

Fungicide

Superintendent Stone is happy so far with results from new control product.

earns high 'Honors' marks



Clemson researcher Martin is also encouraged, but advises supers to keep the 'old standby' products on hand for certain control challenges.

▲ David Stone won't be fenced in by complacency. He often takes advantage of opportunities to try new control products.

The first and last questions a superintendent has when presented with a new product is, "Does it work? Will it work on my course?"

David Stone, golf course superintendent of The Honors Course, Inc. in Ooltewah, Tenn., wants to know as much as any superintendent when it comes to product efficacy.

Located in the Chattanooga area, about 100 miles north of Atlanta, the private 18-hole course of zoysiagrass fairways and bentgrass greens has an elevation of 700 feet and is nestled between hills and dense trees with little air movement during the summer when temperatures stay around 90° F. with constant high humidity. Rainfall is plentiful, an average 52 inches a year.

"In fact, we average over 5 inches in the month of July," Stone says. "That's our hottest month, and also one of our highest rainfall months. With not much wind, that's tough."

Brown patch control at low rates

Brown patch (or zoysia patch) is Stone's primary disease concern at the Honors Course. It can appear when the zoysia is weak or stressed in the fall, when

temperatures cool, and last through the spring before temperatures heat up again.

Stone always experiments with new products. When Heritage became available as an experimental product in 1995, he gave the fungicide a trial run for brown patch control and continued his tests through 1996.

Heritage fungicide, from Zeneca, is the first representative of a new class of fungicide chemistry called strobilurins. The company's claim of long-residual control of the broadest spectrum of diseases ever is of great interest. That it is highly active in small amounts—just tenths of an ounce—has prompted talk about careful application. A spill at the tank could be expensive.

Thorough on-site test

Stone first tested the product in 1995, on bentgrass. Stone installed plots of 27 different bentgrass varieties, with replications, in a partial shade with little air movement. No fungicide applications had been made on the plots, with the exception of a control material used for dollar spot. By July 5, the plots had a significant amount of brown patch disease. Stone applied Heritage at the 0.4-ounce per 1,000-square foot rate to half of the plots.



Martin: Keep SBIs handy for dollar spot.

"The Heritage stopped and cleared up the existing brown patch on those plots," Stone says.

"And it was almost five weeks before any brown patch activity showed back up in those plots. That's very impressive. It stunned me, it really did."

Long residual, no phytotoxicity

Bruce Martin, Ph.D., turf pathologist at Clemson University, found the product lasts longer than more conventional brown patch materials.

"Heritage has given as high turf quality as any currently available materials under moderate to very high disease pressure, but without the negatives of short residual or potential phytotoxicity," he says.

"Our testing has shown good to excellent control of brown patch and summer decline in bentgrass with Fore and Fore/Aliette combinations, but residual control is poor, requiring multiple applications on short intervals when disease pressure is high," Martin says.

"Daconil is also very good and provides consistent control under moderate- to high-disease pressure, but better residual control than Fore or other products containing mancozeb. In my trials, Daconil has not quite provided the highest turf quality in very hot (100° F. and above) weather, as Fore or Fore/Aliette, but it is very close.

Turfgrass quality was a factor that Stone watched closely, as well. In his 1995 tests, Stone decided to use Heritage at the 0.2-ounce per 1000-square foot rate every two weeks on three of his average greens on the golf course.

"We rated those three greens as the best greens on the course that year," Stone says. "So Heritage could have had some turfgrass quality enhancement benefit

in addition to disease control. For sure, there's no damaging effects like we can have with the sterol inhibitors in the summer."

"Certainly there is a place for *sterol biosynthesis inhibitors* (SBIs, such as Eagle, Bayleton, Banner,

Sentinel and Rubigan)," Martin says. "They are still the best dollar spot fungicides available and some have excellent activity on other diseases. But SBIs (at least the one's currently available) can induce unacceptable plant growth regulation effects on bentgrass and Poa-dependent greens in hot weather. Heritage does not do this, even in very hot weather."

Because this fungicide does not control dollar

spot, Martin says dollar spot must be controlled through use of SBIs before hot weather becomes problematic. Or Heritage can be used in combination with chlorothalonil, iprodione, vinclozolin or some other fungicides to control dollar spot.

"Some of the latter fungicides, in combination with Heritage, provide excellent tank mix partners," Martin says.

"Superintendents with more dollar spot-susceptible cultivars, such as Crenshaw, should take note of this."

'Flexible' disease management

Martin points out that the product is the first fungicide that penetrates the plant, is upwardly mobile and controls both brown patch and Pythium blight. "This adds flexibility increases options for disease management programs," he says. The activity is a reflection of its chemistry. It is the first product in a new class of chemistry called strobilurins. Azoxystrobin, the active ingredient of Heritage, is synthetically derived from naturally occurring fungicides produced by several species of wood-decaying mushrooms.

