(Patch Diseases cont'd.)

The development of Rhizoctonia yellow patch is favored by cool wet weather. The primary temperature range in which the disease is most active is 40 to 60 degrees F. When the leaf symptoms are in the early chlorosis stage of development, if the air temperatures drop below 40 degrees F. or go above 75 degrees F., these symptoms will disappear. However, if the temperatures stay within the 40-60 degree range, the disease will progress to foliar blighting.

Since many of the field symptoms of Rhizoctonia yellow patch and necrotic ring spot overlap, and both diseases can occur in the same location and at the same time of the year, confirmation of the diagnosis by laboratory examination of crowns and roots of diseases plants for the presence of the characteristic Rhizoctonia mycelium is advisable.

Attempts to contrl Rhizoctonia yellow patch with applications of fungicide have met with little success. Research at Ohio State University has shown that 'Adelphi', 'Cheri', and 'Touchdown', Kentucky bluegrass are highly resistant to this disease.

Summer Patch Diseases

Fusarium Blight

Many species of Fusaria are found in association with stands of turfgrass. Only three of these, however, have been shown by research procedures to be pathogenic to turfgrass plants. These are (i) **Fusarium nivale**, the incitant of the winter disease, Fusarium patch, and (ii) **Fusarium culmorum** and **Fusarium poae**, the incitants of the warm weather patch disease, Fusarium blight. All of the other Fusarium species that are commonly isolated from turfgrass have been shown to be either non-pathogenic or at best very weakly pathogenic. This means that they can not function as primary parasites of either leaves, crowns or roots. In order for a warm weather patch disease to be diagnosed as Fusarium blight, then, either **Fusarium culmorum** or **Fusarium poae** must be present in the diseased tissue. If one of these two species is not present, then the disease in question is not Fusarium blight.

Fusarium blight is a major disease of Kentucky bluegrass, bentgrass, tall fescue, red fescue and ryegrass. The total pathology of the disease consists of two phases: (i) a direct blighting of the leaves, and (ii) a crown and root rot. All turfgrass species are vulnerable to the crown and root phase of Fusarium blight, but the impact of this aspect of the disease is more pronounced on ryegrass and tall fescue. One of the economic impacts of Fusarium blight in tall fescue sod production is the reduction in the size of the root systems to the extent that even though the plants may not be showing foliar symptoms, the sod shatters when lifted.

The better known foliar symptom for Fusarium blight is the so-called ''frog-eye'' pattern. In field diagnosis, however, it is important to keep in mind that this symptom pattern is not always present. Also, at least two other warm weather patch diseases, Pythium blight and Rhizoctonia blight (brown patch) can develop very pronounced ''frog-eye'' patterns — particularly under fairway and tees cutting heights.

Fusarium blight can be very destructive to bentgrass under putting green management. On putting greens, the disease first appears as tan to light brown, irregularly-shaped areas 2-3 inches in diameter. Under favorable weather conditions, these patches will develop into irregularly shaped areas of blighted grass

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(Patch Diseases cont'd.)

up to 3 feet wide. If it is suspected that Fusarium blight might be present, a laboratory examination of the diseased grass for presence of **Fusarium culmorum** or **Fusarium poae** should always be made.

The new sterol inhibiting fungicides Bayleton and Rubigan are very effective in Fusarium blight control. The benzimidazole fungicides Tersan 1991, Fungo 50 and Cleary 3336 are also labeled for control of the disease. In areas with recurring Fusarium blight, for maximum effectiveness of control, the fungicide application should be made immediately after the first occurrence of night temperature that do not drop below 70 degrees F.

Summer Patch

To date, a hot weather dying-out condition of Kentucky bluegrass referred to as "summer patch" has been reported in New York. It has also been suggested that the disease may occur in other northeastern and in certain midwestern and north central states. Outbreaks of what is being referred to as summer patch develop during July and August during prolonged periods of hot, dry weather.

The symptoms reported for this disorder are irregular patches of dull tan to brown grass. The individual areas may be more or less circular in outline and extend up to several feet in diameter. Within the diseased stand of grass, there may be patches that show the basic "frog-eye" pattern of blighted grass with center tufts of apparently healthy plants.

Recent research at Cornell University indicates that summer patch might be brought on by periods of high air temperature stress and then the colonization of the weakened plants by the fungus **Phialophora graminicola**. This fungus species is commonly found in association with the root systems of grasses. It's potential for affecting the health of plants has been the subject of considerable research by plant pathologists in England.

