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# Bermudagrass decline

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## *Chemicals alone won't control this root-rotting fungus*

**B**ermudagrass decline is a destructive root rot disease caused by the fungus *Gaeumannomyces graminis* var. *graminis*. This fungus grows on the root system, invades the root vascular system (xylem and phloem) and thus debilitates the plant due to lack of water and carbohydrate movement between roots and leaves.

In combination with other stresses (for example, low mowing height, nutritional deficiencies or imbalances), above-ground symptoms will develop during the late summer and fall months if environmental conditions are conducive for disease development.

Initial symptoms of this disease may

include the appearance of irregular yellow (chlorotic) patches ranging in diameter from a few inches to a few feet. A general chlorosis and necrosis (dead tissue) are first observed on the lower leaves.

Foliar lesions, such as leaf spots, are absent.

The root systems of these plants are



discolored with dark-colored lesions present on the roots. Associated rhizomes and stolons may have lesions also.

As the disease progresses, the roots become short and completely rotted and may appear totally black in color. Entire plants may die resulting in an irregular thinning of the grass (Figure 1) and eventually bare patches may develop.

As a general rule, the outer margins (clean-up pass) of a putting green exhibit the disease symptoms first (Figure 2). Correct diagnosis of the problem will require having a sample analyzed by a plant diagnostic clinic such as the Florida Extension Plant Disease Clinic in Gainesville (904-392-1994) since severe nematodes or *Pythium* species may cause similar damage.

I have been examining cultural and chemical methods for controlling this disease using the portion of the FCGSA Otto Schmeisser Research Green that is planted with Tifgreen 328. This area is maintained as a "normal" putting green mowed at  $\frac{3}{16}$  inch six times each week during the summer.

Fertility during the summer months (May through October) is 6 pounds each of nitrogen and potash per 1000 square feet with  $\frac{1}{2}$  pound of each applied every two weeks. Phosphorus is applied twice each year in May and October. Micronutrients are applied with each nitrogen application as they are a component of the fertilizer blend currently used (Harrell's 12-0-12 with Polyon TM polymer coated urea). The area is verticut and topdressed with an 80/20 mix

approximately once each month.

Experiments conducted in 1991 were initiated after moderate to severe above-ground disease symptoms were apparent (Figure 1). These experiments indicated that fungicides alone had no curative effect on this disease and that the best cultural treatment was simply to raise the height of cut.

In other words, once the above-ground symptoms are observed, it is too late to apply fungicides to control *G. q. graminis*, as the fungus has been attacking the root system for weeks or even months.

Contact fungicides may be useful to prevent secondary leaf diseases and to control the algae that usually develops in the areas where the grass thins and/or dies.

Experiments conducted in 1992 and 1993 were designed to examine preventive controls of this disease.

In one experiment, I evaluated all currently registered systemic fungicides and fungicides expected to be registered shortly for bermudagrass. Three preventive rate applications were made at 28-30 day intervals beginning the end of April.

In another experiment, fertility (N, P, K and Mn—individually and combined) was increased.

In addition, a 6-foot wide strip of the area was cut at  $\frac{1}{4}$  inch rather than  $\frac{3}{16}$  inch for the entire summer. The primary discernable difference among all treatments (fertilizers and fungicides) throughout the duration of the experiment was the better quality associated with the grass strip cut at  $\frac{1}{4}$  inch rather

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than  $\frac{3}{16}$  inch (Figure 3). No symptoms were ever observed on this higher cut of grass. Thus, as was observed in 1991, the higher height of cut is extremely important in preventing and eliminating the disease.

I realize that superintendents cannot maintain their Tifgreen putting greens at  $\frac{1}{4}$  inch all summer and early fall, but fungicides alone will not stop the disease from developing.

If you have Tifdwarf putting greens, the same principles apply in terms of raising the height at least  $\frac{1}{32}$  inch greater than your normal mowing height.

Cultural practices must be used in addition to any preventive fungicides. As soon as you observe any stress or initial symptoms, raise the height for a few days. There are ways to maintain speed — double cut, topdress, roll.

Explain to the members and players why you feel it is important to increase mowing height. Stress the need to raise the height off and on throughout the summer so the grass will not decline.

Bermudagrass Decline is a root rot disease and not a leaf disease. Grass can easily recover from a leaf disease. However, once the crown and root system of the plant dies, the plant will not recover, resulting in the bare patches of soil often

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observed. Emphasize that a little inconvenience during the summer means there will be grass to play on this fall and winter.

