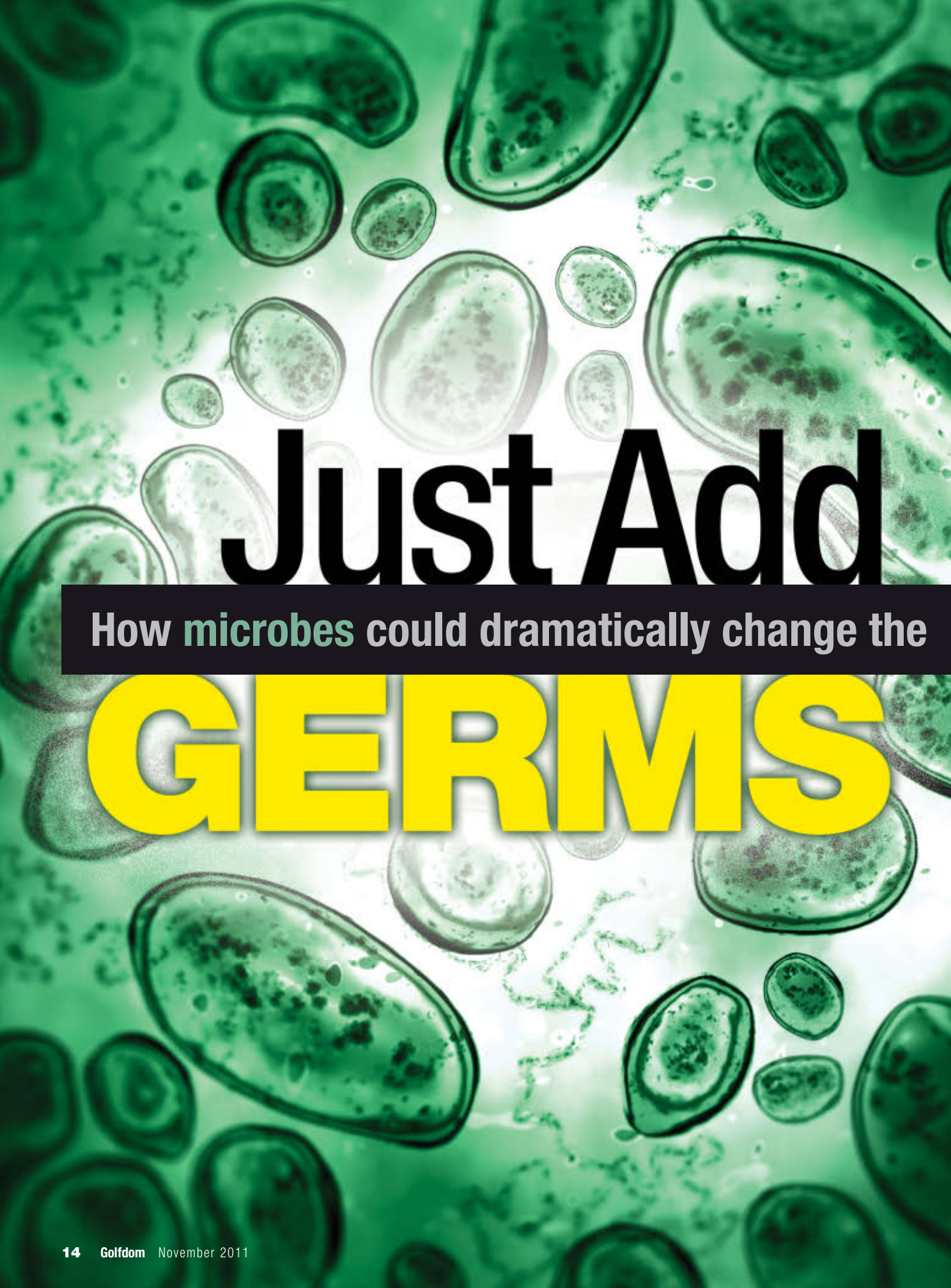

Just Add GERMS

How microbes could dramatically change the

A soil core from a sports field treated with Turf Tech Bio-Min.

way you fertilize your golf course

BY STACIE ZINN

For years, superintendents have shrugged off microbial fertilizers as just another batch of snake oil. Some with good reason. But recently, biofertilizers infused with beneficial microbes that can help release nutrients bound in the soil are starting to make an impact for superintendents around the country.

