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John Weihing

Malcolm Shurtleff

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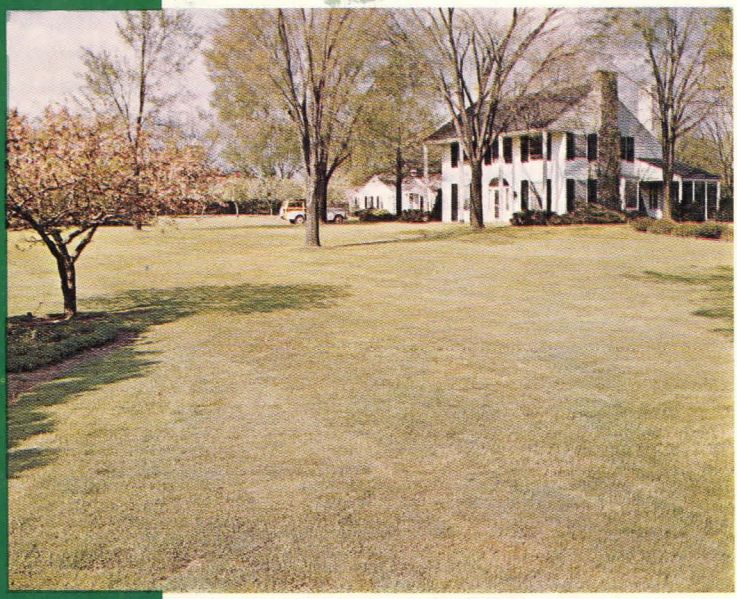
Lawn Diseases in the MIDWEST



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EC 61-1833

Extension Service
University of Nebraska College of Agriculture
And U. S. Department of Agriculture
Cooperating
E. F. Frolik, Dean; E. W. Janike, Director

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LAWN DISEASES IN THE MIDWEST

by

John L. Weihing and Malcolm C. Shurtleff[1]

INTRODUCTION

The amount of time and money spent on lawns each year is staggering. In the Midwest alone there is probably more than a billion dollar investment in lawns and a likely 300-500 million dollars spent annually for maintenance. When totaled, lawns are big business and compare in economic importance with our major Midwest field crops.

PREVENTIVE DISEASE CONTROL

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

There is no secret formula for growing a good lawn. Lawn grasses are simply living organisms that need sunlight, moisture, and nutrients the same as do all plants. Diseases occur in all plants. Following are some facts about diseases and general cultural practices which will help prevent them.

1. Fungi cause most of the serious diseases in lawns. These organisms usually produce seeds (technically called spores) that are spread by wind, water, mowers, infected grass clippings and numerous other ways.

2. These fungus "seeds" need moisture and proper air temperature before they can cause infection. Diseases of lawns are, therefore, most common and harmful during wet, humid seasons. Although temperature is virtually impossible to control, diseases may be started easily by too frequent watering during dry summers.

3. The more often grass is wet and the longer it remains wet the greater will be the chance of a disease problem. 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 at least six inches down after watering.

4. Practically all parasitic fungi of grasses can become established in the damp mulch from clippings. Here they flourish and attack healthy grass growing through the mulch. To guard against this, do not allow clippings to accumulate more than ¼ inch deep.

5. Do not clip upright grasses such as Kentucky bluegrass (or fescues) too closely—2-3 inches during midsummer; 1½ to 2 inches in the spring and fall. Creeping grasses such as bentgrass and zoysia may be clipped ½ inch or less.

6. Mow grass frequently, so that no more than one-third of the leaf surface is removed at one time.

7. Areas about the lawn 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.

[1] **John L. Weihing is Extension Plant Pathologist, University of Nebraska; Malcolm C. Shurtleff is Extension Plant Pathologist, Iowa State University.**

8. Any grass disease may spread and build up rapidly in a pure stand because every plant is susceptible. The chance for a disease to spread and build up is restricted in lawns containing a mixture of grass varieties or species. One should be aware of the destructive diseases if he wishes to have a pure single species and to adjust his lawn care operations to perform control measures regularly.

