

1976

EC76-1833 Lawn Diseases in the Midwest

J. L. Weihing

M. C. Shurtleff

R. E. Partyka

Follow this and additional works at: <http://digitalcommons.unl.edu/extensionhist>

Weihing, J. L.; Shurtleff, M. C.; and Partyka, R. E., "EC76-1833 Lawn Diseases in the Midwest" (1976). *Historical Materials from University of Nebraska-Lincoln Extension*. 4290.

<http://digitalcommons.unl.edu/extensionhist/4290>

This Article is brought to you for free and open access by the Extension at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Historical Materials from University of Nebraska-Lincoln Extension by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Lawn Diseases

in the MIDWEST



Agricultural Extension Services of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin and the United States Department of Agriculture cooperating.

EC 76-1833

Extension work in "Agriculture, Home Economics and subjects relating thereto," The Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, Cooperating with the Counties and the U.S. Department of Agriculture
Leo E. Lucas, Director

KEY TO DISEASES

Symptoms	Diseases	Page
Irregular patterns of dead grass	Helminthosporium leaf spot and melting-out	4
Round patterns of dead grass		
Patches from 1 inch to 3 feet in diameter	Rhizoctonia brown patch	10
Patches usually 1-6 inches in diameter	Dog injury	19
	Sclerotinia Dollar spot	9
	Pythium blight	15
	Corticium red thread	16
Light green to straw-colored patches often have green centers	Fusarium blight	8
Dead patches often following melting snow	Snow molds	13
Surface of grass blades become powdery		
Reddish-brown to orange	Rust(s)	11
Milky-white	Powdery mildew	7
Bluish-gray to black	Slime molds	17
Black powder in stripes	Stripe and flag smut	7
Seedlings wilt and die (thin stand)	Damping-off, seed rot	16
Mushrooms or puffballs in the lawn	Mushrooms, puffballs	12
Rings or arcs in lawn; mushrooms occasionally appear in the rings	Fairy ring	12
Other causes of poor turf	Septoria leaf spot or tip blight	16
	Nematodes	17
	Insect injury	18
	Chemical burn	18
	Chlorosis or yellowing	18
	Buried debris	19
	Compacted areas	19
	Algae, green scum	19
	Moss	19

Pictures on pages 4, 8, 11, 12, 13 and 15 used by permission of the Government Printing Office, United States Department of Agriculture.

Picture on page 7, courtesy of The Morton Chemical Co.

Pictures on pages 10 and 14, courtesy of Mallinckrodt Chemical Co.

Picture on page 12, courtesy of The Upjohn Chemical Co.

Cover photo courtesy Better Lawn Institute.

Issued June 1961, 67,000
Reprinted April 1962, 36,500
Revised June 1963, 51,000
Reprinted June 1964, 23,000
Revised May 1966, 83,000

Reprinted April 1968, 20,000
Revised September 1969, 36,000
Reprinted May 1970, 30,100
Revised April 1973, 53,000
Reprinted June 1974, 25,000
Reprinted July 1976, 27,700

LAWN DISEASES IN THE MIDWEST

by
J. L. Weihing, M. C. Shurtleff, R. E. Partyka and
J. M. Vargas, Jr.¹

INTRODUCTION

An attractive, beautiful, well-kept lawn is an important and valuable asset to the home as well as commercial and industrial complexes.

The amount of time and money spent on lawns each year is staggering. In the Midwest alone, there is probably more than a two billion dollar investment in lawns and an excess of one-half billion dollars spent annually for maintenance. Lawns are big business and compare in economic importance with major Midwest field crops.

The homeowner is as proud of a beautiful lawn as he is of a new carpet or automobile. After friends and neighbors have heaped praise and admiration for his skill in growing such a lawn, disease may suddenly devastate large areas. This is most discouraging.

PREVENTIVE DISEASE CONTROL

This circular is written for the homeowner who desires to keep his lawn as disease-free as practical. Much of the information should prove useful to the professional turfgrass manager.

There is no magic formula for producing a good lawn. Like all plants, lawn grasses need proper amounts of light, moisture, and nutrients, and are subject to several diseases much the same as

other plants. Not all lawns are affected with the same disease; some areas are more disease-prone than others. Following are some facts about disease and general cultural practices that help prevent them, reduce their effects, and foster plant recovery.

1. Fungi and nematodes are the cause of all serious infectious diseases in lawns in the Midwest. The fungi usually produce microscopic spores that are spread by wind, water, mowers or other equipment, and infected grass clippings. Nematodes are microscopic worms which survive in the soil or grass debris as eggs, cysts or larvae and feed on the roots of grass plants.

2. Fungus spores need proper moisture and favorable temperatures to infect. Lawn diseases are most common and damaging during wet, humid seasons, or with frequent light waterings during dry periods.

3. Water properly. The more often grass is wet and the longer it remains wet, the greater are the chances of disease problems occurring. During dry periods, enough water should be applied at one time to provide adequate moisture for a week. This means the soil should be wet 6 to 8 inches deep.

4. Remove excess thatch in early spring or early fall when one-half inch or more has accumulated. Use a "vertical mower," "power rake" or similar equipment.

Thatch is a tightly intermingled layer of living and dead stems, leaves and

¹ John L. Weihing is Director of the University of Nebraska Scotts Bluff Station; Malcolm C. Shurtleff is Extension Plant Pathologist, University of Illinois; Robert E. Partyka is Extension Plant Pathologist, Ohio State University; and Joseph M. Vargas, Jr. is Assistant Professor of Plant Pathology at Michigan State University.

roots of grasses which develops between the layer of green vegetation and the soil surface. Too much thatch keeps water from penetrating the soil; makes some disease problems worse; and apparently prevents the grass from putting down a deep root system. Thatch is often an ailment of "good lawns." Grasses differ in their inclination to develop thatch but common Kentucky bluegrass is less likely to have a serious thatch problem than bentgrass, Merion Kentucky bluegrass or red fescue.

5. Do not mow upright grasses, such as Kentucky bluegrass and fescues too closely—clipping to 2" or higher is recommended; somewhat higher in summer. Creeping grasses such as bentgrasses, bermudagrass, and zoysia may be mowed to ½ inch or less.

6. Mow grass frequently, so that no more than ¼ to ⅓ of the leaf surface is removed at any one time. Mow the lawn throughout the fall until the grass stops growing.

