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So call your Toro distributor about the Greensmaster 3. The agile mower that gives a quality of cut second to none.
Two leading plant pathologists, J.M. Vargas Jr. of Michigan State University and Don Blasingame of Mississippi State University, cut through confusing terminology and present the latest turf disease control methods. Diseases of cool-season turfgrasses, warm-season turfgrasses, and overseeded ryegrasses are discussed. This is a section you'll want to save. An added help is the Turf Fungicide Directory on page 44.

Northern Turf Diseases

by J. M. Vargas, Jr., turfgrass pathologist, Michigan State University

Concepts about turfgrass diseases and their management have gone through many changes in the past few years, including the scientific names of the organisms that cause them. These diseases, the organisms that cause them, and their cultural, biological and chemical management tools are given in Table 1. The following will be a discussion of the latest developments on cool-season turfgrass diseases.

Dollar spot
Dollar spot is primarily a disease of golf course grasses such as creeping bentgrass and annual bluegrass. It is now believed to be caused by two organisms, a *Lanzia* spp. and a *Moellerodiscus* spp. Now that two fungi have been identified as the cause of dollar spot, it helps explain some of the confusion that has existed about the occurrence of this disease. It has been considered both a cool weather disease and a warm weather disease. It appears that dollar spot is both, and that there are two different fungi which caused a disease with similar symptoms. This means that you can have dollar spot at any temperature between 60-85°F.

What is needed is an easy, reliable method to distinguish the difference between these two fungi in the field. Fortunately, dollar spot caused by both fungi appears to be reduced by adequate nitrogen levels and adequate soil moisture levels. For the most part, they are also managed by the same fungicides, although one has to wonder if some of the resistance to some fungicides might not be due to the differential sensitivity of the two fungi species that causes this disease.

Brown patch
Brown patch is also primarily a disease of golf courses, although with the new improved perennial ryegrasses being incorporated into home lawn mixtures, it is also becoming a problem on home lawns. The disease occurs under hot, humid conditions. It can be culturally managed by reducing the amount of nitrogen applied just prior to the advent of warm weather, increasing air circulation by removing trees or shrubs, and/or by pruning them.

Pythium blight
Pythium blight is also a disease of golf courses, and like brown patch, it is becoming more of a home lawn problem with the incorporation of the improved perennial ryegrass.

There still seems to be some controversy over how many species of pythium are involved in this disease, but regardless of how many or how few there are, they do tend to cause rapid loss of turf in hot, humid weather.

Unlike many diseases where only the foliage is damaged and recovery occurs soon after, Pythium blight usually kills the plant. This means recovery in the infected areas will be slow because it will have to come from
Pythium blight rapidly strikes ryegrasses and other turfs where drainage is poor in hot and humid weather. Recovery is slow since pythium usually kills the entire plant.

Cultural management of Pythium blight consists of reduced nitrogen levels just prior to the advent of warm weather and improving drainage.

Concerning drainage, in marginal areas of the cool-season grass regions, Pythium blight is only a problem in areas of poor soil drainage, where water stands for prolonged periods. In regions where severe Pythium blight damage occurs, it is always most severe in poor drained soil areas. It goes without saying, that good Pythium blight management begins with improving soil drainage.

As far as chemical management is concerned, there are two systemic fungicides to manage Pythium blight, which are metalaxyl (Subdue, Ridomil, Apron) and propamocarb hydrochloride (Banol). These two fungicides will manage the disease for up to three weeks. They appear to be slower acting than chloroneb (Teremec SP) or ethazol (Koban, Terrazole). Little spread of the disease occurs after these systemic fungicides are applied, although the mycelium of the fungus may remain evident on the previously infected tissue for a couple of days. No actual resistance to these two fungicides has been reported, but the possibility exists. It would be wise therefore, to follow each systemic fungicide application with contact (chloroneb or ethazol) in case resistance does occur following a systemic fungicide application, the contact fungicide will prevent the resistant strain from devastating the turf.