MELTING-OUT (FADE-OUT, DYING-OUT)

Symptoms

A variety of symptoms are produced by this disease. Thinning out of grass in scattered areas of the lawn is one sign of melting-out. A general brownish undercast caused by dead grass leaves accompanies the general thinning out. As the disease progresses, large irregular areas of the lawn are killed (Figure 1). In some instances the entire lawn is lost.

Examination reveals a spotting of the leaves. The spots are usually brown or purple, or brown with a purple border. They may be round or oblong and parallel to the leaf blade (Figure 2).

The leaf spot stage of the disease does not cause extreme damage to the lawn. The more severe injury results when the leaf sheath area in the crown of the plant is infected. An infected leaf sheath will turn brown and die—resulting in death of the leaf blade. Under moist conditions the disease progresses from leaf sheath to leaf sheath until all aboveground plant parts are killed. The disease then may move down into the crown and rhizomes. killing the entire plant.

Figure 1. The lawn on the left is dying from melting-out disease. At right is healthy lawn.

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

In hot weather, and particularly on Kentucky bluegrass, the disease may cause a sudden dying-out of large, irregularly shaped areas. There may be no visible symptoms on the foliage of dead plants and they appear to have died from drought.

Sometimes this disease causes yellowing of the leaves, resembling symptoms of low nitrogen or iron deficiency. Later, much or all of the affected area may die out. The internal tissues of the crowns and roots of the affected plants in these areas are brown and rotten.

Procedure for diagnosing melting-out disease:

1. Check the leaf blades for leaf spots. This symptom may not be apparent during midsummer but is common in the spring and fall.

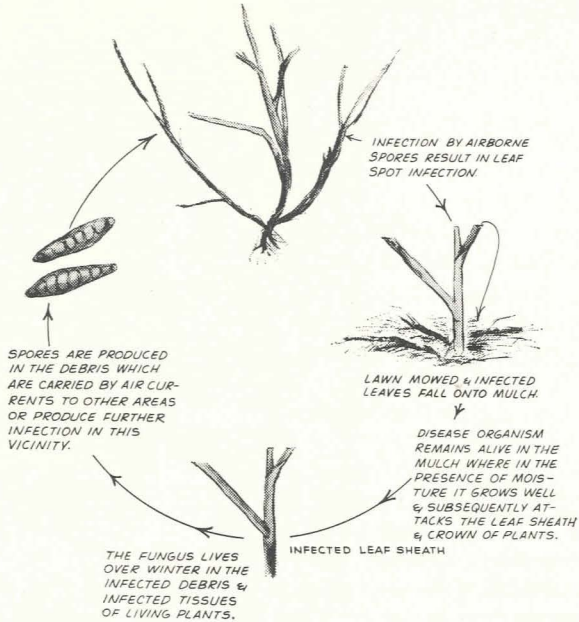

Figure 3. This drawing shows the life cycle of the fungi that cause melting-out (Fade-out, Dying-out) diseases.

2. Check the leaf sheath for brown discoloration.

3. Where the lawn is yellowing and dying, check the crowns and roots for a brown rotting of these parts.

4. Where sudden dying-out of areas of various sizes occurs in midsummer, first check for grub damage. Grubs are found about one inch below the surface of the sod where they have cut off the grass roots. If grubs are absent and fertility and moisture are adequate, but there are no distinctive foliage symptoms, then the grass may have died as a result of root infection by one of the melting-out organisms.

Cause

This disease is caused by several species of *Helminthosporium*. All of these fungi have essentially the same life cycle (Figure 3).

The organisms produce spores (seeds). These spores can be blown around by the wind or may be carried to other areas of the lawn by mowers, flowing or splashing water, on feet, etc. Here they may cause infection if there is free moisture on the surface of the plants. Excessive moisture and favorable temperatures during the next several days will allow the organisms to develop rapidly, resulting in death of many plants.

Control

Resistant varieties. There are no grass varieties resistant to all of the melting-out fungi. Merion bluegrass is resistant to *H. vagans* but highly susceptible to *H. sativum*.

Watering. Water the lawn not more than once a week. Each watering should soak the soil to a depth of 6 inches or more. The time of watering should be such that the grass will dry off quickly. Avoid keeping the grass wet for long periods of time.

Removal of lawn clippings. A

dense mulch is ideal for the development of melting-out organisms. Clippings should be removed from lawns.