This is especially true in places where regulations on applications of nitrogen have made proper fertilization regimens a challenge. The latest information suggests that biofertilizers can reduce the quantity of necessary N applications, combat disease and increase turf health. How about that? Germs can be your friends.

In Fort Myers, Fla., John Stach, golf course superintendent at Olde Hickory Golf & Country Club, recently started using KaPre Remed8 and KaPre ExAlt, biological products from Performance Nutrition, a division of Lidochem, on his TifEagle bermudagrass greens.

"Right now," Stach says, "I'm treating some stress areas. I have a lot of fairway traffic in (the winter) season and it shows a lot of weak turf in heavy traffic areas, resulting in some nematode stress and other pathogenical factors that I'm trying to improve with the biologicals. In a way, I'm reducing the amount of fertilizer, because if I wasn't treating biologically, I'd be trying to stimulate the grass with extra fertilizer. I've cut back on the extra feeding of the weak areas."

But it's not just problem areas that benefit from the biological approach at Olde Hickory. Stach says he's cut what would typically be applications of "a little over a pound of nitrogen per month by a third," by incorporating biofertilizers into his program.

"For greens alone, it's a good thing because excessive amounts of nitrogen have an effect on greens speeds, putting quality, turf health and disease resistance," Stach says. "So, it's a good way to reduce your nitrogen on your greens and have a healthy plant."

In Stach's region of southwest Florida, residential and commercial fertilizer restrictions are in place. Best management practices created by the industry have helped golf courses meet reasonable guidelines. Still, those guidelines call for reduced fertilizer requirements during the hot and rainy summer months, just when the plant is growing and actually needs it. Stach says using the biofertilzers to help reduce his inputs of N, P and K have helped. "Any way you can reduce that and stay within the BMP guidelines, it's essential," Stach says.

The research says

Research from the past two decades builds a case for the viability and usefulness of biofertilizers. A study in a book published by the EPA in 1988 titled "I.P.M. for Turfgrass and

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PHOTOS BY: ISTOCK INTERNATIONAL INC. (LEFT); SOIL TECHNOLOGIES

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Ornamentals" concluded that treatments using TurfTech, a beneficial microbe product from Soil Technologies Corp., could reduce soil hardness (compaction) by an average of 29 percent at a depth of two inches, and 24 percent at the four-inch depth in a period of 6 to 8 months after application.

In 1989, Michigan State University plant pathologists studying the ability of organic fertilizers to inhibit fungal pathogens reported that TurfTech had been effective in reducing summer patch and necrotic ring spot by over 40 percent in treated research plots. In 1990, similar tests at Rutgers University confirmed the results.

In 1998, several strains of organisms were incorporated into the TurfTech formula to create a new product, TurfTech Bio. According to Steven Nichols, executive vice president of Soil Technologies, headquartered in Fairfield, Iowa, TurfTech Bio is formulated with cyanobacteria, which, he says, are "nitrogen-fixing organisms that take nitrogen in the air and water not available to the plant and then convert it to a usable form of nitrogen." It also has bacillus spores that Nichols says "reduce the incidence and severity of pathogenic fungi."

The material comes as a dry concentrated powder that is mixed with water and spray applied at four- to six-week intervals during the growing season. In tests at Texas A&M University, TurfTech Bio provided a 53 percent reduction of disease symptoms compared to untreated plots.

