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9 = very best — 1 = very poor

Variety	Turf Quality	Spring Color	Brown Patch Resistance	Pythium Resistance
Warren's® ADVENTURE Sod	6.8	6.5	7.8	8.0
Apache	6.7	*	6.5	5.0
Olympic	6.5	5.8	5.8	5.3
Jaguar	6.1	*	7.3	6.0
Rebel	5.9	7.4	6.5	6.0
Hound Dog	5.9	*	6.2	6.2
Falcon	5.8	5.6	6.3	7.0
Kentucky 31	3.4	4.0	6.5	6.8

*Not reported

Data from Adelphia and North Brunswick, New Jersey, 1980 thru 1983

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SPECIFICATIONS

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Fertility Requirements	2-3 pounds of N per year per 1000 square feet. ADVENTURE is less prone to iron chlorosis than leading competition.	**Heat Tolerance**	Excellent. Far superior to ryegrass or bluegrass.
Seeding Rate	5-7 pounds per thousand square feet.	**Cold Tolerance**	Much better than perennial ryegrass.
pH Tolerance	Ranges of 4.7 to 8.5.	**Fungus Susceptibility**	Superior resistance to brown patch and red thread. No mildew seen in shade. Good crown rust resistance.
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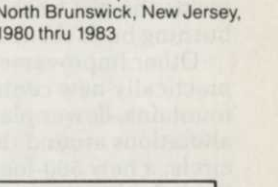

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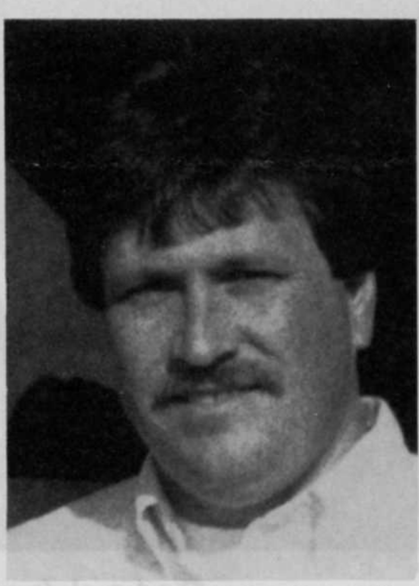
A view of Churchill Downs' famous grandstand and twin spires.



Raymond "Butch" Lehr, Churchill Downs' plant supervisor and 19-year employee.

the Board of Directors has made continued improvements over the years. The latest, a $6.5 million improvement program begun early in 1985, is spotlighted by the addition of the turf track, nestled inside the dirt track and edged by burning bush shrubs.

Other improvements: a practically new centerfield with new fountains, flower planters, and alterations around the winner's circle; a new 500-foot tunnel from the infield to the main parking lot; new dining and entertainment areas; a remodeled lounge known as The Jockey Club; and a general repainting.

Superintendent Lehr oversaw construction of the fescue track (it's actually 90 percent fescue and 10 percent Kentucky bluegrass) that will host its first race in the spring of 1987.

He assures a visitor he didn't choose the fescue turf arbitrarily. "We did tests on grasses before choosing. We also talked to a lot of turf people. It was almost unanimous—most recommended the Kentucky 31 fescues," says Lehr, another Louisville native who has work his way up the corporate totem pole since joining Churchill Downs in 1967.

Ground was broken for turf track July 5, 1985, at 10 a.m. (Evidently, Lehr keeps records to the minute). The grass was sowed on Sept. 30, mowed on Nov. 5, and again on Nov. 18. A Rain Bird irrigation system was installed near the turf track, the only area at Churchill Downs that is irrigated. The system was turned on March 10 of this year.

The baby track experienced some kill over the winter but was resowed in March, fertilized shortly thereafter, and greened-up by April 1.

RVA Omnisports, based in Ontario, Canada, designed the mortar sand-based track.

Lehr says he chose the Rain Bird irrigation system because other Rain Bird users he spoke with noted the system's low maintenance requirements.

The Breeder's Cup

It's no secret that Churchill Downs built the 7/8-mile turf track with an eye on playing host to the annual Breeder's Cup, held each November. To date, no Breeder's Cup is scheduled for Churchill Downs, but there's a good chance that will change in the future.

Walter Hagan has recently been named turf track superintendent.