7. Lawn areas where air movement is restricted can be problem spots. Thinning or removal of surrounding shrubs and trees allows sunlight to penetrate and increases air flow. This speeds drying of the grass and aids in disease control. Space landscape plants properly to allow adequate air movement and to avoid excessive shade.

8. Grass diseases may build up and spread rapidly in pure stands of a susceptible variety because every plant is susceptible. Disease severity is reduced in lawns containing a compatible blend of two or more locally adapted, disease-resistant grass varieties or a mixture of grass species. Increased awareness of the destructive diseases is necessary when a single variety is grown. Adjust lawn care operations and perform control measures regularly.

9. Provide good surface and subsurface drainage when establishing a new turfgrass area. Fill in low spots where water may stand.

10. Fertilize according to local recommendations and a soil test.

Recommendations will vary with the grasses grown and their use. Do not overfertilize to promote fast lush growth, especially in hot humid weather, or early spring. Overfertilizing may accentuate disease development.

11. Coring compacted areas, using a hand corer or power machine. Coring is a form of cultivating involving the use of a hollow tine or spoon to remove soil cores that leave a hole or cavity in the soil.

12. Follow suggested insect and weed control programs for your area and grasses grown.

13. Do not plant grasses that are not adapted to your area. Be careful of seed mixtures that may contain some "weed" grasses; plant at recommended rates. Additional information may be obtained by consulting your local county Extension office or turfgrass specialist at your state land-grant university.

HELMINTHOSPORIUM LEAF SPOT AND MELTING/OUT

Symptoms

A variety of symptoms are produced by this disease, depending on the causal fungus, the variety affected, and the stage of disease development. Thinning out of grass in scattered areas of the lawn is one symptom. A general brownish or reddish color of dead grass accompanies the general thinning out.



Figure 1. As melting-out disease progresses, large irregular areas of the lawn may be killed.



Figure 2. Typical leaf spot symptom caused by melting-out disease on bluegrass.

As the disease progresses, large irregular areas of the lawn may be killed (Figure 1). In some instances the entire lawn is lost.

Close examination of infected leaves usually reveals lesions that are usually dark reddish-brown, purplish-brown, chocolate-brown, or straw-colored with a reddish-brown to purplish-black border. They are round to oblong and parallel to the leaf blade.

The leaf spot stage commonly does not cause serious damage to the lawn (Figure 2). More severe injury results when the leaf sheath area in or near the crown of the plant is infected. A diseased leaf sheath turns reddish to purple or brown and dies, resulting in death of the entire leaf blade. When conditions are moist, the disease progresses from leaf sheath to leaf sheath until all above-ground plant parts are killed. The disease then may affect the crown, rhizomes and roots killing the entire plant.

During hot weather, the disease may cause a sudden dying of large, irregularly shaped areas, with no visible symptoms on the foliage of dead plants. They may appear to have died from drought.

A yellowing of the leaves sometimes

occurs, resembling symptoms of nitrogen or iron deficiency. Later, much or all of the affected area may die out. Internal tissues of the crown and roots of affected plants are dark brown and rotted.

Procedure for diagnosing melting-out:

1. Check leaf blades for lesions. This symptom is most common in spring and fall.

2. Check the leaf sheaths, crowns, rhizomes and roots for reddish-purple to brown discoloration.

3. When sudden dying-out of grass in areas of various sizes occurs in mid-summer, first check for sod webworm, chinch bug, grubs or other insect damage. Grubs are usually found about one inch below the surface of the sod where they have cut off the grass roots. Sod webworms commonly chew the grass blades off at the soil surface, while chinch bugs suck the sap from the blades turning them yellow or brown. You may have to obtain help from your county Extension office in identifying insect injury. If there are no distinctive foliage symptoms, and if insects are absent while fertilizer and moisture are adequate, then the grass may have died as a result of root infection by a melting-out fungus.

Cause

Melting-out is caused by several species of *Helminthosporium*. These fungi all have essentially the same life cycle (Figure 3).

The organisms produce large numbers of spores which are blown or splashed onto leaves, where infection may occur if there is free moisture on the surface of the plants. Spores may be carried to other areas of the lawn by mowers and other equipment, foot traffic, dragging hoses, infected clippings, flowing or splashing water, etc.

Control

Resistant varieties. There are major differences among varieties of Ken-

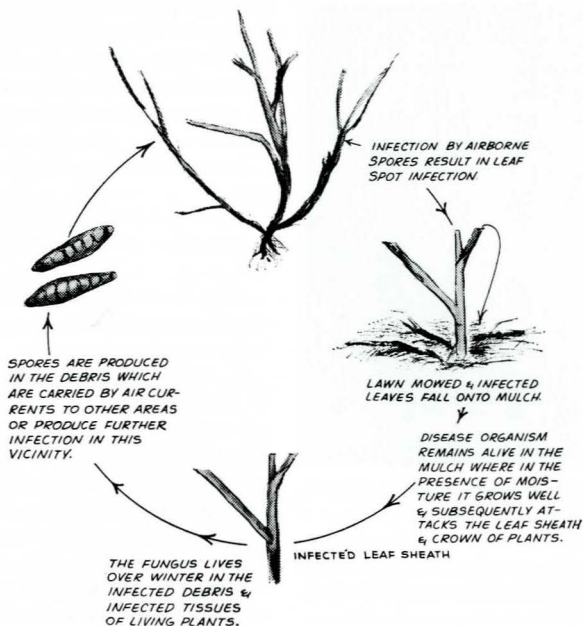


Figure 3. This drawing shows the life cycle of the fungi that cause melting-out (Fade-out, Going-out) diseases.

tucky bluegrass in resistance to the various *Helminthosporium* species. For example, Merion Kentucky bluegrass is resistant to *H. vagans* and *H. dictyoides* but susceptible to *H. sorokinianum*. Also varieties (cultivars) of Kentucky bluegrass differ in their resistance depending on geographic location. For example, Windsor is *Helminthosporium* resistant in parts of Ohio but susceptible in Michigan.

Watering

Avoid wetting the grass with frequent light sprinklings, waterlogging of the soil, or allowing the soil to become excessively dry. Usually a lawn need not be watered more than once every 7 to 10 days if the soil is soaked to a depth of 6 to 8 inches at each irrigation. If the grass is allowed to become excessively dry and begins to go "dormant," and then is watered heavily, melting-out may occur. The crown and root rot phase of this disease occurs more read-

ily whenever grass vigor is suppressed. It is important to keep the grass in good vigor, particularly during hot weather.

