lawn situations for several reasons:

1. Proper diagnosis and selection of the right fungicide to apply is difficult;

2. It is usually too late for recovery after extensive damage has occurred;

3. Homeowners often lack the proper application equipment or cannot purchase the suggested turfgrass fungicide(s) locally;

4. It is probably less expensive and more satisfactory in the long run to overseed or resod a diseased turf area with a mixture or blend of disease-resistant cultivars (Table 2) or species;

5. Lack of application experience and proper certification to handle pesticides; and

6. Fungicides are mildly to highly toxic and only qualified personnel should apply them following the manufacturer's directions and precautions as listed on the container label.