For Lehr, the turf track means even more responsibility. At 37, he handles the pressure smoothly though there's no doubt he's a man with a lot on his mind.

He credits his employees for his success. "It's frustrating at times, but our people go farther than expected when the chips are down. I've got good men under me and they feel the same as me—there's something special about working here and it leads to pride in your job," says Lehr, in between answering his walkie-talkie and the telephone.

Since 1967, he's seen every Kentucky Derby with the exception of the two he missed in 1969 and 1970 when he was serving in the Army. He'll probably see a lot more.

"I guess if I had to work somewhere for the rest of my life, I'd like to work here," says the blue-eyed father of two.

His co-worker and friend Lord has seen 35 Derbies. He can rattle off the names of most Derby winners, especially those in long-past years. He has trouble with the recent winners.

That could be because of the growing pressure Lord faces preparing the track for Derby Day. The greater the spectacle, the greater the pressure. The race becomes secondary for Lord.

Still, it's a job he wouldn't trade. "I love what I do. I couldn't imagine doing anything else," he says, inhaling a Marlboro.

After the Derby, Lord and crew take the role of landscape maintenance workers—flower care, spraying, mowing, fertilizing, pruning, and the other tasks presented in a 147-acre landscape.

In preparing for the Fall Meet (the fall racing season which runs from late October to late November), Lord plants chrysanthemums and other fall bloomers. The flowers, he says, cause his biggest worries but are most rewarding.

When they're right and Churchill Downs is at its finest, then the 365 days of toil and worry are worth it for the employees. **WT&T**

TAKE-ALL PATCH: THE BENTGRASS DESTROYER

by Peter H. Dernoeden, University of Maryland

Take-all patch disease (formerly known as Ophiobolus patch) is an extremely destructive disease of bentgrass, caused by the fungus *Gaeuannomyces graminis* var. *avenae*.

Peter H. Dernoeden is associate professor of agronomy in the college of Agriculture at the University of Maryland in College Park.

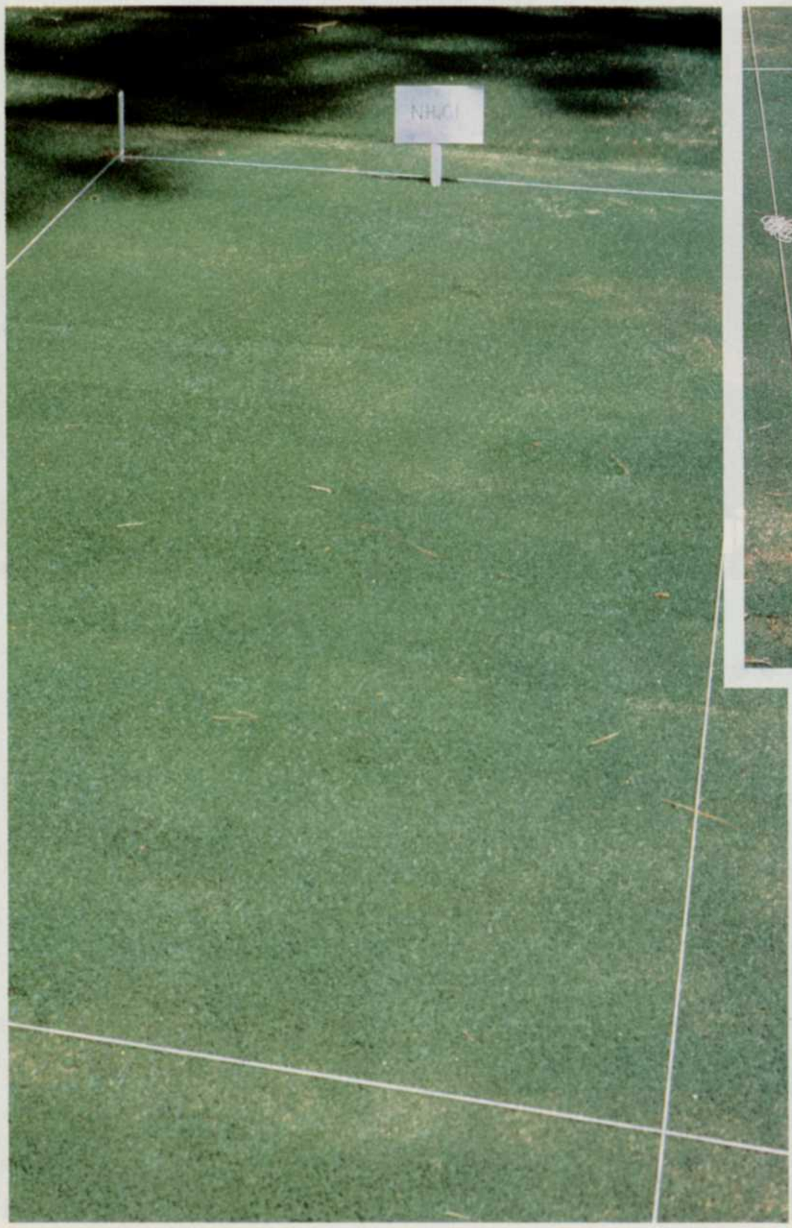
Common in western Europe, Australia, and the United States, take-all patch was first reported in Holland (1931) on a bentgrass putting green.