Among the most commonly used beneficial bacteria is mycorrhiza. Information from Dr. Fred. T. Davies' website at Texas A&M University, where mycorrhiza has been studied for 25 years, explains the relationship of mycorrhiza and plants:

> *The word "Mycorrhiza" is given to a mutualistic association between a fungus (Myco) and the roots (rhiza) of the plants. This association is symbiotic because the relationship is advantageous for both organisms. The macrosymbiont (the plant) gains increased exploration of the soil (rhizo sphere) with the intricate net of hyphae that increases the uptake of water and nutrients from the soil interphase. The microsymbiont (the fungus) uses the carbon provided by the plant for its physiological functions, growth and development.*

Dr. Davies' site highlights several benefits and advantages of mycorrhiza, including:

- Enhanced plant efficiency in absorbing water and nutrients from the soil
- Reducing fertility and irrigation requirements
- Increased drought resistance

A view of No. 18 at Olde Hickory, which uses products from Performance Nutrition on its bermudagrass greens.

"THE FIRST TIME I WENT TO THE GOLF INDUSTRY SHOW IN 1987, WE WERE THE ONLY COMPANY THERE TALKING ABOUT THESE TOPICS. NOW IF YOU GO TO THE GIS, THERE ARE PROBABLY 20 TO 30 COMPANIES. IT'S CLEARLY A BIG TOPIC."

STEVEN NICHOLS, SOIL TECHNOLOGIES

- Increased pathogen resistance/ protection
- Enhanced plant health and vigor
- Minimized stress

In 1995, the *USGA Green Section* published a report on a four-year study conducted by researchers at the University of Rhode Island that looked at the benefits of mycorrhizal fungi on bentgrass putting greens. According to the report, the "results of inoculation were striking. Establishment of young turf was enhanced by inoculation with mycorrhizal fungi, and differences were apparent within three weeks after seeding. Turfs older by several months continued to grow more vigorously with mycorrhizae. In addition to improved growth, mycorrhizal turf was greener than non-mycorrhizal turf and possessed up to 60 percent more chlorophyll."

The report went on to conclude "improved drought tolerance and related rapid recovery from wilting appear to be the most significant (benefits), but increased growth and establishment rates, greater chlorophyll content, and a lowered phosphorus requirement are also worthy of note. A probable result of these benefits may be manifested in an increase in resistance of mycorrhizal turf to foot traffic (wear), although this was not measured in our results."

Growing business of biofertilizers

Unfortunately, at the time of the research, as reported by the University of Rhode Island researchers themselves, not much product was commercially available for use on golf course greens. Even though the research showed real promise, superintendents couldn't really buy the stuff. So not a lot happened. But recently, that has changed. Availability of products containing mycorrhiza, and other beneficial microbes, has increased.

Soil Tech's Nichols says his company has produced biological fertilizers for the golf industry for nearly 30 years. Nichols attests to the growth of the product category and recently increased availability. He says that the number of distributors promoting and selling Soil Tech's biological products has doubled in the past three years.

"The first time I went to the Golf Industry Show in 1987, we were the only company there talking about these topics," Nichols says. "Now if you go to the GIS, there are probably 20 to 30 companies. It's clearly a big topic. As we've continued to grow and expand, other companies have entered this area of developing biological applications for turfgrass."

Still, Nichols says there is a bit of confusion in the marketplace as to what should be classified as a true biological product.