Spray program. A severe outbreak of melting-out is difficult to stop. There is such a large amount of the disease organism that protective measures listed above will not reduce sufficiently the quantity of the parasite to stop its development. In such cases it will be necessary to spray.

Good protection against melting-out is attained by spraying every 2 or 3 weeks from the time the grass greens in the spring until late fall. However, such a spray program is expensive and perhaps beyond the finances or available time of the average lawn owner.

When only a few sprayings can be made it is best they be applied in the spring. Make the first one shortly after the grass greens up, a second one three weeks to a month later and a third one a month after the second one.

If one waits until midsummer to spray, the disease will likely have increased and caused extensive damage. At this time it is hard to gain control because the fungus is most likely established in the crowns, roots and rhizomes. These tissues can not be reached satisfactorily by most fungicides. Proper spring spraying may reduce the amount of the disease so that the lawn will progress satisfactorily throughout the rest of the growing season.

Best results are obtained when the chemicals are applied with 50 to 400 pounds pressure. A commercial wetting agent or spreader-sticker should be put into the spray solution to get the necessary coverage. Ask your pesticide dealer about them. Where commercial wetting agents are not obtainable one could use a common household detergent at the rate of 1 teaspoonful per gallon of water. Most of the fungicide chemicals are protective in action and will not control the disease satisfactorily unless the plants are thoroughly coated. Without a wetting agent the spray solution tends to run off the plants in large droplets.

There are a number of chemicals that, when properly used, give satisfactory control of melting-out. New and more effective chemicals are being developed. Check with your county extension agent, or equivalent, each spring to see if any new chemicals or practices are recommended. Following is a list of suggested fungicides:

Acti-dione RZ and Acti-dione-thiram—Fungicides designed for the control of many lawn diseases. Follow the manufacturer's directions.

Captan—This fungicide has given good control of melting-out. Apply at the rate of 2 tablespoonsful per gallon or 2 pounds per 100 gallons of water. Apply at least 1 gallon per 100 square feet.

Dyrene—Experimental trials indicate this chemical to be very promising. Use at rate suggested for Captan.

Kromad — A fungicide designed specifically for the control of many lawn diseases. Follow the manufacturer's directions.

Ortho Lawn and Turf Fungicide—A fungicide designed specifically for control of many lawn diseases. Follow manufacturer's directions.

Panogen Turf Spray—A mercury material that can be used in midsummer without burning the grass foliage. Follow the manufacturer's directions.

Phenyl Mercury—(This type of chemical is sold under numerous trade names.) An excellent chemical for the first two spring applications but *do not use* this chemical in the

summer or if the spring temperature should rise above 80°F. because it may cause severe injury above that temperature. *Do not use* phenyl mercury on Merion bluegrass. Use 1.5 oz. of 10 percent active phenyl mercury or equivalent in 5 to 10 gallons of water, sprayed evenly over 1000 square feet.

Thiram—A good lawn fungicide. Follow the manufacturer's directions.

Zineb—This fungicide has given good control of melting-out. Apply at the rate given for Captan.

BROWN PATCH, RHIZOCTONIA DISEASE

Symptoms

This disease appears as somewhat circular brown patches, up to several feet in diameter (Figure 4). Grass leaves are first watersoaked and dark, but soon dry, wither and turn light brown in color. On close-clipped bentgrass a dark, grayish-black ring of wilting grass borders the diseased areas. This ring disappears when the weather become drier. Turf generally recovers from brown patch in two or three weeks. When severe, however, the roots and crowns may rot, especially in southern states. Such turf is killed or thinned out in large areas. Brown patch occurs in hot, humid, summer weather when night temperatures are above 70°F., and when leaf surfaces are covered with free moisture for long periods.

Figure 4. Brown patch disease in bentgrass golf green.

Cause

Brown patch is caused by the common soil-borne fungus, *Rhizoctonia solani*. This organism is present in most fertile soils. Virtually all lawn grasses grown in the midwest are attacked. Bentgrasses are more seriously injured than the coarser bluegrasses and red fescues. Colonial bents are more susceptible than creeping bents.

The fungus parasitizes the grass blades, leaf sheath, stems, crowns and even the roots, causing their death.