Symptoms of the disease are most conspicuous in late April through June, and in autumn when cool, wet weather prevails. Affected bentgrass turf dies in circular patches a few inches in diameter and may progress to two or more feet in diameter.

When the disease is active, the outer perimeter of the patch assumes a bronzed appearance, eventually turning a bleached or tan color.

The small circular patches increase in size over a number of years and dead bentgrass in the center of the patch is often replaced by broadleaf weeds (especially dandelions) and occasionally *Poa annua*.

Because the fungus attacks the



Above, an untreated control plot in the 1983-85 fertility and soil acidification study. Right, a plot treated with ammonium chloride during the same study.

Bronze color of active take-all patch in creeping bentgrass. The dandelions are colonizing the interior areas of dead patches and the smaller, dollar spot disease patches.

TABLE 1

Evaluation of fungicides for curative control of take-all patch in a Penncross creeping bentgrass turf.

Treatment and rate/1000 ft.2	Take-all severity* May 5	May 21	June 25	Turf color** June 4	June 25
Bayleton 4.0 oz.	4.8c+	5.3b	4.8bc	8.9c	8.2b
Chipco 26019 4.0 oz.	6.8b	5.0b	6.3b	9.9a	9.0a
Banner 3.0 fl. oz.	6.8b	6.3ab	6.0b	8.8c	8.8a
Daconil 2787 8.0 fl. oz.	7.5ab	6.2ab	6.3b	10.0a	9.0a
BMAS 1.0 fl. oz.	4.7c	2.0c	2.7c	9.1bc	7.2c
Untreated Control	9.0a	8.0a	9.7a	9.5ab	9.0a

*Severity was visually determined on a 0 to 10 scale where 0 = no disease and 10 = all turf dead in affected patches.

**Color was visually determined on a 0 to 10 scale where 0 = brown turf and 10 = dark green turf.

+Means in a column followed by the same letter are not significantly different at the 5% level according to the Bayes LSD.

root system, turf in affected areas is easily detached and is reminiscent of the type of damage caused by white grubs. Adjacent patches may coalesce resulting in large, irregular patches of dead turf.

During the spring, circular patches are generally a bronze color. However, some have reported a reddish-brown color of affected turf in Maryland.

Root damage and plant death may not become apparent until hot, drought-like conditions develop.

A microscopic examination of infected roots reveals that the fungus possesses two distinguishable hyphal froms: 1) brown or colorless hyphae that branch and produce infection structures (hyphopodia), and 2) dark brown 'runner hyphae' which may form multiple strands of five or more hyphae.

The fungus uses hyphopodia and massive infection cushions (pseudoparenchymous mats) to penetrate roots. Frequently epidermal cells appear healthy although the fungus can be observed growing along the epidermis and penetrating cells.

Vascular tissues are eventually plugged and roots turn brown and die. Runner hyphae also colonize stolons and grow upwards along sheathes and invade the crown, killing the plant.

Root infection is favored by moist soil conditions and cool soil temperatures (54-68 degrees F).

G. graminis produces needle-shaped spores borne in a flask-shaped structure (perithecium). Usually produced during the autumn and early winter, the perithecia are often difficult to find in the field.

The fungus survives the winter as spores or as resting mycellium within infected tissues.