Superintendents and golfers must realize that both Tifgreen and Tifdwarf are over 20 years old. The grasses have not changed, but the maintenance practices and amount of play have changed dramatically. The primary maintenance change, due to the demand of the golfer, has been the decrease in the mowing height. Without leaf tissue, the plant cannot produce carbohydrates to sustain itself. Without a viable root system, there will be no leaf tissue. A simple but important lesson to remember and to emphasize to the golfer.

If you feel you must use a systemic fungicide, follow the directions completely and do not overuse these products. During the 1991 curative experiment, when the fungicides were used after severe symptoms had developed, the curative rates of the registered triazole fungicides actually slowed recovery of the grass. Again, the emphasis should be placed on cultural practices for disease prevention and control rather than chemical practices.

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**Figure 2.** As a general rule, the outer margins (clean-up pass) of a putting green exhibit the disease symptoms first. Correct diagnosis of the problem will require having a sample analyzed by a plant diagnostic clinic.



**Figure 3.** The primary discernable difference among all treatments (fertilizers and fungicides) throughout the duration of the experiment was the better quality associated with the grass strip cut at 1/4 inch rather than 3/16 inch.



# Split label rate into 3 equal applications for best results with DMI fungicides

**1** Assuming the 30-day waiting period has been observed, what types of effects do DMI fungicides have on overseeded bermudagrass greens?

"We did the work on fenarimol at College Station. We found the best annual bluegrass control was to split that label rate into three equal applications made at two-week intervals.

"We tested some fairly high rates and never found any toxicity in perennial ryegrass on either Tifgreen or Tifdwarf bermudagrass. With a rough bluegrass, there was initial thinning of seedlings even at label rates. However, there was never enough damage to cause concern, since adequate turf was formed rapidly."

## Even a 10x rate showed no post-emergence activity

**2** What rates of a DMI fungicide would be too excessive use on bermudagrass greens prior to overseeding?

"We didn't see any problems on bermudagrass or perennial ryegrass — over three years of studies on both research plots and golf courses (real world golf courses in Waco, Tex.), from a 2x rate.

"I had one study where a research associate made an error on calculation. He made a 10x rate mistake. Even at 10x the label rate, the bermudagrass was only about 50% thinner and it recovered fully within a year.

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## Dr. Beard answers your questions

*Chip Lewison, superintendent at Dunedin CC, gathered questions from superintendents around the state and put them to Dr. James Beard, recently retired professor at Texas A&M University in College Station, Tex., for a one-time question-and-answer clinic.*

"So at a 2x on bermudagrass and perennial ryegrass under our conditions in College Station, fenarimol did not cause a problem over a three-year period.

"In one study we applied fenarimol at two-week intervals from August through the entire winter. It showed no post-emergence activity of any kind on the *poa annua* - it behaved strictly as a preemergence herbicide in these winter overseeding studies."

## Activated charcoal may not be a solution to pesticide residue

**3** Some people are wondering if we should apply activated charcoal to our greens once every year or two to aid in "flushing" some of the pesticide residues that may be accumulating. Do you have any feelings on this matter?

"I've never had that question asked before and I really don't know of research to provide the answer.

"The charcoal is only going to be effective on certain pesticides, not all of them. Only certain chemical groups are absorbed onto the charcoal particle surface.

"Also, this charcoal will continue to absorb certain chemicals. This might force one to use higher rates of certain pesticides to get pest control in future years until the charcoal surface has become

saturated.

"Thus charcoal may not flush the pesticide residues out; rather it is trapping them and the organic chemicals until they eventually degrade or are displaced.

## Five-year old charcoal layer

**4** Will that layer stay there from year to year?

"I've seen distinct charcoal layers in greens five years later."

## Layer stays, particles move

**5** So the charcoal may not go anywhere?

"No, I didn't say that. There might be some charcoal particles leaching downward, depending on the root zone physical and chemical characteristics and the intensity of leaching."

## Some rooting problems

**6** What are your studies showing concerning the use of preemergence herbicides on root development of bermudagrass?

"We just finished a series of studies with six preemergence materials on rooting of bermudagrass and St. Augustinegrass. One two-year study involved repeat applications compared to a nonrepeat program. The chemical group where most of the rooting problem ap-

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peared was the Dinitroanilines.”

### **Broad spectrum approach may no longer be appropriate**

**7** Would we be better off using more broad-spectrum pesticides instead of combinations of single-acting pesticides?

“The broad-spectrum approach has traditionally been used whether we are talking the control of disease, insects, or weeds.

“Point in fact: with environmental issues and the activists’ microscope golf is under today, we should be accountable on the environmental issues. Thus the trend to more narrow-based, target-specific controls using only as much pesticide as is needed to control a particular pest problem.

“This approach is more costly, involves continuous scouting and proper diagnostic interpretation and timely application of the proper material by a professional.