A dense mat of thatch is ideal for the development of melting-out fungi and should be avoided. If the thatch or mat accumulates to a depth of $\frac{1}{2}$ inch or more, the lawn should be power raked in early spring or early fall. Aerification also brings up soil which when mixed with the thatch increases the rate of thatch decay.

Fertilization. Follow a recommended fertilizer program; be sure to maintain adequate levels of potassium. Avoid excess nitrogen as this results in soft lush grass that is very susceptible to *Helminthosporium* disease-causing fungi.

Plant Health Program. A severe outbreak of melting-out is difficult to stop once it is in progress. There is such a large amount of the fungus present that cultural measures will not reduce the parasite sufficiently to stop disease development. In such cases plant-

protective fungicides must be used in the spring during the early leaf spot stage. Make the first application shortly after the grass greens up, and repeat at two-week intervals until four or five applications have been made. If you delay until melting-out symptoms appear, the disease will be difficult to control.

The disease will also develop in late fall during periods of cool wet weather. It is advisable to apply one or two fungicide applications during this time otherwise disease development may progress to the point where spring application will be ineffective.

POWDERY MILDEW

Symptoms

Heavily infected leaf blades appear as if dusted with flour or lime. Close examination reveals patches of a whitish, powdery-like growth on the leaf surface (Figure 4). Infected leaves often turn yellow and wither. New plantings may be killed when mildew is severe. The disease is most severe on Kentucky bluegrass grown in the shade. Established plantings may be predisposed to adverse environmental conditions. Disease attacks occur chiefly in late summer, fall and spring when the nights are damp and cool.

Cause

Mildew is caused by a fungus (*Erysiphe*



Figure 4. The white substance on the leaves is the powdery mildew fungus.

graminis) which attacks the surface of leaves. It sends branched, absorptive structures (haustoria) into the surface cells of leaves from which it obtains nourishment. Later, the fungus produces millions of spores which are distributed by air currents. New infections are rapidly produced. The fungus survives the winter on living or dead grass leaves. Mildew is most severe in shaded areas.

Control

Keep the lawn vigorous by adequate, proper fertilization and maintaining adequate moisture in the soil. Avoid excess nitrogen. Mow frequently at the recommended height. Increase air circulation and reduce shade by proper pruning of dense trees and shrubs.

Kentucky bluegrass varieties with fair to good resistance include Warren's A-20 and A-34, Anheuser Dwarf, Belturf, Cougar, Delta, Fylking, Newport, Nuggett, Pennstar, Prato, and Sodco.

This disease can be checked by thorough application of a fungicide. Consult your state recommendations included in this circular. Make two or three applications about 10 days apart, starting when mildew is *first* seen.

STRIPE OR FLAG SMUT

Symptoms

Stripe and flag smuts produce similar symptoms and are most noticeable during spring and fall because they are favored by cool (50° to 60° F) temperatures. Infected plants usually occur singly or in patches, varying from a few inches to a foot or more in diameter. Infected plants are often pale green to slightly yellowed and stunted.

Individual leaf blades may be curled and show black stripes with black powdery spores that rub off from these stripes. The stripes run parallel with the leaf veins. When first developing, they are yellow-green. Later they turn gray then black and may or may not be con-



Figure 5. Leaves of a Kentucky bluegrass plant curled and shredded by stripe smut infection.

tinuous along the leaf blade. The leaf then twists, curls and shreds from the tip downward (Figure 5). Infected plants may die during hot dry weather. In other instances, the symptoms disappear or become “masked.”

Cause

Stripe and flag smuts are caused by *Ustilago striiformis* and *Urocystis agropyri*, respectively. Laboratory diagnosis is necessary to distinguish the two smut fungi. Spores of these fungi germinate in the soil and thatch where they may infect the buds on crowns and rhizomes of young tillers. The fungi grow throughout the plant tissues and remain within the plant until it dies. Smutted plants in newly seeded lawns are uncommon. Watering and high fertility favor their buildup.

Control

Varieties of Kentucky bluegrass and creeping bentgrass differ greatly in resistance to stripe and flag smut. Varieties of Kentucky bluegrass cur-

rently with good resistance include Warren's A-20 and A-34, Anheuser Dwarf, Baron, Belturf, Delft, Delta, Fylking, Kenblue, Park, Pennstar, and Sodco.

Very susceptible bluegrasses include Cougar, Merion, Newport, Prato, and Windsor. Common and Troy are moderately susceptible.

Creeping bentgrasses reported as susceptible to stripe smut include Arlington, Cohansey, Congressional, Evansville, Old Orchard, Penncross, Pennlu, Seaside, Toronto, and Washington. Resistance to these smut fungi may not be stable due to numerous races of each smut fungus. It is suggested, where feasible, that you plant a blend rather than a single variety.

Certain systemic fungicides may be used to control smut fungi in bentgrass and bluegrass plants when applied as a soil drench and watered in. The manufacturer's directions should be carefully followed.

FUSARIUM BLIGHT

This disease of lawns more than two years old is becoming one of the most troublesome in the eastern half of the United States on bentgrasses, Kentucky bluegrass and red fescue. All lawn grasses grown in the Midwest appear to be susceptible. Fusarium blight is caused by a different fungus than that causing Fusarium patch or pink snow mold.



Figure 6. Fusarium blight. Apparently healthy green grass may occur within the centers of patches of dead grass.

Symptoms

Light green patches of affected plants, 2 to 6 inches in diameter, appear first (Figure 6). Later, the color changes in a 36-48 hour period to dull reddish-brown, then tan, and finally a light straw color. The patches may form elongate streaks, crescents, or circles 2 feet or more in diameter.

In final stages of the disease, distinct streaks and uniformly blighted circular patches of diseased grass are scattered throughout the lawn. Apparently healthy green grass may occur within the centers of patches of dead grass giving a diagnostic "frog-eye" pattern.

When ideal conditions for disease development exist for an extended period of time, affected areas may overlap, resulting in a completely blighted area. Pink mycelial growth of the causal fungus can sometimes be found in crowns of diseased plants which are dry and dark brown to black.

Cause

Fusarium blight is caused by *Fusarium roseum* f. sp. *cerealis* 'Culmorum' and *F. tricinctum* f. sp. *poae*. *F. roseum* appears to be more important and more widely distributed. Both fungi survive the winter in infected grass roots, crowns and rhizomes and in the thatch layer. High nematode populations predispose plants to injury by the Fusarium fungi. Poor cultural practices may weaken the turf and predispose it to Fusarium blight.