The spores germinate on roots but not on leaves or sheaths. The germ tubes of the spores penetrate root hairs and epidermal tissues.

The soil pH factor

There is an interesting relationship between take-all patch and soil pH. The disease occurs in soils with 4.5 to 7.5 pH ranges but is most severe in the neutral to alkaline range (pH 7 and higher).

Professor J.D. Smith noted that soil pH in the upper one inch of turf was critical for disease development.

On those sites where the disease was found in Maryland, soil was a sandy loam texture and was in the 6.7 to 7.2 pH range.

Symptoms of the disease are most conspicuous in late April through June, and in autumn when cool, wet weather prevails.

Smith further noted the disease was generally more severe after an application of ground limestone.

Dr. Noel Jackson, explaining the sudden appearance of the disease in the eastern U.S., suggests the fungus has caused mild, chronic disease symptoms in eastern bentgrass turf and has been either mis-diagnosed or dismissed as a cultural problem.

However, the recent severe outbreaks of the disease may be attributed to a decline of naturally-occuring microorganisms that have antagonized and suppressed the pathogen.

This theory is strengthened by previous studies involving take-all disease of cereal crops, also caused by the *tritici* or *avenae* varieties of *G. graminis*.

Outbreaks of take-all on successively-grown cereal crops reach peak severity in two to four years and the decline. Take all is more prevalent the second year following soil fumigation and is more severe on virgin soils.

Then decline of take all has been attributed to a build-up of microorganisms suppressive to the pathogen.

Likewise, the encouragement of the disease in fumigated soils or on soils where typical soil microorganisms have not been introduced is due to the demise or absence of these antagonists.

Dr. Jackson notes that the suppressive mechanism is reduced or eliminated in turf by pesticides and/or other intensive managerial practices.

Several researchers have achieved dramatic disease reduction through the use of various fertilizers, fungicides, and chlordane.

Smith reported excellent control using 1.5 pounds of nitrogen per 1000 sq. ft. from monoammonium phosphate or ammonium sulfate, and from an organomercurial fungicide applied twice on a three-week interval.

Fertilizer control is attributed to 1) growth stimulation by the nitrogen component, and 2) to acidification of the surface layer, which presumably discourages the ability of the pathogen to cause disease.

Fungicide control

Fungicides were evaluated for take-all control in Maryland in 1980 (table 1). In that study fungicides were applied on April 23, May 7, and May 23. Disease symptoms were conspicuous before application, developing around mid-April. The disease remained active until early July.

All fungicides, except Daconil 2787, significantly reduced disease intensity within two weeks of the initial application.