It makes the job of the turf manager somewhat more difficult, but also places demands on the owners to hire knowledgeable, well-paid superintendents, with the capability to successfully accomplish this management approach.”

### **Cold storage not necessary on established cultivars**

**8** Do you believe in cold storage of bentgrass seed for a year prior to overseeding in warm season climates?

“Essentially all seeds — much less in ryegrasses but certainly in bluegrasses — contain a certain amount of a germina-

tion inhibitor in them at the time of harvest. In general, this seed-germination inhibitor is short-lived.

“Typically, by the time the seed goes through the harvest, cleaning, bagging, shipping operations, the inhibitor has been degraded and is no longer a problem in terms of planting that same year with the seeding rates used.

“Whether some of these newer bentgrass cultivars will have a seed dormancy problem requiring extended storage is unclear.

“Along this same line, it takes a minimum of four years before one really knows whether a new turfgrass cultivar possesses superior traits relative to its weaknesses over the long term.

“Most of the new cultivars have not been tested for four years in multiple locations or areas. Unfortunately, many of the new cultivars are being promoted and sold throughout the country.

“I’ve been in the turfgrass business 35 years and have seen a lot of turfgrass cultivars look good in year one, two or three. The soil and turf ecosystem is not fully stabilized or come into balance and the thatch has not built up, so one really does not yet know the true stress tolerance, pest resistance, or susceptibility and overall longterm performance.

“It takes four years at a minimum to obtain relative data, which is what researchers should be concerned with.”

### **Too early for results on first sound algae research program**

**9** Are there any good, effective controls for algae on USGA spec or modified spec greens?

“Currently, Dr. Jeff Krans, one of my

former students now at Mississippi State, has an elaborate study on algae — types of algae species around the country.

“He finds six to eight algae species on a single putting green that rotate one to the other as the dominant population over a growing season. This may explain the erratic control and rapid recovery of algae areas.

“It is too early to have all the answers yet, but it’s the first algae research program based on sound science. He is approaching the problem the right way and I look forward to some good information from this research.”

### **Tifway off-types due to contamination, not mutation**

**10** Can you comment on the problems being raised about Tifway bermudagrass contamination? How true are dwarfs being grown today? Is mutation possible or is contamination more likely the problem?

“Always keep in perspective that the potential for mutation percentage-wise, is very, very small. The appearance of off-types in Tifdwarf is appearing far too frequently to be a mutation.

“For the most part, the off-type cause is either from the purchase of plant material that is already contaminated or is planted on a site that was previously contaminated with another bermudagrass.

“You’ve got to treat greens with methyl Bromide. In Texas there have been a lot of situations where they are treating existing greens with glyphosate and re-planting. It doesn’t work and is a major source of off types.

“Off types also could be carried in on golf cleats, and equipment. There are



many other ways for it to contaminate greens."

### **Gibberelin will green it right up under certain conditions**

**11** Can you offer a strategy to keep non-overseeded Tifdwarf color up during the winter months? What about bringing it back once the color goes down?

"Nitrogen helps at temperatures above chill stress or above 55-60 degrees. The other is gibberelin to correct chill stress or stress below 55 degrees. I've had one master's thesis done in this area.

"In south Texas or south Florida, where the soil temperatures stay relatively high, dropping low on certain nights causes low-temperature discoloration. If you treat the next day with gibberelin, particularly with Tifdwarf, it works very well.

"Gibberelin will green it right up.

"The key is whether the soil temperature there is warm enough so that regrowth and chlorophyll synthesis starts again right away. If the soil temperature remains too cold — especially if the site is too far north or the cold air mass has extended farther south — the gibberellin is not going to help during a longterm period of cold temperatures below chill stress."

### **DNA technology is there, but is it worth the time and expense?**

**12** Do you think Dr. Grasshof's DNA testing (University of Tennessee) is reliable?

People are very concerned after four or five years now as the problems associated with non-certified grasses (in Florida) continue to leave doubts as to their authenticity and contamination potential.

"I have not done any DNA cultivar characterizations myself, only isoenzymes characterizations, but his program looks promising.

"The technology is there. It is a matter of developing the specific application.

"It involves great expense for the development and equipment. One just doesn't go into a lab and run a few tests. It requires the efforts of a trained bio-

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chemist who must perfect the routine but specific procedures over a period of three to six months.

"It involves an art dimension as well as science.

"The same is true when running starch gel or electrophoretic acrylamide gel cultivar characterizations. As it is rather expensive, these technologies may only be justified when civil action is deemed necessary.

"More significantly, the I.D. techniques may assist growers to assure genetic integrity and purity in their cultivars. This may very well be its most important role."

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