Temperatures from 75 to 100° F coupled with high humidity favor disease development. Disease severity appears to be directly related to the drought stress to which the turf has been subjected. The disease may appear in 1-2 days during the summer when night temperatures are high.

Control

Maintain grass in vigorous growing condition, but *avoid* the use of excessive nitrogen during hot summer weather.

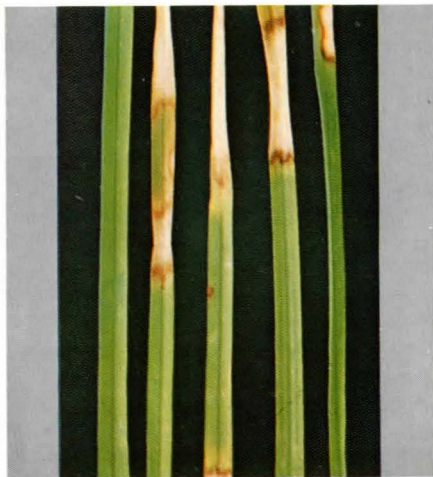


Figure 7. Typical dollar spot leaf lesions on Kentucky bluegrass.

Water deeply to avoid drought stress. Mow at the suggested height (page 3).

Keep thatch to a minimum (below ½ inch) as excessive thatch provides an ideal medium for the fungi to overwinter and multiply.

Bentgrasses, fescues, ryegrasses and bluegrasses are all susceptible to this disease, but varieties differ in resistance. Merion Kentucky bluegrass is particularly susceptible.

Disease may be controlled by proper application of certain systemic fungicides. Carefully follow the manufacturer's recommendations.

SCLEROTINIA DOLLAR SPOT

Symptoms

Dollar spot appears as round, brownish or bleached-tan spots of turfgrass ranging from the size of a silver dollar on bentgrasses to 4 to 6 inches in diameter on bluegrass, fine-leaf fescues, zoysia, and Bermudagrass. If left unchecked, the spots may merge forming large, irregular, straw-colored patches of dead grass.

Individual blades are girdled with yellow to light tan lesions with reddish-

brown borders (Figure 7). When dollar spot is active a white, cobwebby growth (mycelium) can sometimes be seen on the grass leaves while dew is still present. Injured turf recovers quickly if treated promptly. If left untreated, it may take weeks or months for new grass to fill in the sunken dead areas.

Cause

Dollar spot is caused by the fungus, *Sclerotinia homoeocarpa*. The disease may occur regardless of management or soil fertility. Damage is usually most severe if there is a deficiency or a great excess of nitrogen.

Dollar spot is most active during moist periods of warm (60-85° F) days and cool nights in spring, early summer and fall. The fungus overwinters as resting mycelia in the thatch layer and infected plant parts. The fungus does not normally produce spores. Spread occurs from one area to another on infected material that is blown or splashed about and carried on mowers, hoses, maintenance equipment and shoes.

All lawn grasses grown in the Midwest are susceptible to attack. Bentgrasses, especially certain strains of creeping bent, are very susceptible as are bermudagrasses and zoysias. New seedlings of tall fescue are also commonly attacked.

Control

Follow the same cultural practices as outlined under Preventive Disease Control (page 3). Maintain adequate to high fertility by following the recommended lawn feeding program for your area. The disease may be controlled by applying certain fungicides starting when the disease is first evident. Follow manufacturer's directions.

RHIZOCTONIA BROWN PATCH

Symptoms

This disease appears in bentgrass turf as somewhat roughly circular brown



Figure 8. Brown patch. Most noticeable early in the morning.

patches, up to several feet in diameter (Figure 8). Leaves are first water-soaked and dark, but soon dry, wither and turn light brown. On closely clipped bent, a dark grayish-black ring of wilting grass often borders diseased areas. This ring is most noticeable early in the morning, disappearing as the grass dries.

In light attacks, turf generally recovers from brown patch in 2 or 3 weeks. When severe, however, the crowns, rhizomes and roots may rot. Such turf is killed or thinned out in large areas. Brown patch occurs in hot, humid weather when night temperatures are above 60° F, and leaf surfaces are covered with free moisture for long periods.

Cause

Brown patch is caused by the common soil-borne fungus, *Rhizoctonia solani*, which attacks all lawn grasses. Bentgrasses and annual bluegrass are more seriously injured than the coarser bluegrasses, fescues and ryegrasses.

The fungus invades and kills the grass blades, leaf sheaths, stems, crowns and roots. It overwinters principally in the form of small, hard, brown to black resting bodies (sclerotia) that measure about 1/16 of an inch in diameter. These form in the thatch of infected plants or in the top ½ inch of soil. Sclerotia are extremely resistant to cold, heat,

drought and chemicals. During moist periods, when the soil temperature is above 50° F, the sclerotia may send out microscopic threads (hyphae) that penetrate and infect grass plants. The fungus does not produce spores.

Four conditions are necessary for *Rhizoctonia* brown patch to develop:

1. Viable fungus must be present.
2. Dense growth of a susceptible grass.
3. A temperature of 70° to 95° F for several hours.
4. Prolonged dew or a film of moisture on the foliage.

If any one of these conditions is lacking, brown patch will not be severe.

The *Rhizoctonia* fungus grows out radially through the soil and thatch from germinating sclerotia—hence the circular spots of diseased plants. Under hot and humid conditions the lower grass leaves touching the soil or turf mat are attacked. Infection then progresses up the plant and spreads to adjacent grass blades in the dew or exuded water on the leaf tips.

Sclerotia may germinate and cause infection an indefinite number of times (30 or more) and survive in soil for a number of years. The fungus is also capable of surviving up to 4 months in dried grass clippings.

Control

Follow the suggested cultural practices outlined under Preventive Disease Control (page 3). Brown patch occurs less frequently when available nitrogen supply in the soil is adequate or low and phosphorus and potassium levels are high. Apply a suggested fungicide weekly in hot, humid weather following the manufacturer's directions. Apply when the temperature is 80°F or lower. Bentgrasses cut at golf green height cannot be grown without a preventive fungicide program.

RUST

Symptoms

Rust does not usually become a prob-

drought and chemicals. During moist periods, when the soil temperature is above 50° F, the sclerotia may send out microscopic threads (hyphae) that penetrate and infect grass plants. The fungus does not produce spores.