PMA (an organomercurial) provided excellent suppression of symp-

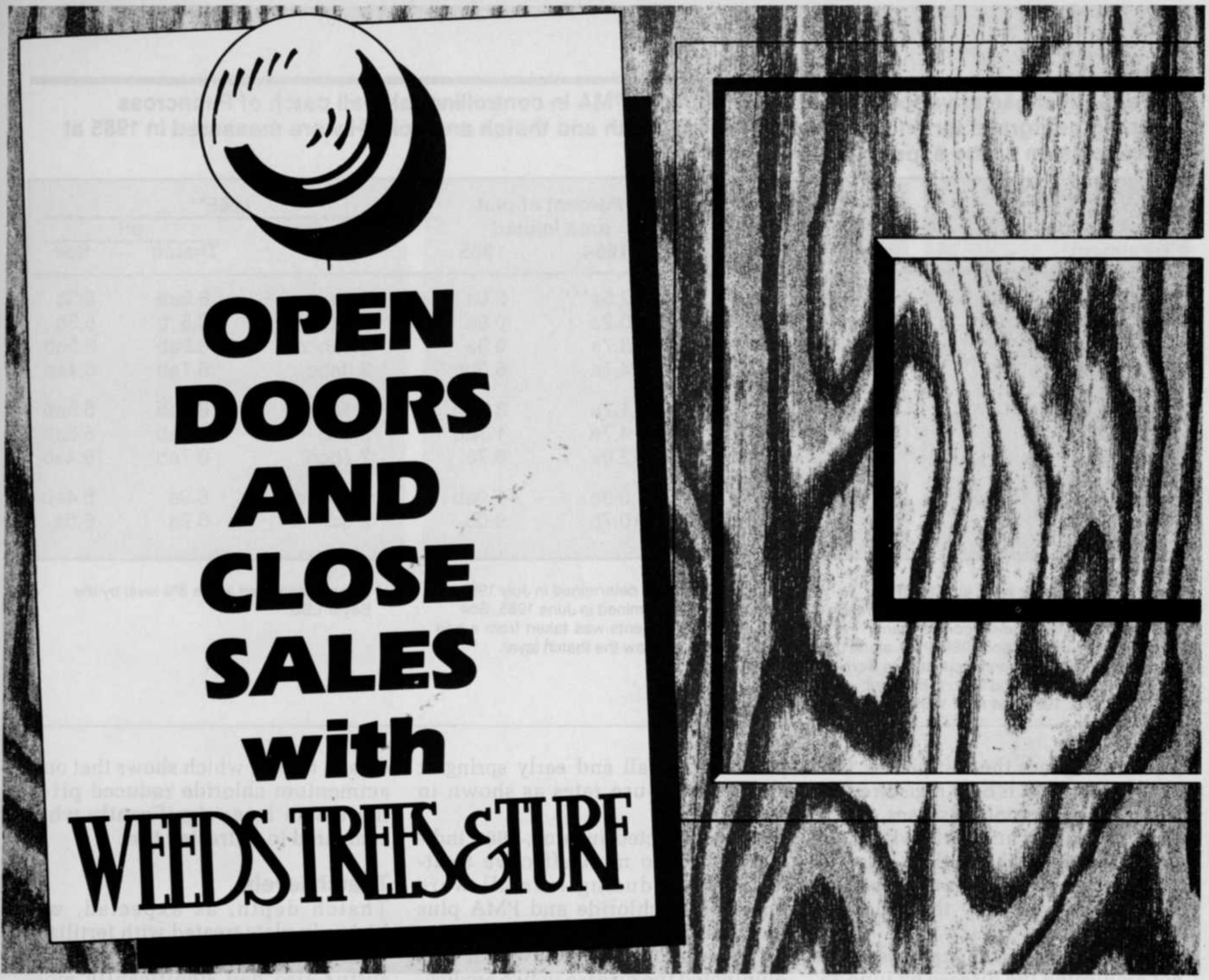


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TABLE 2

The effectiveness of various fertilizers, sulfur and PMA in controlling take-all patch of Penncross creeping bentgrass turf in Easton, MD. Thatch depth and thatch and soil pH were measured in 1985 at the conclusion of the experiment.

Treatment*	Application rate per 1000ft²	Percent of plot area injured		1985**		
		1984	1985	Thatch depth (cm)	pH Thatch	pH Soil
Ammonium sulfate	0.75 lbN	2.5a***	0.0a	3.2a	6.6ab	6.3b
Ammonium chloride	0.75 lbN	0.2a	0.0a	3.0abc	6.5 b	6.3b
Urea	0.75 lbN	3.7a	0.3a	2.9abcd	6.9ab	6.5ab
Sulfur 90G	0.75 lbS	4.7a	6.0bc	3.0abc	6.7ab	6.4ab
Sulfur 90G + ammonium sulfate	0.50 lbS + 0.5 lbN	1.2a	3.0ab	3.1ab	6.7ab	6.5ab
PMA 10L	1.0 fl oz	4.7a	1.3ab	2.6cd	6.9ab	6.5ab
PMA 10L + Sulfur 90 G	1.0 fl oz + 0.75 lbS	2.0a	8.7c	2.7bcd	6.7ab	6.4ab
PMA 10L + ammonium sulfate	1.0 fl oz + 0.75 lbN	0.3a	1.0ab	2.8abcd	6.9a	6.4ab
Untreated control	—	10.7b	9.0c	2.5d	6.9a	6.6a

* Fertilizers and sulfur were applied three times on monthly intervals between Oct. and Dec. 1983 and Sept. and Dec. 1984, and again in April of 1984 and 1985. PMA alone or with either sulfur of ammonium sulfate were applied once in Oct. and Nov. 1983, April, Sept. and Oct. 1984 and April 1985.

** Thatch depth was determined in July 1985 and pH was determined in June 1985. Soil for pH measurements was taken from a one inch zone just below the thatch layer.

*** Means separated at the 5% level by the Bayer LSD.

toms throughout the test period. Unfortunately PMA is only registered for control of snow mold diseases.