The fungus is believed to overwinter principally as small, hard, brown to black bodies (sclerotia) which measure about 1/16 of an inch long. These are formed on underground parts of infected plants or in the top ½ inch of soil. Sclerotia are extremely resistant to heat, cold, drought and chemicals. During moist periods, when the soil temperature is above 60°F., the sclerotia send out microscopic filaments which penetrate and infect grass plants.

For the brown patch fungus to attack grass leaves, four conditions must be fulfilled:

1. The presence of the active fungus in the soil or turf mat.
2. A dense growth of a susceptible grass.
3. A prolonged dew or film of moisture on the foliage.
4. The maintenance of a temperature of 70° to 95°F. for at least several hours.

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

The brown patch fungus grows out radially through the soil from

germinating sclerotia—hence the circular spots. 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 four months in dried grass clippings.

Control

Avoid overwatering and frequent late afternoon or evening sprinkling. Water early in the day so that the grass leaves will be dry before evening. Avoid overfeeding during summer months with a quickly available, high-nitrogen fertilizer. Less brown patch occurs when the available nitrogen supply in the soil is low and phosphorus and potassium levels are high. Prune dense trees and shrubs to let in sunlight, increase air circulation and promote faster drying. If possible, remove the clippings. Spray weekly in hot, humid weather using Kromad & Calocure, Calo-clor, Tersan OM, Thimer or Calocure-thiram mixture. Follow the manufacturer's directions. Apply sprays in the evening if the temperature is 80°F. or above.

DOLLAR SPOT, SMALL BROWN PATCH

Symptoms

These diseases appear as round, brown or bleached spots, the size of a silver dollar, or somewhat larger (Figure 5). On bluegrasses and fescues the spots may reach four to six inches in diameter. If left unchecked, the spots may run together forming large, irregular, straw-colored, sunken areas. When dollar spot is active a white, cobwebby growth can be seen on the grass leaves when 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.

Figure 5. Typical dollar spot leaf lesions on Kentucky bluegrass.

Cause

The white, cobwebby growth on the grass foliage is the dollar spot fungus, *Sclerotinia homoeocarpa*. Dollar spot may occur regardless of management or soil fertility, but damage is usually most severe if there is a deficiency or great excess of nitrogen.

Dollar spot is most active during moist periods of warm (60-86°F.) days and cool nights in spring, early summer and fall.

All lawngrasses grown in humid areas of the north central states are attacked. Bentgrasses, especially certain strains of creeping bent, are most susceptible.

Control

Follow the same cultural practices as for Brown Patch. Maintain adequate to high fertility by following the recommended lawn feeding program for your area. Spray during the spring months and again in late summer and fall using Cadminate, Tersan OM, Thimer, Kromad, Caddy, phenyl mercury, Dyrene, Ortho Lawn and Turf Fungicide, Calocure, Acti-dione and Thiram, Cadtrete or Panogen Turf Spray. Follow manufacturer's directions. Start applications when disease is first evident.

FUSARIAL PATCH (SNOW MOLD OR SCALD)

Symptoms

This disease appears as more or less circular, dead, bleached areas from one inch to several feet in diameter. Several spots may run together forming large, irregular areas. Affected grass may be first covered by a dense, whitish-pink or dirty gray to almost black mold growth. The disease is usually found in winter or early spring in wet, shaded areas or where snow is slow to melt (Figure 6). A crust-like mat of light brown foliage may form where the grass has been left long. Roots and stems may be rotted over a wide range of temperatures (28-65° F.). All lawn grasses are susceptible. Bentgrasses are more severely attacked than coarser lawn grasses.

Cause

Various fungi. Fusarial Patch, or pink snow mold, is caused by *Fusarium nivale (Calonectria),* while Snow Scald is caused by *Typhula itoana.* The latter fungi produce dark mold growth on affected areas. In some northern areas, where summers are cool and moist species of Fusarium are active throughout the summer.