Four conditions are necessary for *Rhizoctonia* brown patch to develop:

1. Viable fungus must be present.
2. Dense growth of a susceptible grass.
3. A temperature of 70° to 95° F for several hours.
4. Prolonged dew or a film of moisture on the foliage.

If any one of these conditions is lacking, brown patch will not be severe.

The *Rhizoctonia* fungus grows out radially through the soil and thatch from germinating sclerotia—hence the circular spots of diseased plants. Under hot and humid conditions the lower grass leaves touching the soil or turf mat are attacked. Infection then progresses up the plant and spreads to adjacent grass blades in the dew or exuded water on the leaf tips.

Sclerotia may germinate and cause infection an indefinite number of times (30 or more) and survive in soil for a number of years. The fungus is also capable of surviving up to 4 months in dried grass clippings.

Control

Follow the suggested cultural practices outlined under Preventive Disease Control (page 3). Brown patch occurs less frequently when available nitrogen supply in the soil is adequate or low and phosphorus and potassium levels are high. Apply a suggested fungicide weekly in hot, humid weather following the manufacturer's directions. Apply when the temperature is 80°F or lower. Bentgrasses cut at golf green height cannot be grown without a preventive fungicide program.

RUST

Symptoms

Rust does not usually become a prob-



Figure 9. Rust lesions on bluegrass. The lesions contain reddish dust-like material that readily rubs onto one's fingers or shoes when walking through a rusted lawn.

lem until summer when extended dry periods slow the growth of grass. Some varieties of Kentucky bluegrass (*Adelphi*, *Delft*, *Merion*, *Prato* and *Windsor*) and the newer ryegrasses are very susceptible. All lawn grasses grown in the Midwest are attacked by one or more kinds of rust fungi.

Grass heavily infected with rust becomes reddish-brown or yellow-orange. Close examination of the grass blades and leaf sheaths reveals powdery, rust-colored or yellow-orange spots (Figure 9). The powdery material rubs off easily on your fingers, shoes or clothing. Continuous heavy infection causes many grass blades to turn yellow, wither and die. Severely rusted lawns may winter-kill.

Cause

The dusty material is composed of millions of microscopic spores of rust fungi (*Puccinia* spp.). The spores may be carried about by air currents, mowing, splashing water, on shoes, etc. Some land on healthy grass blades where, in the presence of moisture, they germinate and cause new infections. Rust fungi usually overwinter as dormant



Figure 10. A large fairy ring of fast-growing, dark green grass.

mycelium in infected grass plants.

Control

Keep grass growing in hot dry weather through adequate applications of nitrogen fertilizer and water. See under Preventive Disease Control (page 3). Kentucky bluegrass varieties resistant to several races and kinds of rust include: Warren's A-20 and A-34, Bel-turf, Fylking, Newport, Park, and Penn-star. Where needed, spray the grass several times, at 7- to 14-day intervals, with a suggested fungicide. Start when rust is *first* seen.

FAIRY RING

Symptoms

Fairy Ring appears as a circular ring of fast-growing, dark green grass often with a ring of thin or dead grass inside or outside (Figure 10). Sometimes the ring is not complete, giving the appearance of an arc or horseshoe. The rings vary in size from a few inches to 50 feet or more in diameter. The strip of thin or dead grass varies from 3 to 6 inches in width. After rains or heavy watering many mushrooms may appear in the dark green grass. Occasionally the symptoms may appear as "dry patches" in lawns instead of a ring. All turfgrasses are subject to invasion.

Cause

Fairy Ring is caused by a number of soil-inhabiting mushroom fungi (usually

Marasmius oreades, *Agaricus campestris* or *Lepiota nancina*) which grow very extensively in the area of the ring.

Growth usually starts with a germinating spore at a central point and fungus hyphae grow outward equally in all directions. Outward spread may occur at the rate of a few inches to two feet or more per year. The part of the fungus on the inner side of the circle dies as the fungus grows throughout the soil forming a dense, white, thread-like growth sometimes to a depth of eight inches or more.

Control

The development of unsightly rings may be suppressed by fertilizing the lawn adequately with nitrogen several times a year, and pumping large quantities of water 10-24 inches deep into the soil, at 1-foot intervals, within the rings of dark green and thin or dead grass using a "root feeder" on a garden hose. Repeat if rings reappear and grass starts to wilt.

Fairy Ring is difficult to control because the infested soil is impervious to movement of water. Probably the most effective method of control involves careful removal of all sod within the ring and two feet to the outside and sterilization of soil underneath using a soil fumigant (e.g., methyl bromide, formaldehyde, chloropicrin, Vapan Soil Fumigant, Vorlex, etc.). The manufacturer's directions must be followed carefully. This treatment is laborious and costly and most people prefer to "live with the problem."

MUSHROOMS, PUFFBALLS

Symptoms

Everyone has seen mushrooms (toadstools) and puffballs (Figure 11). Sometimes they may be quite annoying. Some are foul-smelling; a few are poisonous and a menace to children and pets.

Cause

Mushrooms and puffballs are the



Figure 11. Mushrooms growing in a lawn.

fruiting structures of various kinds of fungi. These fungi grow on decaying organic material in the soil. They are commonly found in areas of buried tree stumps, dead roots, logs, boards or a thick thatch, and generally occur following heavy rains or watering.

Control

These fungi are difficult to control until all wood or other organic matter upon which they grow has been completely decayed. In some cases it may be practical to dig up the pieces of rotting wood or other debris. It is usually best to break or mow off the mushrooms or puffballs and let the fungus go ahead and complete decay of the material, after which the mushrooms and puffballs will disappear.

SNOW MOLDS

There are two types of snow mold in the Midwest, *Typhula* blight or gray snow mold and *Fusarium* patch or pink snow mold. Both diseases are most serious when air movement and soil drainage are poor and grass stays wet for long periods with temperatures near freezing. Damage often conforms to foot prints, paths, snowmobile or ski tracks, etc., because snow compaction and plant injury favor the disease.

These diseases are most severe in northern parts of the Midwest where snow covers the ground continuously for three months or more. Attack ceases when the grass surface dries out. All lawn grasses in the Midwest are susceptible. Bentgrasses are more severely attacked than coarser lawn grasses. These two snow molds are treated separately since chemical controls for each are different.

Typhula Blight or Gray Snow Mold

Symptoms

Roughly circular, grayish, straw-colored spots several inches to two feet or more in diameter appear during winter or early spring in wet areas, usually where snow is melting (Figure 12). Several circles may merge to form large irregular areas. Where severe, the entire lawn may be affected.