"One thing that I would like to make clear is there's what I call biofertilizer products and then there are other products which I would more correctly categorize as biostimulant products," he says. "And sometimes the mar-

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PHOTOS COURTESY: OLDE HICKORY (LEFT); SOIL TECHNOLOGIES

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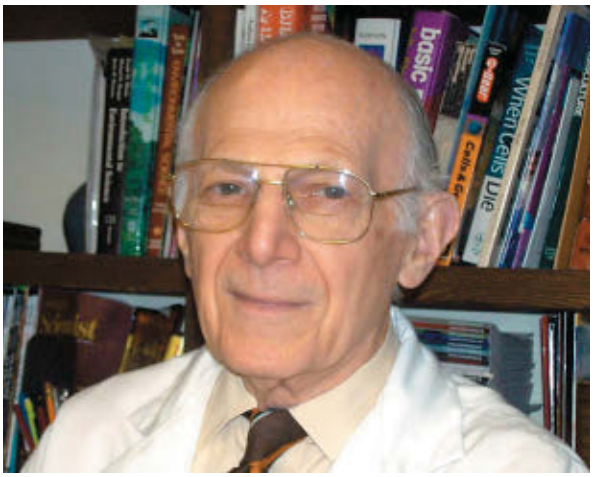
ketplace doesn't make much of a distinction, but I think it's a critical distinction."

Biostimulants, says Nichols, include seaweed extracts, humic acids and organic fertilizers made from compost or compost teas. "Those products attempt to stimulate the biological activities of the plant," he says. "Whereas a biofertilizer, which is what Soil Technologies Corporation is involved in, really is increasing the biological organisms in the soil that produce or release fertilizer materials. It's more of a management system versus just a product application."

Lowering nitrogen

Dr. Haim Gunner, chief scientist of Performance Nutrition, says his company's products "are both biostimulants in that they generate active agents that stimulate the growth both of the biological communities and crops in the soil, and biofertilizers in that they provide, as well, a direct nutritional resource for the crop. We refer to them as biofertilizers because of their predominant organic nature and integration with the components of the soil ecosystem."

Dr. Gunner says products like Performance Nutrition's RemeD8 deliver "free-living microorganisms capable of fixing nitrogen from the atmosphere, making it available to the ecosystem, that are actually incorporated in the product and enhance soil nitrogen content accordingly."



DR. HAIM GUNNER SAYS PRODUCTS LIKE PERFORMANCE NUTRITION'S REMED8 DELIVER "FREE-LIVING MICROORGANISMS CAPABLE OF FIXING NITROGEN FROM THE ATMOSPHERE, MAKING IT AVAILABLE TO THE ECOSYSTEM, THAT ARE ACTUALLY INCORPORATED IN THE PRODUCT AND ENHANCE SOIL NITROGEN CONTENT ACCORDINGLY."

PHOTO COURTESY: PERFORMANCE NUTRITION

Another Performance Nutrition product suitable for turf is NutriSmart, a humate-based granular material that contains patented microbes that fix nitrogen from the atmosphere and unlock N, P and K from the soil, according to Don Pucillo, company president. "If applied according to rate instructions, NutriSmart is capable of fixing nitrogen for up to five months," he says. "It can replace up to 25 percent of a soil-applied nitrogen."

Independent research appears to back up the lower nitrogen claims. In the growing seasons of 2005 to 2007, tests were performed at Cairo University in Egypt to investigate the response of seashore paspalum to two N sources: ammonium nitrate (33.5 percent N) at the rates of 3, 4 or 5g N/m2/month, only, or cerealin (a commercial product containing bacillus polmyxa and Azotobater chroococcum bacteria) with or without ammonium nitrate at the same rates. In most cases, combining cerealin with chemical N fertilization reduced the need for chemical N fertilization by approximately 20 to 25 percent.

At the University of Illinois Golf Course, superintendent Allen Wall can attest to his own personal success with