Infection and injury may take place both under the snow and as the snow is melting. Frequently, snow mold damage will conform to

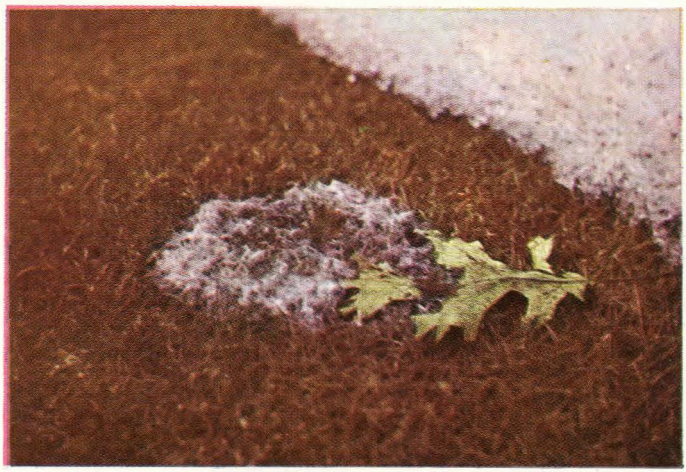

Figure 6. Snow mold injury (next to oak leaf) as snow melts. This growth on the grass is a fungus. When freshly uncovered from the snow, it is whitish but soon becomes a dirty gray to almost black.

foot prints, ski tracks, etc., because compaction of snow favors the disease. Injury ceases when the grass surface dries out.

Control

In northern states do not fertilize after September 15. Follow cultural recommendations for your area. Lawns should not go into the winter in an actively growing condition. Keep the lawn cut to recommended height late in the fall to prevent a mat of grass from forming. *Before* the first heavy snow, or cold drizzly weather, apply a spray of Tersan OM, Calocure, Calo-clor or Thimer. Follow the manufacturer's directions. Repeat during a midwinter thaw. Spray during the growing season as for Melting-out. When establishing a new lawn be sure to plan for good surface drainage.

RUST

Symptoms

This disease does not usually become a problem until August or September following extended hot and dry periods when grass grows slowly or not at all. Merion bluegrass and ryegrass are particularly susceptible.

Grass heavily infected with rust becomes reddish-brown or orange in appearance. Upon close examination of the grass blades and leaf sheaths you will find rust-colored spots (Figure 7). The rusty material will rub off easily onto your fingers, shoes or trousers. Continuous heavy infection causes many of the grass blades to turn yellow and die. Severely rusted lawns may winter-kill.

Cause

The dusty red material is actually "seeds" of a rust fungus (*Puccinia* spp.) These tiny "seeds" are carried about by air currents. Some land on uninfected grass blades where, in the presence of moisture, they germinate and cause new infection.

Figure 7. 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.

Control

Spray the grass several times at 7- to 15-day intervals with one of the following: Acti-dione RZ, zineb, maneb, dichlone or wettable sulfur. Follow the directions given on the container. Add enough wetting agent to the solution so the spray mixture will spread over the surface of the grass blades and not run off in droplets. Good coverage of the leaf surfaces is necessary for control. If possible remove the clippings.

POWDERY MILDEW

Symptoms

A turf heavily infected with mildew looks as if it has been dusted with flour or lime. Examination of the grass blades reveals a white,

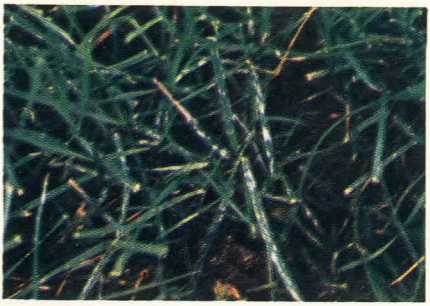

Figure 8. The white substance on the leaves is the powdery mildew fungus.

powdery-like growth (Figure 8). Infected leaves usually yellow and wither. Fall plantings may be killed if mildew is severe. Disease attacks occur chiefly in the fall and spring when nights are cool.

Cause

Mildew is caused by a fungus *(Erysiphe graminis)* which is confined to the surface of the leaves. It sends sucker-like structures into the leaf cells from which it obtains its nourishment. The aerial portion of the fungus produces thousands of "seeds" which are distributed by air currents and result in new infections. Mildew is most severe in shaded areas.