A crust-like mat of hyphae may form where grass has been left tall. Diseased areas are covered with a fluffy, bluish-to dirty-gray mycelium or mold growth when snow is melting or grass is wet. At other times a silvery membranous crust develops over the diseased turf.

Cause

Typhula blight is caused by several



Figure 12. Snow mold injury to grass.

species of *Typhula*, primarily *Typhula itoana*. All require snow cover for disease development. When active, and snow is melting, the fungus produces small (up to 3/16 inch), hard, light- to chocolate-brown sclerotia which are often embedded in the leaves and crowns of diseased plants.

The sclerotia later shrink and become difficult to see with the naked eye. The *Typhula* fungi survive from season to season as sclerotia. When light is absent, under a snow cover and generally over unfrozen ground, the sclerotia germinate and produce mycelia and basidiospores that infect the grass. There is little fungus activity when the ground is frozen with no snow cover. *Typhula* can grow and infect plants in the spring when snow is absent provided the weather is cold (30° to 45° F) and wet. This might occur for a couple of days but not much longer.

Control

Avoid late fall applications of fertilizers containing nitrogen. Follow cultural recommendations for your area. An average date beyond which *not* to fertilize is three months before the first "permanent" or lasting snow.

Mow frequently and keep the grass cut to its suggested height to prevent a heavy mat of grass from forming. Follow other Preventive Disease Control practices (page 3). Apply a suggested

fungicide where *Typhula* occurs each year. Apply up to a month before the first lasting snow fall. Where possible, repeat during a mid-winter thaw.

Fusarium Patch or Pink Snow Mold

Symptoms

Round, bleached-tan or whitish-gray to reddish-brown patches of affected plants, usually 1 to 8 inches in diameter; sometimes enlarging to a foot or two across are usually observed. At the advancing edge of melting snow the spots may have pinkish margins.

Fusarium patch does *not* require a snow cover for development. Disease attacks can occur anytime during cool (below 60° F), wet weather in fall, winter or spring. Under a snow cover or during prolonged cool, wet weather diseased areas may be covered with a dense, slimy mat of white mycelium that turns a faint pink when exposed to light (Figure 13).

Cause

Fusarium patch or pink snow mold is caused by *Fusarium nivale*. The fungus survives from season to season as mycelium and spores in infected grass plants or thatch. When temperature and moisture conditions are favorable,



Figure 13. Pink snow mold. Margins of spots may be pinkish.

the fungus produces tremendous numbers of microscopic spores. Lawn equipment, shoes, air currents and water carry the spores to grass blades where infection occurs. Disease development is optimum when snow falls on unfrozen ground, air temperature is 32° to 45° F, and the humidity is very high.

Control

Follow the same cultural practices as for Typhula blight. Avoid overfertilizing with nitrogen. Somewhat resistant bentgrasses include Cohansey, Northland, and Pennlu. For high maintenance turf, apply a suggested fungicide starting in the fall when daytime temperatures remain below 60° F and the weather is wet. Additional sprays may be needed during winter and spring when cool, wet weather persists.

PYTHIUM BLIGHT (GREASY SPOT, COTTONY BLIGHT)

Symptoms

Round to irregular spots of diseased plants up to 6" in diameter often appear during *hot*, wet weather. The spots are first water-soaked and dark, then fade to a light brown as the leaves dry out and wither.

A greasy border of blackened, matted grass blades, often covered with a cottony mass of fungus mycelium, is seen when *Pythium* is active (Figure 14). The patches may merge and form streaks since the fungus is spread by flowing water and mowing. The disease may spread very rapidly, killing out large areas of turf overnight.

Seedlings in new turfgrass areas may wilt, collapse and die in patches (see Damping-off). Girdling, straw-colored lesions *without* conspicuous borders occur on bluegrass leaf blades, resembling those of Sclerotinia Dollar Spot.

Cause

Pythium blight is usually caused by



Figure 14. *Pythium* blight on bentgrass.

one of two species, *Pythium aphanidermatum* and *P. ultimum*. They are common soil-borne fungi present in diseased turfgrass as dormant mycelium or thick-walled resting spores (oospores). Either species can grow very rapidly, from plant to plant. Long distance spread is by flowing water, equipment, and infested soil. The fungi are most active when air temperatures are 85° to 95° F (minimum night temperature of 68° F) and air is saturated on heavy, poorly drained soils where grass is dense and lush.

Control

Follow the suggested cultural practices as outlined under Preventive Disease Control (page 3). Maintain a proper balance of nutrients, avoiding an excess of nitrogen that stimulates lush growth. Improving surface and subsurface soil drainage will aid greatly in controlling *Pythium* blight. Where feasible, delay seeding until weather is cool and dry. Seed only at suggested rates. Do not overwater. Apply a recommended fungicide when hot, rainy or foggy weather is forecast.

SEPTORIA LEAF SPOT AND TIP BLIGHT

Symptoms

The overall appearance of an infected lawn resembles injury from a dull mower. The leaf blades are light yellow from the tip downward. Close examination usually shows black dots (pynidia, the fruiting bodies of the *Septoria* fungus) embedded in the diseased tissue. Younger, smaller lesions, 1/8 inch or more in length, with red or yellow margins, may also be present.

Cause

The disease is caused by species of *Septoria* active during cool, wet weather in spring and fall. The fungi survive the winter as mycelium and pynidia in debris. During cool spring rains, the spores are splashed to healthy leaves where infection occurs, often in the cut ends of the grass blades. Septoria leaf spot is usually of minor importance during the summer.

Control

Follow the Preventive Disease Control practices on page 3 to maintain a vigorous turf. Where severe, fungicides applied to control Melting-out should provide adequate control. Kentucky bluegrass varieties differ in resistance to Septoria Leaf Spot.

CORTICIUM RED THREAD, PINK PATCH

Symptoms

Round to irregular, light-tan to pinkish patches of blighted grass, usually 1" to 6" in diameter, develop during cool (60° to 75° F), moist weather in spring and fall in slow-growing turf. Where severe, the spots may merge and form large, irregular, bleached-tan areas with a reddish-brown cast that resembles melting-out. Symptoms on bermudagrass resemble "winter-kill." The disease

is common on all grasses grown in the Midwest, being most prevalent in red fescues, Manhattan ryegrass, and bentgrasses.