The research in England has shown that **Phialophora graminicola** is a very weak pathogen. In fact when it is placed in the soil, it actually protects the turfgrass plants from take all patch (Ophiobolus patch). Also, when the soil is infested with **Phialophoa graminicola**, the growth rates of fescue and bentgrass are increased. This is thought to be due the fact that the fungus enhances nutrient uptake by the root system.

The laboratory and field research procedures described by the workers at Cornell University to bring about the death of Kentucky bluegrass by **Phialophoa graminicola** have been of the type that place severe stress on the plants. For example, in one series of pathogenicity experiments, the tests were conducted on Kentucky bluegrass field-grown sod cut at a depth of ¾ inch and then placed over a 3/8 inch layer of soil in plastic containers. These plants were then held in growth chambers under a continous day-night air temperature of 85 degrees F. for 15 weeks. During this time, the leaves were maintained at a ½ inch cutting height. In view of the extreme stress placed on the growth systems of the plants in these tests, it is not surprising that **Phialophoa graminicola** switched from its normal role as a beneficial soil-inhabiting fungus to an active Kentucky bluegrass root colonizer.

The findings at Cornell University place summer patch in the category of turfgrass diseases known as Senescence Syndromes. The diseases in this grouping are caused by the combination of acute plant stress followed by colonization of the weakened

tissue by various microorganisms. In assessing what can be done to control these diseases, the first question that must be answered is whether or not the invading fungi or bacteria are actually compounding the acute stress-induced problem by introducing an added measure of tissue degradation, or if the initial enviromental pressure was severe enough in itself to lead to the ultimate death of the affected leaf, crown or root system.

In view of (i) the research reports from England that show **Phialophora graminicola)** to be beneficial to the growth and development of turfgrass and (ii), the work at Cornell that shows an extreme stress must be placed on the Kentucky bluegrass plants in order to weaken them to such an extent that a major form of colonization by this organism can take place, it would seem reasonable to assume that summer patch is a product of environmental stress rather than the result of infection and colonization of the plants by either **Phialophoa graminicola** or any other microorganism.

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Table 1. Patch Diseases of Turfgrasses

Disease and Season of Occurrence	Susceptible Grasses	Incitant
I. Winter		
Spring Dead Spot	Bermudagrass	**Leptosphaeria korrae** in certain areas
Typhula Blight	annual bluegrass, Kentucky bluegrass, perennial ryegrass, red fescue, tall fescue	**Typhula incarnata** and **T. ishikariensis**
Fusarium Patch	annual bluegrass, bentgrasses, Bermudagrass, Kentucky bluegrass, red fescue, ryegrasses, tall fescue	**Fusarium nivale**
Sclerotinia Patch	Kentucky bluegrass, red fescue,	**Myrioschlerotia borealis** perennial ryegrass
Winter Crown Rot	creeping bentgrass, Kentucky bluegrass, red fescue, tall fescue	**Coprinus psychromoribidus**
Frost Scorch	Kentucky bluegrass	**Schlerotium rhizodes**
II. Spring and Fall		
Necrotic Ring Spot	bentgrasses, Kentucky bluegrass, tall fescue, red fescue, chewings fescue, ryegrasses	**Leptosphaeria korrae**
Take-all Patch (Ophiobulus Patch)	bentgrasses, Kentucky bluegrass, red fescue, ryegrasses, tall fescue	**Gaeumannomyces graiminis** var. **avenae**
Rhizoctonia Yellow Patch	creeping bentgrass, Bermudagrass, Kentucky bluegrass, tall fescue, zoysia	**Rhizoctonia cerealis**
Corticium Red Thread	bentgrasses, Bermudagrass, Kentucky bluegrass, red fescue perennial ryegrass	**Laetisaria fuciformis**
Liminomyces Pink Patch	Red fescue, perennial ryegrass	**Liminomyces roseipellis**
III. Summer		
Fusarium Blight	bentgrasses, Bermudagrass, centipedegrass, Kentucky bluegrass, red fescue, ryegrasses, tall fescue	**Fusarium culmorum** and **F. poae**
Sclerotium Blight	creeping bentgrass, Bermudagrass, Kentucky bluegrass	**Sclerotium rolfsii**
Pythium Blight	bentgrasses, Bermudagrass, Kentucky bluegrass, red fescue, ryegrasses, tall fescue	**Pythium ultimum** and **P. aphanidermatum**
Rhizoctonia Blight (Brown Patch)	annual bluegrass, bentgrasses, Bermudagrass, Kentucky bluegrass, red fescue, ryegrasses, St. Augustine-grass, tall fescue, zoysia	**Rhizooctonia solani**
Melanotus White Patch	tall fescue	**Melanotus phillipsii**
Summer Patch	Kentucky bluegrass	A senescing plant syndrome