Control

The disease can be checked by spraying lawns with wettable sulfur or thoroughly dusting with finely powdered sulfur. Make two applications about 10 days apart. The grass fungicide Acti-dione is effective. The product Karathane is a specific mildew preventative. Keep the lawn vigorous by fertilizing and maintaining adequate moisture in the soil.

SLIME MOLDS

Symptoms

These normally harmless pests frequently cause considerable alarm. They commonly appear in the spring, but may occur during midsummer or fall following heavy rains or watering. Small white, gray or yellow slimy masses grow over the grass in round or irregular patches smothering or shading otherwise healthy surfaces. The masses dry to form bluish-gray, gray, black or white powdery structures (Figure 9). When crushed between the fingers, they disintegrate into a powdery mass that easily rubs free from the grass blade.

Cause

Slime molds are not parasites. They are soil inhabiting organisms *(Mucilago spongiosa, Physarum cinereum,* etc.) which feed on decaying organic material in the soil. In humid weather a slime mold grows out of the soil onto whatever is available for support and produces its spore masses. A well-watered, well-fertilized lawn provides an ideal environment.

Figure 9. The whitish growth on the grass blades is slime mold.

Control

If left alone, the slime mold soon disappears. However, since it is unsightly a home owner may wish to remove it. This can be done by a forceful spray from a garden hose or with a garden rake. Fungicides applied to control Melting-out, Brown Patch or other diseases should keep slime molds in check.

TOADSTOOLS, MUSHROOMS, PUFFBALLS

Symptoms

Everyone has seen toadstools, mushrooms and puffballs of various sorts (Figure 10). Sometimes they are quite an annoyance. Some are foul-smelling; some are poisonous and a menace to children.

Cause

Toadstools, mushrooms and puffballs are fruiting structures of various kinds of fungi. These fungi grow on rotting wood or decaying organic material in the soil. They are commonly found in areas of buried tree stumps, dead roots, logs and boards following heavy rains or watering.

Control

These fungi are difficult to control until all of the wood or other organic matter upon which they are feeding has been completely consumed. Temporary control may be obtained by applying Calo-clor, Calocure or Panogen Turf Spray within and surrounding the affected area. However, after the chemical has been dissipated, the toadstools or mushrooms usually come back. Treatments may be necessary at monthly intervals. Follow the directions given under Fairy Ring. In some cases it may be practical to dig up the pieces of buried wood. It is usually best to let them go ahead and complete the decay of the material, after which they will disappear.

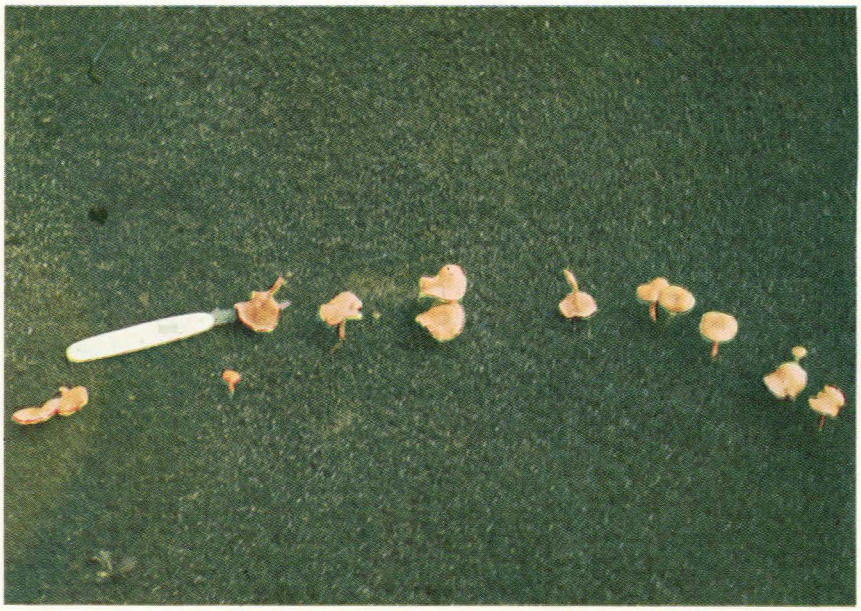

Figure 10. Toadstools growing in a lawn.

Figure 11. A large fairy ring with toadstools (mushrooms) growing at the outer edge.

