We have an additional trial in progress to evaluate mixtures of grasses including creeping bent, Kentucky bluegrass, fine fescue, Colonial bent and Perennial ryegrass, for fairway usage. Performance of these mixtures is being evaluated both with and without fungicides.

Seed of several dozen of the R. I. bentgrass selections were sent to Dr. Milton Engelke and Dr. Ron Ensign for additional stress evaluations.

RUTGERS UNIVERSITY - Dr. C. Reed Funk
Principal Investigator

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

1986 Grant - $5000 [ongoing support since 1961]

The New Jersey Agricultural Experiment Station of Rutgers University continues to devote considerable resources to the Turfgrass Breeding Project adding to the support that we are receiving from the United States Golf Association and other sources. This support enables us to make significant improvements in stress tolerance, turf performance, and pest resistance in Kentucky bluegrass, perennial ryegrass, tall fescue, and fine fescues. In addition, we are training a number of students in the fields of turfgrass science and plant breeding. We are also making contributions to basic research.

The effects of endophytic fungi on turf performance and pest resistance in perennial ryegrass, tall fescue, hard fescue, chewings fescue, strong creeping red fescue and blue fescue are continuing. Germplasm collections are being screened for new sources of potentially useful endophytes in other turfgrass species.

TEXAS A&M UNIVERSITY - Dr. James B. Beard
Principal Investigator

Plant Stress Mechanisms

1986 Grant $73,000 [fourth year of support]

1. Visual assessment via the high canopy resistance - low leaf area concept offers a rapid, economical approach for screening large numbers of mowed bermudagrass or mowed zoysiagrass plantings under field conditions for low water use rates.

2. A procedure for incorporating radioactive $^{14}CO_2$ into turfs and then assaying shoot and root sections for radioactivity has been successfully developed and tested for use in rooting studies.

3. A system for growing turf, enabling the harvest of the entire root system with undamaged root hairs has been successfully developed and tested.

4. Substantial differences in terms of root hair distribution and length are evident among 13 warm-season turfgrass species.

5. The eleven major warm-season turfgrass species and cultivars vary substantially in drought resistance.

6. Of the species studied, zoysiagrass, centipedegrass, and bermudagrass are more drought resistant than St. Augustinegrass and seashore paspalum.

7. A high leaf water potential, extensive root system, and high wax cover over the stomata contribute to a high level of drought avoidance in bermudagrass and centipedegrass. This was confirmed by the higher leaf firing in the polyethylene glycol solution.

8. Since zoysiagrass possessed a shallow root system and low leaf water potential, a high drought tolerance is probably the major mechanism contributing to drought resistance. Low leaf firing in the polyethylene glycol solution supports this conclusion.

9. Zoysiagrasses possess especially strong drought resistance due primarily to internal drought tolerance mechanisms.

10. Root extension length did not appear to be the controlling factor in drought resistance or the avoidance dimension. Tifway bermudagrass and St. Augustinegrass had long extensions, but poor drought resistance. Conversely, Texturf 10 and Tifgreen bermudagrasses had long extension and good resistance. Total root dry weight and root shoot ratio were similarly split, and no firm conclusion can be made.

11. With the exception of the St. Augustinegrass, it appears that the total number of roots in the soil profile is what influences which species are the most drought resistant.

12. Most warm-season species having good drought avoidance and/or resistance had showed closed stomata or stomata blocked by wax layers.

13. The drought susceptible warm-season turfgrass species maintained open stomata and/or less wax accumulation across the stomata.

14. Leaf extension rate, internode length, visual quality when the nitrogen fertility rate is known, and tissue nitrogen content are useful parameters in identifying bermudagrass cultivars possessing low nitrogen stress tolerance.

15. Proline content may be an indicator of proneness to drought stress injury. Those turfgrass species that are prone to drought injury usually exhibited more rapid proline accumulation than other species

that are relatively less susceptible to drought injury. This can be partially explained by the relationship between the degree of leaf firing and the ratio between the shoot proline level before and after water stress.

TEXAS A&M UNIVERSITY - Dr. M. C. Engelke
Principal Investigator

Breeding and Development of Zoysiagrass

1986 Grant - $40,000 [fourth year of support]

The zoysiagrass germplasm nursery continues to be maintained in both the greenhouse and in replicated field plots. The winter of 1985/86 was relatively mild, with very few of the zoysia accessions actually going dormant. Environmental parameters are being continuously monitored and visual observations recorded on relative plant performance.

Considerable emphasis was directed in 1985/86 toward identifying unique genotypes within the Oriental and Domestic zoysiagrass collections which appeared to be well adapted to turf conditions in the Southern United States. In the fall of 1985, several experimental zoysiagrass genotypes were selected from the 1980 turf trials, as well as from the Oriental zoysiagrass collection for inclusion in an accelerated field testing program. These genotypes have been and will be designated DALZ lines, to signify elite genetic resources. Of particular interest are two lines, designated DALZ8501 and DALZ8502 which are accessions from the Plant Introduction Station, Experiment GA in 1981. Data is presented in TABLE 5 to demonstrate the superior regrowth characteristics of these accessions over commercial or other experimental varieties. These two clones along with approximately 20 others are being increased in the greenhouse to provide sufficient plant material for establishment and extensive field testing beginning in 1987.

The occurrence of a rather severe nematode infestation resulted in a major delay in vegetative propagation of plant material. The nematode was identified as Meloidogyne sp. [root knot nematode], which apparently is relatively common on zoysiagrass. Regardless, the incident resulted in delayed planting of the experimental plots.

TEXAS A&M UNIVERSITY - Dr. M. C. Engelke
Principal Investigator

Breeding and Development of Bentgrass

1986 Grant - $40,000 [second year of support; $20,000 contributed by Bentgrass Research, Inc. of Fort Worth, TX]