Anthracnose

Anthracnose caused by Colletotrichum graminicola is primarily a disease of annual bluegrass, although it will attack the fine leaf fescues, perennial ryegrasses and seaside creeping bentgrass. Annual bluegrass dies from an-
<table>
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<td>Anthracnose</td>
<td>Collectotrichum graminicola</td>
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<td>Adequate nitrogen. Cool grass by</td>
<td>Maneb plus zinc sulfate, chlorothalonil, benomyl, thiophanate-methyl, thiophanate, thiophanate-methyl + mancozeb, triadimefon</td>
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<td>Reduce nitrogen. Remove &quot;dew.&quot;</td>
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<td>Dollar spot</td>
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<td>The Snow Molds</td>
<td>Typhula spp. Gerlachia rivalis</td>
<td>Annual bluegrass Colonial bentgrass Creeping bentgrass Fine-leaf fescues Kentucky bluegrass Perennial ryegrass Tail fescue Velvet bentgrass</td>
<td>Avoid early fall nitrogen fertility that leads to lush growth.</td>
<td>Mercury compounds, PCNB products, chlorothalonil, chloroneb. These products may have to be used in combination for effective snow mold management. Benomyl, iprodione or Mancozeb will control Gerlachia patch where it occurs alone.</td>
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<tr>
<td>Yellow patch</td>
<td>Rhizoctonia cerealis</td>
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*The order in which fungicides are presented does not imply the order of their effectiveness.
and Gerlachia patch (pink snow mold).

**Gerlachia patch** Gerlachia patch is caused by Gerlachia nivalis, formerly known as Fusarium patch caused by Fusarium nivale. Yes, another name change and this time, they not only changed the scientific name of the organism causing the disease, but the common name of the disease as well!

The disease becomes a problem in the fall when the temperature drops into the low 60's and continues through the spring, until daytime temperature climbs back into the seventies. It is usually first noticed in the shaded areas of the green, tees and fairways.

Gerlachia patch does not need snow cover to become active, only the cool wet weather. Annual bluegrass is especially susceptible to Gerlachia patch.

In the spring the disease is often misdiagnosed as copper spot, because of the small copper-colored spot that it causes. However, copper spot is a disease that occurs in warmer weather. Keeping nitrogen at low levels during the time when Gerlachia patch may be active is important in helping manage the disease.

**Typhula blight**

Typhula blight is caused by two species, Typhula incarnata and T. ishikariensis. T. incarnata is the primary species in eastern, southern, and regions of the mid-west and western U.S. T. ishikariensis is most prevalent in the more northern snow mold regions, especially where prolonged periods of permanent snow (two or more months) exist in the mid-western and western U.S.

The two typhula species are easily distinguished from each other when observed soon after the snow melts. T. incarnata produces grayish spots in the turf, with fairly large uncommon brown sclerotia (a mass of filaments) evident. Whereas, T. ishikariensis spots have a reddish cast and contain small, dark black sclerotia. Typhula blight only occurs under snow cover. It does not occur in the cool wet weather of fall and spring, except under leaf piles.

Knowing which species you have is important in chemically managing the disease. Many fungicides, including the mercuries, chloroneb(Teremec SP), PCNB(Terraclor), triadimefon(Bayleton), and chlorothalonil(Daconil) will manage Typhula blight caused by *T. incarnata*. They do not all manage Typhula blight caused by *T. ishikariensis*.

The picture also is more confusing state by state. For example, in Michigan, the mercuries, PCNB, and chlorothalonil will manage both species, but triadimefon and chloroneb will not manage Typhula blight caused by *T. ishikariensis*. In northern Wisconsin and Minnesota, combinations of the mercuries and PCNB are required to manage both species. You should check with your local turfgrass experts to find out the fungicides that are effective in your area.

**Gaeumannomycyes patch**

Gaeumannomycyes (take all) patch caused by *Gaeumannomycyes graminis var. avanea* was formerly known as Ophiobolus patch caused by *O. graminis*. This disease was originally thought to be confined to the Pacific northwest. It has now been reported in the coastal areas of New England, New York, and the mid-Atlantic states, primarily on creeping bentgrass turfs. A Gaeumannomyces like organism has also been reported on annual bluegrass in the mid-eastern and mid-western U.S.

In 1983, the disease caused widespread destruction on many annual bluegrass fairways in mid-August and early September. So, Gaeumannomyces patch or closely related diseases are now occurring through most of the cool-season grass regions of the United States.
Lowering the pH through the use of sulfur still appears to be the best way to manage this disease. A word of caution is necessary, the granular sulfur products have been observed to cause injury to the turf the season following application. This injury initially resembles dollar spot. The sprayable sulfurs are just as effective and do not have the bad side effects.

**Fusarium blight**

There are two current schools of thought on the cause of Fusarium blight. The research at Penn State University (Cole) suggests that a basidiomycete (a type of higher fungi) is involved in causing the “frog-eye” symptom associated with Fusarium blight and that, if the Fusarium fungi are involved at all, they are involved as saprophytes colonizing the dead and dying tissue.