FAIRY RING

Symptoms

Fairy Ring disease causes a circular ring of fast-growing, dark green grass often surrounding a ring of thin or dead grass (Figure 11). Sometimes the ring is not complete and gives the appearance of an arc or horseshoe. The rings vary in size from a few inches in diameter to many feet. The strip of thin or dead grass varies from three to six inches in width. After rains or watering many mushrooms or toadstools may appear in the area of dark green grass. Occasionally the symptoms may appear as "dry patches" in lawns instead of a ring.

Cause

Fairy ring is caused by several soil-inhabiting mushroom (toadstool) types of fungi (*Marasmius oreades, Psalliota (Agaricus) campestris, Lepiota morgani* etc.) which grow very extensively in the area of the ring. Growth starts with a germinating "seed" at a central point and filaments of the fungus 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 off as the fungus grows outward. The darker green grass is caused by the fungus in the soil breaking down organic matter which is utilized by grass roots. The dead grass is probably due to temporary exhaustion of nutrients and water.

Control

Fairy ring is difficult to control because the soil in the area in which the fungus is present becomes impervious to movement of water. The fungus can be killed by the use of mercury fungicides, but the main problem is getting the fungicide in contact with the organism. Control will not be satisfactory unless this is accomplished.

Prior to making a fungicide application, break up or perforate the fairy ring soil with a spading fork or some similar aerifying instrument. Make holes ½ to 1 inch in diameter, 4 to 5 inches apart and 6 to 8 inches deep in the ring of stimulated grass and about 6 inches outside the ring.

Fill the holes with a solution containing a mercurial fungicide such as Calo-clor, 2 ounces (1½ tablespoons) per 5 gallons; a mixture of Calomel 2 parts, corrosive sublimate, 1 part, 2 ounces (1½ tablespoons) per 5 gallons; phenyl mercury compounds such as PMAS, 1 fluid ounce, or Puraturf No. 10, 2 fluid ounces per 5 gallons of water. Use a battery bulb or watering can with spout in filling the holes to avoid spilling the solution on the grass. One treatment should be sufficient to obtain control.

Another method of control involves removal of the sod and sterilization of soil underneath using a soil fumigant (e.g., methyl bromide, chloropicrin, Vapam, V.P.M. Soil

Fumigant, etc.). The manufacturer's directions must be followed carefully.

DAMPING-OFF, SEED ROT

Symptoms

Seeds rot in the soil. The grass stand is thin and sickly in irregular patches. Seedlings are stunted, water-soaked, and turn yellow to brown. They 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 (May-June) on heavy, moist or water-logged soils.

Control

Plant good quality seed in a well-prepared, fertile seedbed. Provide for good soil drainage when establishing a new lawn. Fill in low spots where water may stand. Treat seed before planting by dusting thoroughly with thiram or captan seed treatment (½ teaspoonful per pound of seed). Avoid overwatering after planting. If possible, seed in late summer or early fall. The next best time is early spring. After a planting apply a spray of Kromad, captan, thiram or zineb. Use 4 ounces of chemical in 3 gallons of water to cover 1000 square feet.

NEMATODES

Symptoms

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 later thin out, wilt and die out in irregular areas. The severity of symptoms varies with the quantity of plant parasitic nematodes feeding on and in the roots.

Nematode injury is often confused with fertilizer burn, a soil nutrient deficiency, poor soil aeration, drought, insects, and other types of injury. Nematode-injured grass does not respond normally to water and fertilizer. Damaged roots may be swollen, shallow, "stubby" and dark in color. The presence of plant parasitic nematodes can only be identified by taking plugs of suspected turf and having them examined by a competent specialist.

Cause

Nematodes are microscopic, slender roundworms (sometimes called eelworms or nemas). They live in the soil where they penetrate into grass roots or suck sap from the root surface. Nematodes may cause wounds through which disease-producing microorganisms may enter. 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.

Control

Keep grass growing vigorously by watering, fertilizing and following cultural practices outlined above. If severe, apply a soil drench of Nemagon, Fumazone or VC-13 Nemacide, following the manufacturer's directions.

OTHER CAUSES OF POOR TURF

Insect Injury

Numerous insects, including grubs, ants, webworms, chinch bugs, leaf-

hoppers 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 college or university.