Cause

Corticium red thread is caused by *Corticium fuciforme*. Characteristic of both the disease and fungus is the formation of bright, coral-pink to red "threads," about 1/16 to 1/4 inch long, which protrude from diseased leaf tips and leaf sheaths. These are fungus strands that appear gelatinous in early morning and are joined by a pink web of mycelium. Later the stromata become brittle and thread-like as the grass blades dry.

The fungus overwinters in infected grass debris. It can survive for at least two years in the soil. The fungus is spread from one area to another by spores or as fungal strands and infected leaf parts on lawn equipment, shoes, water, etc. Red thread is usually of minor importance.

Control

Follow the Preventive Disease Control practices on page 3 and chemical controls as for Melting-out and Sclerotinia Dollar Spot. Maintaining a balanced, high fertility level is important as is thatch removal and the collection of clippings.

DAMPING-OFF, SEED ROT

Symptoms

Seeds rot in the soil. The grass stand is thin and weak in irregular patches. Seedlings are stunted, water-soaked, turn yellow to brown; may wilt and collapse. Surviving plants are weakened. Stand is slow to fill in. Affected areas are often heavily invaded by weeds.

Cause

Numerous soil-borne fungi (especially *Pythium* and *Rhizoctonia* spp.)

may cause this disease. Attacks are most severe during warm weather on heavy, moist or water-logged soils and where seeding rates have been excessive.

Control

Sow top quality seed only at suggested rates, in a well-prepared, fertile seedbed. Provide for good surface and subsurface soil drainage when establishing a new lawn. Fill in low spots where water may stand. Treat seed before planting by dusting thoroughly with a thiram or captan seed protectant ($\frac{1}{2}$ teaspoonful per pound of seed). Avoid overwatering. If possible, seed in late summer or early fall. The next best time is early spring. See also Pythium blight for care of newly germinated seedlings.

NEMATODES

Symptoms

Heavily nematode-infested turf lacks vigor, often appears off-color, yellow, bunchy, and stunted. Grass blades dying back from the tips may be interspersed with apparently healthy leaves. Injured turf may thin out, wilt and die in irregular areas. The severity of symptoms varies with the type of plant-parasitic nematode population feeding on and in the roots.

Symptoms are easily confused with soil nutrient deficiencies, poor soil aeration, drought, insects, and other types of injury. Nematode-infested grass does not respond normally to water and fertilizer. Damaged roots may be swollen, shallow, "stubby," bushy, and dark in color.

Cause

Nematodes are microscopic, slender roundworms (sometimes called eelworms or nemas). Most nematode types are harmless, feeding upon decomposing organic material and other soil organisms. A few are beneficial to man since they are parasitic on plant-feeding types.

Many genera and species are present in turf, but only a relatively few are injurious in the Midwest. They survive in the soil or grass debris as eggs, cysts or larvae. With the advent of warm spring weather they become active and penetrate into grass roots or suck cellular contents by inserting a hollow stylet into the root tissues.

Nematodes cause wounds through which disease-producing fungi may enter. The presence and identity of plant-parasitic nematodes can only be determined by taking plugs of suspected turf with soil attached and having them examined by a competent nematologist.

Control

Keep grass growing vigorously by watering, fertilizing and following Preventive Disease Control measures (page 3). If severe, apply a suggested nematocide such as Nemagon or Fumazone following the manufacturer's directions.

SLIME MOLDS

Symptoms

These normally harmless fungi frequently cause considerable alarm. They suddenly appear in spring, summer or fall following heavy rains or watering. Small, watery-white, gray, cream or yellow slimy masses grow over the grass in round to irregular patches, smothering or shading otherwise healthy grass. The masses dry and form unsightly bluish-gray, gray, black, white or yellow powdery structures (Figure 15), the fruiting stage of the causal fungus. When crushed between the fingers, they disintegrate into a powdery mass that easily rubs free from the grass blade.

Cause

Slime molds are primitive, soil-inhabiting fungi (mostly *Mucilago spongia*, *Physarum cinereum*, etc.) that utilize decaying organic material and other



Figure 15. The whitish growth on the grass blades is slime mold.

microorganisms in the soil as a food source. They are not parasitic on plants. In humid weather slime molds grow out of the soil and thatch onto whatever is available for support and produce their spore masses. A well-watered, well-fertilized lawn provides an ideal environment.

Control

If left alone, the slime mold soon disappears. However, if you wish, mold growth may be removed by raking, brushing, mowing or hosing with a stream of water. Fungicides applied to control Melting-out, Rhizoctonia Brown Patch or other diseases should keep slime molds in check. Reduce accumulation of thatch.

OTHER CAUSES OF POOR TURF

Insect Injury

Numerous insects, including grubs, webworms, chinch bugs, ants, leafhoppers and others may damage turf. Insect injury may closely resemble one or more lawn diseases. If you suspect a lawn insect problem contact your county Extension office or the Extension entomologist at your land-grant university.

Chemical Burn

Agricultural chemicals (e.g., fer-

tilizers, pesticides, hydrated spray lime) may injure grass if improperly applied. Burned areas may occur in spots or streaks, or the entire lawn may be "s-corched." Prevent injury by following the directions printed on the package label. Apply fertilizers evenly in recommended amounts, when the grass is dry. Then water immediately. The use of a calibrated lawn spreader is highly recommended. Ground agricultural limestone is safer to use on lawns than hydrated lime.

Chlorosis, Yellowing

Areas or all of the turf may become yellowed and stunted. Chlorosis (yellowing) is usually caused by nitrogen, iron deficiency, or temporary water-logging of the soil. Most lawn fertilizers contain nitrogen. If a recommended fertility program is carried out (see page 3) this element is probably being applied in sufficient amounts. If the lawn continues to remain yellow after nitrogen application followed by rain or watering, the cause is likely to be iron deficiency. This is most likely if the soil is either highly acid or alkaline.

Control

Have a soil test made and follow directions in the report. If iron deficiency is the problem, apply four tablespoons of iron sulfate (sold as "Copperas" or "Sulfasol") in 5 to 10 gallons of water per 1,000 square feet. Sprinkle in immediately. Repeat the treatment as necessary to maintain normal green color. Avoid spray drift because iron sulfate leaves a brown stain on the grass blades.

Iron chelate materials also correct iron deficiency. When starting a new lawn, have the soil tested before planting. This can be done, usually for a small service charge, by your state university, county Extension office, or a private soil testing laboratory. The pH of the soil should be close to neutral (pH 6.0 to 7.0). If the pH is far outside this

range (below pH 5.5 or above 7.3) check with your county Extension office on what and how to bring the soil within the desired range.