The other school of thought, represented by Cornell University (Smiley) suggests the cause of the “frog-eye” is due to two fungi, *Leptosphaeria korrae* and/or *Philocephora graminicola*. It could be we are actually dealing with three different fungi causing three different diseases, all of which have the same symptom. Time will tell which of these schools of thought are correct or if they both are.

Fusarium blight is a warm weather disease that occurs from late June through early September depending on your location. The disease usually occurs after a week or two of dry weather following a heavy rain.

The characteristic initial symptom is wilted turf in the infected spot. This separates it from six other diseases that have similar “frog-eye” symptoms, like brown patch and yellow patch.

Since there may be as many as three fungi involved in the Fusarium blight syndrome, it is difficult to make specific recommendations to encompass all of them. The following are the best management recommendations available, although slight variations may exist in different areas of the country.

**Cultural management**

Coring should be done to improve root development, reduce thatch, and eliminate layering caused by two different soil types. Homelawn turf is often grown on poor soil. Many times sod is laid on compacted subsoil because the topsoil was removed during construction.

Nutrient and water uptake are active processes which require adequate oxygen. Coring holes provide an excellent area for root growth with good aeration for proper uptake of nutrients and water.
For nearly a hundred years, the Statue of Liberty has been America's most powerful symbol of freedom and hope. Today the corrosive action of almost a century of weather and salt air has eaten away at the iron framework; etched holes in the copper exterior.

On Ellis Island, where the ancestors of nearly half of all Americans first stepped onto American soil, the Immigration Center is now a hollow ruin.

Inspiring plans have been developed to restore the Statue and to create on Ellis Island a permanent museum celebrating the ethnic diversity of this country of immigrants. But unless restoration is begun now, these two landmarks in our nation's heritage could be closed at the very time America is celebrating their hundredth anniversaries. The 230 million dollars needed to carry out the work is needed now.

All of the money must come from private donations; the federal government is not raising the funds. This is consistent with the Statue's origins. The French people paid for its creation themselves. And America's businesses spearheaded the public contributions that were needed for its construction and for the pedestal.

The torch of liberty is everyone's to cherish. Could we hold up our heads as Americans if we allowed the time to come when she can no longer hold up hers?

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Save these monuments. Send your personal tax-deductible donation to: P.O. Box 1986, New York, N.Y. 10018. The Statue of Liberty-Ellis Island Foundation, Inc.
Thatch reduction is best accomplished during the coring operation by breaking up the cores with a vertical mower or power rake, and incorporating the soil back into the thatch layer. Power raking does little for thatch reduction. It removes leaf tissue which is readily broken down but does nothing to remove the rhizomes and roots which are primarily responsible for thatch formation.

Layering results from one soil of a different type being placed on top of the other, as when a muck sod is placed on mineral subsoil.

In the cool weather of spring and fall it may not be a problem, but under stress conditions of the summer it can become a serious problem. The entire turfgrass root system is restricted to the upper layer during the summer heat stress period. This often means the root systems are no more than an inch in depth.

Obviously, drought stress diseases like "Fusarium blight syndrome" are going to be more severe under such conditions.

Integrating two soil layers over a period of years through a coring program should make for a deeper rooted, healthier turf.

Fertility: Nitrogen fertility in the summer months of June, July and August, will reduce the severity of the "Fusarium blight syndrome". Approximately 1/2 lb. of actual nitrogen/1,000 sq ft./month should be adequate.

Irrigation: Supplemental irrigation can culturally reduce "Fusarium blight syndrome" if applied on a daily basis. If applied at mid-day it will cool the plants, similar to syringing performed on golf courses during the heat stress period. It also provides water for the short and limited root systems of the infected plants.

If the mat or thatch is kept moist, antagonistic microorganisms may develop, which will prevent the pathogenic fungi from attacking the plants. A daily irrigation program during the summer on infected turf may also cause the build-up of antagonistic microorganisms that destroy the "Fusarium blight syndrome" fungi.

Chemical management: Thiophanate(Cleary's 3336), thiophanate-methyl(Fungo 50) and benomyl(Tersan 1991), are good fungicides for the management of the "Fusarium blight syndrome". They all have the same basic chemistry.

The turf area to be treated should be irrigated the night before and the fungicides drenched in before they dry on the foliage. They can be used either cura-
The LESCO Spreader features corrosion-resistant "Delrin" 100 ST gears; sturdy stainless steel axle, impeller shaft and on/off assembly; adjustable metering slide; pneumatic tires and a bumper handle to protect the impeller. Also available in an electric truckster-mount model.

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