RUTGERS UNIVERSITY

Endophytes of Turfgrasses: New Tools and Approaches

1990 Research Grant: $40,000
(First year of support)

Dr. Peter Day
Dr. Reed Funk
Principal Investigators

Endophytes are fungi which live within several turfgrass species without causing damage to the host plant. In turn, endophytes have demonstrated an ability to impart increased resistance to insect pests through the production of alkaloid compounds. This project was proposed and initiated by Dr. Peter Day, Center for Agricultural Molecular Biology (AgBIOTECH) and Dr. Reed Funk, Department of Crop Science, Rutgers University. Dr. Jane Breen, a post-doctoral researcher began work on the project in April 1990, in the laboratory of Dr. Michael Wilson (Professor, AgBIOTECH).

The objectives of this project are to: (a) produce a germplasm collection of fungal endophyte-infected grasses concentrating on *Poa* (bluegrass) and *Agrostis* (bentgrass) species; (b) produce a collection of unifungal endophyte cultures for both classical and molecular analysis; (c) produce endophyte-specific DNA probes for sensitive detection of particular species and/or isolates of endophyte by nucleic acid hybridization techniques and by recently developed polymerase chain reaction (PCR) amplification methods; (d) use these and other molecular probes to characterize endophyte variability and produce RFLP maps as taxonomic aids in this field; (e) develop gene transfer methods for fungal endophytes, as well as fungal transfer methods between different turfgrasses, to test for compatibility or incompatibility; and (f) identify those genes responsible for insect repellant alkaloid biosynthesis and metabolism, particularly in beneficial endophyte-grass combinations.

Including material collected recently using USGA-funds and acquisitions from Dr. Funk's turf breeding program, we now have a germplasm collection of multiple selections of fourteen species of endophyte-infected turfgrasses, including some bentgrasses and bluegrasses (*Agrostis hiemalis, A. scabra, A. alba* and *Poa palustris, P. autumnalis, P. ampla*), in addition to a number of tall fescues, perennial ryegrasses and fine fescues. Our endophyte collection includes multiple isolates of eight species of *Acremonium* fungal endophytes which infect a broad range of grasses. A DNA library has been developed from *Acremonium starrii*, which will be used to provide probes for DNA 'fingerprinting'. These probes will be used to evaluate and quantify genetic differences among endophytes, particularly in terms of those which confer insect resistance or have the ability to produce choke disease in livestock.

RUTGERS UNIVERSITY

Breeding and Evaluation of Kentucky Bluegrass, Tall Fescue, Perennial Ryegrass, and Bentgrass for Golf Turf

1990 Research Grant: $ 5,000
(Eighth year of support)

Dr. C. Reed Funk
Principal Investigator

We are continuing an extensive program to collect, evaluate, enhance, and preserve turfgrass germplasm and to participate in the development of turfgrass cultivars with improved stress tolerance, increased persistence, greater pest resistance, and reduced maintenance requirements.

1. Additional turfgrass germplasm collections were made in Delaware, Louisiana, Maryland, New Jersey, and Texas.

2. Over 1,000 newly collected plants were screened for useful *Acremonium* endophytes. New sources of endophyte were found in blue fescues, strong creeping red fescues, slender creeping red fescues, and Chewings fescues. However, we have been unsuccessful, to date, in finding a useful *Acremonium* endophyte in Kentucky bluegrass, creeping bentgrass, or Colonial bentgrass.

3. The first certified seed crops were harvested from Advent, Envy, Legacy, and SR-4000 perennial ryegrass; Austin, Hubbard 87, and Shenandoah tall fescues; SR-5000 Chewings fescue; and Suffolk Kentucky bluegrass.

4. Over 9,000 turf plots were seeded in 1990 along with over seven additional acres of space-plant nurseries.

5. Striking resistance to chinch bugs was observed in strong creeping red fescues containing some, but not all, biotypes of *Acremonium typhinum*. Various strains of endophytes are showing significant differences in their ability to enhance host plant performance.

6. Progeny of an *Acremonium* endophyte infected strong creeping red fescue collected from the Rose City Cemetery in Portland, Oregon showed excellent resistance to dollar spot in turf trials in New Jersey. Studies have been initiated to determine if this resistance is genetic or associated with this particular strain of endophyte.

7. Considerable genetic variability in resistance to summer patch has been observed both within and between species and subspecies of fine fescue in field and growth chamber tests. Opportunity exists to develop more resistance cultivars.

(Please Note: The Turfgrass Research Committee is proud to continue its support of Dr. Funk's prolific breeding program. The Committee's small grant covers but a small fraction of the costs of the program.)