These mushrooms produce "strobilurin" fungicides that inhibit competitive fungi while they break down dead trees. Natural strobilurins must be continually produced and excreted by the fungus, because they are unstable in the presence of light and other microbes. To form a more stable molecule, Zeneca modified the chemical structure of the strobilurin in the laboratory.

Preventive use for Stone

According to Zeneca, azoxystrobin is the only fungicide active ingredient that controls representatives of all four major classes of fungi, including the oomycetes, ascomycetes, basidiomycetes and deuteromycetes. Sterol inhibitors work by affecting a compound required by only three of the disease classes. Azoxystrobin stops the formation of ATP, a material required for metabolism in all fungi. As a result, azoxystrobin is a true fungicide. It actually kills the fungus by stopping active mycelium, preventing spore germination and inhibiting production of new spores in certain fungi.

Based on his experience, Stone believes that the product should be used on a preventative basis. Although both preventative and curative applications performed well, the preventative use was the better timing for Heritage. He plans to use it on his greens this year, under full registration, alternated with other materials to manage the potential for resistance.

Stone plans to use Heritage on his greens this year, under full registration, alternated with other products to manage the potential for resistance.

Stone will either make 0.2-ounce rate applications every couple of weeks or go with the 0.4-ounce rate at monthly intervals. He wants to review the product's activity on his zoysiagrass fairways. Last year he used Heritage at the 0.4-ounce rate on test strips located at his number 7 fairway, a hole located in a bowl with higher surrounding humidity. Number 7 is always prone to brown patch.

"We had total control for the fall and winter and through much of this spring. All the untreated strips have very high disease occurrence," Stone says. "We did make a second application in April on half of the strips. But even on the one's we didn't re-treat, there was not much disease activity."

Superintendents will find the fungicide is easy to mix and work with, Stone says. His workers have

not noticed any fumes or odors. A buffering agent is not required in water, he says, because the product is stable under a wide pH range. The Honors Course team has not noticed any phytotoxicity or negative effects on beneficial organisms, such as earthworms.

"The bottom line with Heritage is that it increases our options for disease control," says researcher Martin. Heritage is new. Although a lot of testing has been done, we still have a lot to learn."

Questions remain relative to anthracnose basal rot control or fairy ring control, for example.

Photos by Scott C. Lee.

ed. note: Inclusion of product names does not imply endorsement, nor does omission of any product does not imply criticism.

FUNGICIDES WERE FIRST USED AS SEED TREATMENTS

1915: ORGANOMERCURIAL FUNGICIDES

- ▶ Provided fungicidal and bactericidal activity
- ▶ First introduced as seed treatments
- ▶ Later became available as foliar sprays
- ▶ Diseases controlled: Snow mold
- ▶ No longer registered for turfgrass use

1930S-1940S: DITHIOCARBAMATE FUNGICIDES

- ▶ Includes mancozeb and substituted benzene (chlorothalonil, PCNB) fungicides
- ▶ Multiple-site protectant fungicides
- ▶ Active against a broad spectrum of fungi
- ▶ Short residual
- ▶ Widely used in combination or alternation with longer residual fungicides

1968: BENZIMIDAZOLE FUNGICIDES

- ▶ Includes benomyl and thiophanate-methyl
- ▶ Important breakthrough: First curative, systemic fungicides
- ▶ Could be used at lower rates with longer intervals
- ▶ Plants translocate active ingredients directly to the fungus
- ▶ Thiophanate-methyl still widely used on turfgrass

1978: PHENYLAMIDE FUNGICIDES

- ▶ Includes metalaxyl
- ▶ Especially useful against one class of fungi (Oomycetes)
- ▶ Controls Pythium, Phytophthora, etc.
- ▶ Metalaxyl remains in use on turfgrass

1980: DEMETHYLATION INHIBITOR (DMI) OR STEROL BIOSYNTHESIS INHIBITOR (SBI) FUNGICIDES

- ▶ At the time, these fungicides offered the widest range of activity
- ▶ Effective against three of the four major classes of fungi
- ▶ Not effective against Oomycetes fungi, including Pythium and Phytophthora
- ▶ Could be used with lower rates and offered long residual activity
- ▶ More fungicides marketed from the DMI's than any other group
- ▶ Widely used today on turfgrass

1997: STROBILURIN FUNGICIDES

- ▶ First fungicide to control all four major classes of fungi
- ▶ "True fungicides," strobilurins actually kill the fungus by stopping active mycelium, preventing spore germination and inhibiting production of new spores
- ▶ Preventative and curative activity
- ▶ Highly active at extremely low rates with long residual
- ▶ Does not control dollar spot
- ▶ Controls more than 18 diseases, including brown patch, Pythium, take-all patch, summer patch, anthracnose and snow mold
- ▶ Heritage fungicide, first strobilurin introduced, was registered February 7, 1997