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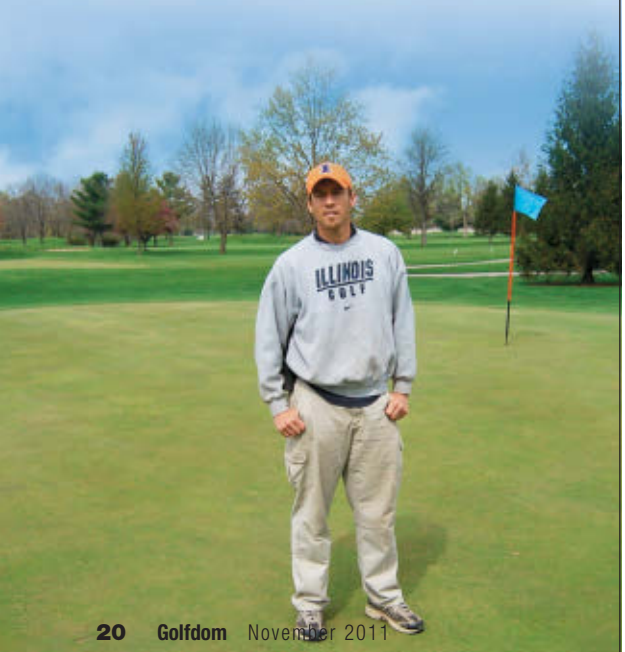
biofertilizers. Last summer, Wall decided to test the effectiveness of biological fertilizers at his 36-hole facility. Having two 18-hole golf courses side-by-side gave him a perfect means of comparison. On the Orange course, he kept his regular fertilization program. On the Blue course, he replaced all of his liquid fertilization apps with TurfTech Bio-Min, a powdered biological product that can be mixed with water and sprayed. It has all the ingredients of the TurfTech Bio product, plus volcanic minerals. All other practices were identical.

Wall did one application per month over the five-month growing season with the TurfTech Bio-Min at 1 pound per acre on the Blue course. On the Orange course he spoonfed liquid fertilizer every two to three weeks.

"Generally speaking, the overall health of the greens on the Blue course seemed much better

AT UNIVERSITY OF ILLINOIS GOLF COURSE, SUPERINTENDENT ALLEN WALL LIKED THE RESULTS HE SAW ON HIS 18-HOLE BLUE COURSE. "WE DIDN'T HAVE THE LOCALIZED DRY SPOTS SHOW UP THAT WE ANTICIPATED. WHATEVER DISEASE ISSUES WEREN'T AS INTENSE, THE DISEASE PRESSURE WAS NOT AS HEAVY AS THE ONES WITH LIQUID FERTILIZER."

PHOTO COURTESY: ALLEN WALL



than the others did with the liquid fertilizer," he says. "When you go out and you see your greens and grass day after day, it looks good, it looks healthy. And it was a constant the whole summer, even through the heat stress, the water, all the rain we had, they just kind of maintained that green color.

"Then when it got really hot and tough last year," he continues, "we didn't have the localized dry spots show up that we anticipated. Whatever disease issues weren't as intense, the disease pressure was not as heavy as the ones with liquid fertilizer."

The results were sufficient enough for Wall to change his fertilization program for 2011. He says, "I'm planning on using the Bio-Min on both golf courses this year and on my bentgrass fairways."

Frank Tichenor, superintendent at Forest Hill Field Club in Bloomfield, N.J., has been using Lebanon Turf's Emerald Isle CPR for the past 12 years. Lebanon Turf is a company that promotes using a combination of synthetics and bionutritionals as a complement to each other.

Tichenor says he started using Emerald Isle CPR, which contains seaplant extract, when a trusted colleague recommended it.

"You have to stick with it, that's the biggest thing — you have to give it more than a year," he says. "I think it's synergistic. It's a good stress fighter, and it provides plant health. Knock on wood, it's made my greens really good the last several years."

Dick Duggan, superintendent at Meadow at Peabody Golf Course in Peabody, Mass., uses Lebanon Turf's Turf Vigor on his greens. He's been using it for ten years now. He also uses a product called Nitrozymes from Growth Technology. He calls them "complementary products" because they complement his regular fertilization plan.

"There are a lot of good products out there," Duggan says. "If you don't try something new you'll never know. And it benefits everybody — the superintendents, the golfers and the salespeople." ■

Contributing editor Stacie Zinn lives in northern Washington State.