Chemical Burn

Agricultural chemicals (e.g. fertilizers, pesticides, hydrated spray lime) may injure grass if improperly applied. Burned areas may occur in spots or streaks, or the entire lawn may be "scorched." 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 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 or iron deficiency. Most lawn fertilizers contain nitrogen. If a fertility program is carried out this element is probably being applied in sufficient amounts. However, if the lawn continues to remain yellow after nitrogen application the cause is likely to be iron deficiency. This is most likely if the soil is either highly acid or highly alkaline.

Control: Apply ½ to 1 pound of iron sulfate in 5 to 10 gallons of water per 1,000 square feet. Repeat the treatment as necessary to maintain normal green turf color. Take care to avoid spray drift because iron sulfate leaves a brown stain. Some lawn fungicides (e.g., Kromad, Formula Z, Acti-dione Ferrated, etc.) already have iron sulfate in the spray mixture. Iron chelate materials (e.g., Versonol, Sequestrene) also correct iron deficiency. When starting a new lawn have the soil tested before seeding. This can be done, usually for a small service charge, by your land-grant college or university or by a private soil testing laboratory. The pH of the soil (sweetness or sourness) should be close to neutral (pH 6.5 to 7.0). If the pH is far outside this range (below pH 6.0 and above 7.3) check with your county extension office on what and how much should be added 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 hot summer weather and may resemble disease. Control by digging up suspicious areas and removing the cause.

Compacted Areas

Thin turf or bare spots appear in heavily used areas. Waterlogged soils become packed and later bake hard if walked on constantly. Correct by aerifying the soil using a hand aerifier or tined fork. This allows water and air to penetrate into the soil. If necessary, fertilize and reseed. Reduce foot traffic on lawn by putting the area into a walk or patio or erect a fence or plant a shrub.

Algae, Green Scum

A green to blackish scum may form on bare soil or thinned turf. This is most common in low, wet, shaded or heavily used and compacted areas. The mass of algae (minute plants) dries to form a thin, black crust which later cracks and peels.

Control: Perform the same cultural practices as for Brown Patch and Compacted Areas. Where necessary, apply a spray of copper sulfate, 1-2 ounces in 3 to 5 gallons of water, to 1,000 square feet of lawn.

Moss

Moss occurs in lawn areas low in fertility, with poor drainage, high soil acidity, too much shade, watered improperly, heavily compacted or a combination of these factors.

Control: Remove moss by hand raking. Correct the unfavorable condition by following the cultural practices as for Brown Patch and Compacted Areas. Have a soil test made and follow the instructions given in the report.

Dog Injury

Injury from dog urine, principally female, may resemble brown patch. Affected areas are often more or less round and commonly are several inches or larger in diameter. Injured grass turns brown or straw-colored and usually dies.

Summary of Diseases Controlled by Various Fungicides

Fungicide	DISEASES						
	Melting-out	Brown Patch	Rust	Mildew	Toad-stools, mush-rooms, puff-balls, Fairy ring	Dollar spot	Snow mold
Acti-dione RZ or Acti-dione-thiram	yes	yes	yes	yes		yes	
Caddy						yes	
Cadminate						yes	
Cadtrete						yes	
Calo-clor		yes			yes	yes	yes
Calocure		yes			yes	yes	yes
Captan	yes						
Dyrene	yes		yes			yes	
Karathane				yes			
Kromad	yes	yes*				yes	
Maneb			yes				
Mer cad	yes	yes			yes	yes	
Ortho Lawn and Turf Fungicide	yes					yes	
Panogen Turf Spray	yes	yes			yes	yes	yes
Phaltan	yes						
Phenyl Mercury**	yes				yes	yes	yes
Sulfur			yes	yes			
Tersan OM	yes	yes			yes	yes	yes
Thimer	yes	yes			yes	yes	yes
Zineb	yes		yes				

* Calo-clor or Calocure (1-1½ oz./1000 sq. feet) should be added to Kromad to control brown patch.
** Trade names of phenyl mercury: PMAS, Puratized, Tag, Liquiphene Turfgrass Fungicide, Merbam 10, Puraturf, etc.