Nature playing increasing

Future fairly bright for biological disease controls...

By Peter Blais

CINCINNATI — The future looks fairly bright for biological controls of insects and disease as an alternative to pesticides, according to Dr. Hank Wilkinson, a turfgrass pathologist at the University of Illinois.

With chemicals coming under increasing fire from environmentalists, biological controls (one living organism that controls the growth of another) are being touted as an alternative in the battle to control turf diseases.

"We're not there, yet," Wilkinson said at last month's annual Ohio Turfgrass Conference and Show. "But it's coming."

Agro-chemical companies are currently testing biologics, although golf course applications are still five to 10 years away, Wilkinson said.

"If there is anything that will drive biologics into your hands faster, it's the environmentalists," he explained. "As they push on chemicals and they are gradually reduced or eliminated, that increases the interest in the dollar value and the money behind biological controls."

Biological controls are not expensive to produce, but they take a long time to develop. The reason is there are hundreds of turf diseases and many different types of turf (bluegrass, bentgrass, Bermudagrass, etc.). But each organism and each turf type must be dealt with singly.

"It may not be efficient to develop one biologic that controls many diseases. Two diseases may require two different controls. In fact, the same disease in different parts of the country may require different biological controls," Wilkinson said.

For every pathogen there exists at least one naturally occurring biological control, the Illinois researcher said. Disease occurs when one pathogen temporarily gets out of hand. Most diseases will eventually disappear, which is the natural biological control.

Dr. H. Wilkinson

"Research tries to understand how nature does it, and then speed up the process. What we'd like to do is take the control that is naturally established in five to 10 years, and make it take hold in one or two on your course," Wilkinson said.

There are three ways to achieve a biological control system — managing a healthy turfgrass; maintaining a balanced, living biomass; or reducing the effective pathogen population.

Managing a healthy turfgrass by changing to a turf type that is better-suited to naturally occurring biological controls is the best way to develop disease resistance. But ripping up one type of grass in favor of another is often impractical.

The second option — maintaining a balanced, living biomass — is more practical, especially in the soil. The soil tries to keep all organisms in balance This is called general suppression and is accomplished by many organisms working together. Dying or dead soil has low general suppression leading to more disease. Cultural practices like core cultivation, proper fertilization and others can make the soil more active in fighting disease.

Soil amendments with organic materials and organisms can also be added to the soil to help improve the biomass and control disease. But there are so many products on the market that it is difficult for any researcher to determine if the introduction of any one significantly reduces disease, Wilkinson said.

That leaves the third method of biological control, reducing pathogens, as the easiest to research and perhaps most promising biological control of turf disease, Wilkinson said.

Specific suppression is the technical term for one organism attacking and actually suppressing another organism. The controls work in different ways on the pathogen — directly attacking it, reducing its food supply, secreting toxins on it.

The control works best when it is present in the turf when the pathogen attacks. It is much less effective if applied after the pathogen establishes a foothold.

"They are more protective than curative," Wilkinson said.

Soils tend to keep all organisms in balance. Foliage is constantly reproduced and replaced. That means biological controls introduced at the roots rather than soil or foliage level will be most successful and will likely be the first available to the golf course market, Wilkinson predicted.

"The protection, if it needs to be there before the pathogen, has to continuously grow and respond to cover up those new tissues," Wilkinson explained of the likely success of root-level controls.

Using biologics will force superintendents to re-think how they deal with disease. While eliminating the disease-causing pathogen may seem the best response, "it's basically a better idea to suppress a disease than eliminate it," said Wilkinson.

"If you eliminate the organisms that cause disease, you create imbalances in the soil. Other things can happen. Other pathogens may fill in that niche and give you bigger problems. The goal of biological control is to reduce disease to acceptable levels and hold it without eliminating it."

Biologics (usually in the form of bacteria) respond to diseased grass. The cycle works like this: A diseased root develops, bacteria grow on it, pathogen numbers are reduced, less disease develops and the situation eventually stabilizes.

"You get a little disease and no symptoms," Wilkinson explained of the natural cycle.

An organism must not only survive, but also grow to be successful as a biological control. Competition with other organisms that are already in the soil, plus the constant reproduction of grass foliage, make that difficult.

The control must also continue effective against constantly changing pathogens. Pythium blight and dollar spot are two diseases, for example, that can change and become resistant to a certain biological controls.