Buried Debris

A thin layer of soil over buried rocks, lumber, bricks, plaster, concrete, etc., dries out rapidly in dry summer weather and may resemble disease. Control by digging up suspicious areas, removing the cause, and adding good topsoil.

Compacted Areas

Thin turf or bare spots appear in heavily used areas. Waterlogged and heavy-textured soils become compacted; later bake hard if walked on constantly. Water flows off these areas and plants may die of drought. Correct by aerifying the soil with an aerifier (can be rented at garden supply stores) or installing drainage tile for seriously water-logged soils. This allows water and air, necessary for root growth, to penetrate into the soil. If necessary, fertilize and reseed. Reduce foot traffic on lawn by putting in a walk, patio or parking area; erect a fence; or plant a shrub or two.

Algae or Green Scum

A green to blackish scum may form on bare soil or thinned turf in low, wet, shaded or heavily used and compacted areas. The slimy mass of algae (minute, single-celled, filamentous plants) dries to form a thin, black crust that later cracks and peels.

Control

Follow the cultural practices outlined under Preventive Disease Control (page 3); including correcting soil and air drainage. When necessary, an algicide may be desirable.

Moss

Moss occurs in lawn areas low in fer-

tility, with poor drainage, high soil acidity, excess shade, compaction or a combination of these factors.

Control

Remove moss by hand raking. Correct the unfavorable condition(s) by following Preventive Disease Control practices (page 3). Have a soil test made and follow instructions given in the report.

Dog Injury

Injury from urine may resemble Rhizoctonia brown patch or Sclerotinia dollar spot. Affected areas are often more or less round and commonly up to a foot or more in diameter. These are usually bordered by a ring of lush, dark green grass. Injured grass turns brown or straw-colored and usually dies. Heavy watering helps spots to recover.

Read the entire pesticide label

- what the chemical is
- the diseases it controls
- how much to use
- when to use

Apply only as directed

- controls will be more effective
- chances of plant injury are reduced

Handle pesticides carefully

- take proper precautions with children and pets
- avoid drift
- wear protective clothing if specified
- clean-up immediately after application
- safely dispose of empty containers
- keep and store in the original containers

1976 TURF DISEASE CONTROL GUIDE

John E. Watkins
Extension Plant Pathologist
and
Robert C. Shearman
Extension Horticulturist

Rates listed give a range—use the lower rates for routine preventive control and the higher rates for eradicative treatments at the first signs of disease.

Disease	Fungicides‡	Rate of formulation: Ounces/1000 sq ft in 5-10 gal water	Time of application
Helminthosporium	Acti-dione TGF*	1-2	April to June as directed on the label.
Leaf Spot	Acti-dione RZ*	1/2	
(Melting-out)	Acti-dione Thiram,	2-4	
<i>Helminthosporium</i>	75.75 W*		
spp.	Bromosan, 66.67 W*	6	
	Daconil 2787, 75 W, 6F	2-8	
	Dyrene, 50 W	4-8	
	Fore, 80 W	4	
	Kromad, 27.5 W	3-8	
	Tersan LSR, 80 W	3-8	
Fusarium Blight	Cleary's 3336, 50 W	4-8	June to Aug. as required and directed on the label.
<i>Fusarium roseum</i>	Fungo, 50 W	4-8	
	Tersan 1991	5-8	
Pythium Blight	Acti-dione RZ*	1/2	June to Aug. as required and directed on the label.
(Greasy spot,	Dexon, 35 W	4-5	
Cottony blight)	Fore, 80 W	8	
<i>Pythium</i> spp.	Koban, 35 W*	4-6	
	Tersan SP, 65 W	4	
Sclerotinia	Acti-dione Thiram,	2-4	June to Aug. as required and directed on the label.
Dollar Spot	75.75 W*		
<i>Sclerotinia</i>	Bromosan, 66.67 W*	6	
<i>homeocarpa</i>	Cleary's 3336, 50 W	2	
or	Daconil 2787, 75 W, 6F	4-8	
Rhizoctonia	Dyrene, 50 W	4-8	
Brown Patch	Fore, 80 W	4-8	
<i>Rhizoctonia</i>	Fungo, 50 W	1-2	
<i>solani</i>	Kromad, 27.5 W	3-8	
	Mertect 140 F	1-2	
	Tersan 1991, 50 W	1	
	Tobaz, 27.2 W	2	
Rust	Acti-dione TGF*	1-2	July to Sept. as required and directed on the label.
<i>Puccinia</i> spp.	Acti-dione RZ*	1/2	
	Acti-dione Thiram,	2-4	
	75.75 W*		
	Daconil 2787, 75W, 6F	2-8	Stem rust only.
	Dyrene, 50 W	4-8	
	Fore, 80 W	4	
	Tersan LSR, 80 W	3-4	
	Zineb, 75 W	2	
Powdery Mildew	Acti-dione TGF*	1-2	Spring or fall as required and directed on the label.
<i>Erysiphe graminis</i>	Acti-dione RZ*	1/2	
	Acti-dione Thiram,	2-4	
	75.75 W*		
	Sulfur, W	3-4	
Stripe Smut	Cleary's 3336, 50 W	4-8	Apply in Oct. and/or early spring before growth.
<i>Ustilago</i>	Fungo 50, 50 W	4-8	
<i>striiformis</i>	Tersan 1991, 50 W	6	
Gray Snow Mold	Dyrene, 50 W	4-8	One application late fall. Repeat during winter as directed on the label.
(Typhula Blight)	Tersan SP, 65 W	6-9	
<i>Typhula</i> spp.	Thiram, 75 W*	8	
Pink Snow Mold	Acti-dione Thiram,	6-8	Late fall as required. Re- peat as directed on the label.
(Fusarium Patch)	75.75 W*		
<i>Fusarium</i>	Fore, 80 W	6-8	
<i>nivale</i>	Mertect 140 F	2	
	Tersan 1991, 50 W	2	

‡ Trade name followed by percent active ingredients, W = wettable powder, F = flowable. This list does not include all formulations sold by companies and implies no endorsement of listed material nor criticism for materials not listed.

* Phytotoxicity may occur with use at high temperature or by exceeding recommended rates.

The Cooperative Extension Service provides information and educational programs to all individuals without discrimination on the basis of age, socioeconomic levels, race, color, national origin, sex, or religion.