However, fall and early winter applications (applied at a time legal for control of snow mold) have helped reduce take-all severity the following spring.

All fungicides had suppressed but not eradicated the disease by June 25.

Repeat applications of PMA, however, discolored turf. The high rates of Bayleton and Banner elicited an unfavorable, blue-purple color in the turf.

Acidification of soil with ammonium sulfate is the primary cultural approach to control take-all patch.

Early studies used to establish this approach, however, evaluated excessively high levels of nitrogen (8, 12, or 20 pounds of nitrogen per 1,000 sq. ft.) fertilizer to achieve successful suppression of disease symptoms.

A University of Maryland experiment, however, was initiated to determine how rapidly various acidifying agents would suppress take-all to acceptable levels with conventional-use rates and dates of application.

Because of the favorable test results achieved with PMA, it was applied preventatively with either sulfur or ammonia sulfate to see if acccelerated take-all suppression could be achieved.

It should be noted that the sulfur used in this test was formulated as a granule (90G) rather than a powder of flowable form. The materials were applied in the fall and early spring at conventional-use rates as shown in table 2.

Data collected in June, 1984 indicated the two most effective treatments in reducing take-all were ammonium chloride and PMA plus ammonium sulfate.

Ammonium sulfate, which had eliminated the disease in two applications (.78 pounds of nitrogen per 1,000 sq. ft.) in an English study did not reduce take-all severity to an acceptable level.

Once rain begins, fire ants...may be effectively controlled with mound treatments of diazinon, Dursban, Orthene, Amdro bait or MC-96.

Sulfur, PMA plus sulfur, PMA plus urea reduced disease severity but to an unacceptable level of control.

Treatments were reapplied in the fall of 1984 and spring of 1985 and by June, 1985, plots treated with ammonium chloride and ammonium sulfate were free of take-all. Urea-treated plots had only a trace of disease activity.

The date was the opposite of that anticipated and may be related to the inability of granular forms of sulfur to rapidly acidify the thatch.

The view is supported by 1985 pH data in table 1, which shows that only ammonium chloride reduced pH of the thatch layer significantly when compared to untreated turf.

Thatch levels

Thatch depth, as expected, was higher in plots treated with fertilizer.

Interestingly, plots receiving only sulfur also had significantly more thatch than untreated turf.

The importance of thatch in the severity of take-all is unknown. However, it is likely that management of the thatch micro-environment will be a key factor in control of the disease.

The pH data in table 2 provide a good indicator of how slow the acidification process is in both thatch and soil.

But thatch and soil pH data may be misleading due to the buffering capacity of soil and organic matter, and our inability to accurately assess pH in soil water adjacent to roots, where take-all fungus resides.

It is probable that the soil water adjacent to and on roots has a much lower pH than may be indicated on a routine soil test, an important fact to remember when considering that acidification is believed to be the primary factor responsible for alleviating take-all with ammonium sulfate and ammonium chloride.

Some researchers say that the chloride anion lowers the water potential of a cell sap in roots and that this physiological response reduces the ability of the take-all fungus to

colonize roots.

It's also theorized that acidification of the soil water either directly reduces growth of the take-all fungus or that it favors growth of other microorganisms, which effectively compete with or in some other way antagonize *G. graminis* var. *avenae*.

Ammonium chloride appears to be our most formidable weapon against take-all. The findings of our studies show ammonium sulfate does not rapidly reduce disease severity but it does work.

Combining the Maryland test results with information obtained elsewhere, one would recommend the use of ammonium chloride to combat take-all patch.

A second choice is a combination of ammonium sulfate with muriate of potash (KCL), and a phosphorus fertilizer.

The phosphorus could be eliminated where soil testing reveals existing moderate of high P levels.

PMA, where legal to apply, should be used in the fall for preventative control of snow mold disease and should provide additional benefit against take-all.

Three to four pounds nitrogen and potassium per 1,000 sq. ft. from the aforementioned fertilizers should be applied annually for at least two years.

Furthermore, the use of lime or topdressing soil with a pH above 6.0 should be avoided, and thatch should be controlled through aerification and/or verticutting.

The use of ammonium fertilizers will provide good winter color to turf but they also encourage growth (and therefore increased mowing) into early winter. **WT&T**

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