Some diseases and grasses are more receptive to biological control than others. Warm-season pythium is one that has proven extremely difficult to control.

Warm-season pythium can consume grass within a few hours. Bentgrass and ryegrass are very susceptible to it. Bluegrass is more resistant. As the turf's resistance increases, the biological control has less work to do. The more susceptible the grass, the more effective the biological control must be. So the integration of a resistant grass with a strong biological control is important.

How do researchers find effective controls considering there are thousands of different organisms in a single handful of soil?

It is time-consuming process that involves scraping bacteria found on foliage and smearing it on a petri dish where the pathogen is also present. In most cases, the bacteria has no effect in limiting the pathogen's spread. In the rare instances it does inhibit pathogenic growth, the bacteria is subjected to further

Continued on page 22

Biologicals: The proof is on your turfgrass

Continued from page 20

tests on actual grass grown in the laboratory. Even if it survives this second round of lab tests, it must still test positively in the field.

"Don't buy anything that is only laboratory-tested in terms of a biological control. The proof is on your turf, not in the laboratory," Wilkinson said.

Since many of the biological controls tested on warm-season pythium have done little more than slow the growth of disease, Wilkinson predicts the first wave of biologics on the market will be mixed with chemical fungicides.

A successful biological controls keeps 97 to 98 percent of the plant surface, according to researchers. What diseases potentially have biological controls that fit the bill?

Tests have shown many patch diseases, take-all and summer patch among them, to be successfully suppressed by certain bacteria. They are suppressed naturally, although it may take five to 10 years for the diseases to run their course.

In addition to natural suppression, the patch disease has two phases — a seedling blight phase and a mature declining phase. Biologics work best on seeds rather than mature grass stands that are more resistant to change. Grass seeds coated with a certain bacteria have proven resistant to patch disease on grass-less soil containing patch fungi.

Tests have been less successful on mature turf where the biologic must be drenched into the ground and then journey to the plant root to attack the fungus. Many of the bacteria don't survive the trek. Biological controls have been only half as successful on mature turf as grass-less soil.

Coating the disease-carrying fungi itself with a biological control and then placing both in the turf has yielded interesting results. Introducing the problem and the solution at the same time kills some of the plants, but also helps build resistance against future attacks, Wilkinson said.

Perhaps the biggest obstacle to full-scale development of biologics is the bacteria's ability to change, Wilkinson said. A researcher can give an agro-chemical company a bacteria that has proven effective in deterring disease. But if the company's method of growing the biologic is even slightly different than the researcher's, the control could change into something ineffective or even harmful to turf.

So what is the future of biological control?

"We'll probably never be able to rely completely on biologicals," Wilkinson concluded. "They're not designed to do the whole job.

"But with an integrated approach of biologics and other combinations of chemical, managerial and fertilizer solutions, we'll probably be able to reduce the impact of pesticides into the system and gain very acceptable levels of control."

Ohio Turfgrass Foundation gives out scholarships

CINCINNATI — OSU senior Robert King received the $2,000 George Biddulph Memorial Scholarship from the Ohio Turfgrass Foundation at its annual show.

OSU junior Carolyn Fisk was given the $1,000 Dick Duke Award.

The $1,000 Glen Hudson Scholarship went to OSU junior Michael Fast. Fast worked most recently at Sycamore Hills Golf Club in Fort Wayne, Ind., and would like to become a superintendent.

Fast also received a $1,000 Central Ohio District Golf Scholarship, as did fellow OSU students Dawson Thombs, Gary Posey and David Zahniser. The $1,000 Nor Am Award went to Thombs.

Recipients of $1,000 OTF scholarships were ATI seniors Ron Swing and James Kracker as well as sophomore Monty Hale; Clark State University sophomores Mark Seitz and Joseph Wichie; and OSU seniors Zahniser and Donna Barlow along with junior Timothy Kelley.

Kelley also received a $1,000 scholarship from the Trans-Mississippi Golf Association.

Michigan State adds specialist

Frank S. Rossi has been appointed to the new position of environmental specialist in turf at Michigan State University.

Rossi will be responsible for developing and teaching material concerning safe pesticide use, and concepts of integrated pest management. He also will develop and coordinate seminars dealing with environmental stewardship and turf managemen.

He holds bachelor's and master's degrees from the University or Rhode Island. He is finishing his Ph.D dissertation at Cornell University.