Virginia Lehman and Dr. Milton Engelke screen tissue for heat tolerance at Texas A&M University's Research and Extension Center in Dallas.

TEXAS A&M

Whence the bent?

Researchers seek heat-and-humidity-tolerant bentgrass

By
Irene Jones

Many candidates end up here after going through the pathology lab.

Banyan GC in West Palm Beach is one of about two dozen golf courses in the United States taking part in a USGA/GCSAA-funded project to develop a heat-and-humidity-tolerant bentgrass.

The only other participating course in the Southeast is Augusta National GC in Georgia, site of the annual Masters golf tournament.

The project, headed by Dr. Milton C. Engelke, associate professor of turfgrass breeding and genetics at Texas A&M University's research and extension center at Dallas, was begun 10 years ago and may take another decade.

"The total process of identifying desirable plants for evaluation of heat-tolerant characteristics can take up to 10 years," Engelke said. "Plants are bred and evaluated. Then those with the most desirable genetics are intercrossed again and re-evaluated.

"This process goes on for years, as we continue to develop disease-resistant and drought-resistant varieties that are most adaptable for warm-season growth."

The experimental plots at Banyan, established last fall, "are doing well," Engelke says. "Preliminary results look good; better than we had hoped."

The main goal of the project, according to Virginia Lehman, an Engelke team member who expects to earn her Ph.D. this summer, is "the production of bentgrasses that have heat resistance, which may include heat tolerance, heat avoidance or heat escape."

"Those main goals are no small undertaking when one looks at the facts, says Dr. Phillip F. Colbaugh, associate professor and plant pathologist at the Dallas Center. Colbaugh's role on the research team is to identify bentgrass plants with disease-resistant qualities.

Teamwork is emphasized by Dr. James Reinert, resident director of research at the center.

"Scientists here pool their expertise and knowledge for the advancement of the total project," he says. "Our intent is to address as many factors as possible to develop the best turf system."

Computers also play an important role in the search for what ultimately will produce a better putting surface. Mountains of data taken from field plots are fed into the computers which analyze everything from the number of mites found on beetles to the types of elements found in the soil at each plot.

The problem with growing bentgrass in Florida "all has to do with heat and dehydration tolerance, which is part of heat stress resistance," says Lehman.

"You are growing in very high humidity environments with regards to transpirational cooling. The humidity actually inhibits the evaporative cooling mechanism and the plant cannot cool itself."

"Our project to find bentgrasses that can cool themselves is very simply stated but not so simply achieved," Engelke explains. "We have to collect bentgrasses with genetic diversity and bring those plants into our nurseries where we can evaluate them under multiple stress environments.

"In fact, we have samples collected from greens in Palm Beach County that have survived many growing seasons with no special care. We use these plants to expand our germplasm pool.

"This project is an opportunity for advancement of our industry," Engelke continues. "You have a need (for a superior stress-resistant bentgrass) and we have the ability to produce the product you need.

"And that is very exciting for our researchers here. This program did not happen overnight. The breeding program was established in 1980.

"Now 10 years down the road, we are beginning to see results."

What they're looking for... and how they go about it:

Researchers at Texas A&M have not yet found the ideal bentgrass plant, but they know what they're looking for. In order of importance, its characteristics:

1. Stress (dehydration, heat) resistant
2. Disease resistant
3. Good color
4. Fine textured, uniform, dense
5. Good survivor without a lot of fertilizer or water

Each candidate goes through a five-step evaluative process:

1. **Plant preservation:** the new plant is established in the greenhouse and then vegetatively divided for inclusion in greenhouse, laboratory and field studies.
2. **Field assessment:** growth, turf quality, wear tolerance to a traffic machine and compaction are evaluated.
3. **Greenhouse assessment:** root growth characteristics and disease resistance.
4. **Laboratory assessment:** High humidity incubation at 100 degrees Fahrenheit for 16 hours to pre-stress plant; high temperature water bath for tissue heat-tolerance test; determination of the precise temperature at which cell breakdown occurs.
5. **Seed production:** Strongest and best plants go on to Oregon where they are cross-pollinated with other strong, desirable plants. Resulting seed hopefully will have the best characteristics of both parents.

RESEARCH NOTES

By Darcy Meeker

Bacteria kills the nematodes, but it's tough to grow

A recent report in the *Wall Street Journal* interested several golf course superintendents. The story had it that one Bert Zuckerman, a tomato researcher at the University of Massachusetts, was looking at a bacteria to control root-node nematodes in tomatoes.

At press time, Dr. Zuckerman was off in Puerto Rico doing a field test, but at the University of Florida's Institute of Food and Agricultural Sciences in Gainesville, Drs. Don Dickson and Grover Smart were proceeding with FTGA-sponsored research on bacterial controls for sting and lance nematodes, the two major nematode parasites on turf grasses.

"These two feed on the outside of grass roots,"Dickson said. "The root system becomes very abbreviated so the plant can't take up nutrients.

"This is a great big problem for Florida's golf courses. They all have to practice some sort of control, treating with nematicide once or twice a year with 15 to 20 pounds of active ingredient (organophosphate) per acre.

"Obviously we need some options. That's a heavy chemical load to put into soil. We would prefer not to have to use such high doses."

Dickson says scientists have found *pseudomonad* bacteria specific to the two pest nematodes. The bacteria get in roots and keep the nematodes out, perhaps by producing repellent chemicals.

There's just one problem, says Dickson.

"This bacterium cannot be mass produced. The Beltsville group (USDA researchers) has it growing and sporulating in media, but very slowly."

At IFAS, Bob Cox has been able to grow it vegetatively on *ascaris* (round worm) media, but hasn't gotten it to sporulate, which it needs to do so it can be used as a pesticide.