Better turf from improved breeding methods

Advances in the art of plant breeding and associated disciplines are meeting today's need for superior turfgrass cultivars, according to Dr. C. Reed Funk of Rutgers University.

Dr. Funk, addressing the Sixth International Turfgrass Research Conference in Tokyo this summer, said researchers today continue to strive for turfgrasses that exhibit increased pest resistance, improved stress tolerance and reduced maintenance requirements, and that adapt to problem areas.

Dr. Funk focused on three areas of turfgrass breeding that have received considerable attention recently: turf-type perennial ryegrass, tall fescue and *Acremonium* endophytes for improved insect resistance.

Perennial ryegrasses

Perennial ryegrass, an important cool-season grass for turf and forage use, will be used in Europe, the U.S., Great Britain, Japan, Austrailia, New Zealand and Canada to the tune of 30 million kilograms of seed in 1989, said Dr. Funk. It is best adapted to fertile soils and maritime climates having mild winters and cool, moist summers.

Perennial ryegrass in Great Britain has been used for forage for centuries, figuring prominently in pastures and more recently in high traffic athletic fields. Still, its lack of tolerance to temperature extremes limited its use in this country.

"A revolution in turf-type perennial ryegrass started in the United States in the mid-1960s when Howard Kaerwer and Robert Russell developed and promoted NK-100," said Dr. Funk. This spawned Manhattan, Pennfine, Citation, Pennant and All*Star, he noted.

The early success of Manhattan and Pennfine led to a rapid expansion of turf-oriented ryegrass breeding programs in the U.S. and Europe, leading to turf with improved wear tolerance, stress tolerance, mowing quality, more efficient seed production and enhanced endophyte performance.

"Prospects for continued genetic improvement are great," said Dr. Funk, adding that greater cooperation among scientists around the globe and advances in biotechnology are allowing researchers to make great strides in the development of good turf.

Advances in research are leading toward improved turf all around the world, Dr. C. Reed Funk has observed.

Tall fescue

Tall fescue, a tall, deep-rooted, long-lived perennial grass, is used extensively for pastures, conservation and turf, noted Funk. It has above average tolerance of acidic, alkaline, saline and poorly drained soils and is drought tolerant. It was introduced into the U.S. from Europe in the 1800s and early 1900s.

"The species was not widely used until after the development and release of Alta and Kentucky-31 in 1940 and 1943, respectively," said Dr. Funk.

A tall fescue breeding program began at Rutgers in 1961 led to the production of Rebel in 1980. That program was expanded in 1972 to incorporate cooperative programs throughout the country. "These programs led to the development and release of a number of useful turf-type cultivars, including Falcon, Olympic, Mustang, Arid, Rebel II and Houndog," said Dr. Funk.

Researchers at Pure-Seed Testing, Pickseed West, KWS and Rutgers University have developed cultivars with a significantly reduced mature plant height, called "dwarf-types." They exhibit good drought tolerance, said Dr. Funk, but work is needed to improve their stress and pest tolerance.

Endophytic fungi have been known to occur in the tissues of many grasses for more than 100 years, said Dr. Funk. And recent studies have revealed an "astounding diversity of fungal species existing within the tissues of many healthy plants."

Endophyte-enhanced turf

Many grazing animals perform poorly after consuming *Acremonium*-infected tall fescue and perennial ryegrass, prompting researchers to work toward eliminating the endophyte from those cultivars. However, improved insect resistance, persistance, and performance in many endophyte-containing plants make them ideal for turf and conservation, said Dr. Funk.

"The ability of endophytes to produce several biologically active toxins undoubtedly contributes to a broad spectrum of insect control," noted Dr. Funk. Instances of better summer survival, enhanced fall recovery and reduced weed invasion has been observed in perennial ryegrass, tall fescue, hard fescue, and chewings fescue turfs containing high percentages of endophyte-infected plants, he said.

"Enhanced resistance to harmful insects was undoubtedly responsible for some of this improved performance," notes Dr. Funk, adding, "improved stress tolerance may also have been a factor."

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No adverse effects of endophytes in turf has been found, said Dr. Funk, and many types of endophytes exist in our major turfgrass species. Further collecting, studying and using these endophytes should make them even more useful in the future. Indeed, breeding programs have been initiated to transfer useful endophytes to elite cultivars and germplasm population of perennial ryegrass, hard fescue, tall fescue, chewings fescue and blue sheeps fescue, he said.

"Utilizing desirable selected endophytes to enhance the persistance, performance, pest resistance, and stress tolerance of turfgrasses has considerable potential," said Dr. Funk.

—*Will Perry*