Identification of Genetic Insect and Mite Pest Resistance in Turfgrasses

James Reinert
Texas A&M University

Objectives:

1. Establish a regional center to identify genotypes of *Cynodon*, *Zoysia*, *Buchloe*, *Paspalum*, *Agrostis*, and *Poa* with genetic resistance to insects and mites (i.e., fall armyworms, black cutworm, sod webworms, greenbug and host-specific eriophyid mites) for use in cooperating turf breeding programs.
2. Bioassay resistant lines with insect diets to characterize the mechanisms of resistance and determine their biochemical nature.
3. Develop effective and efficient procedures to accommodate screening and identify typical breeding populations previously unavailable to plant breeders.

Start Date: 1998
Project Duration: 5 years
Total Funding: $139,235

This regional center to identify genetic insect and mite pest resistance in turfgrasses was established as a result of funding from the USGA Green Section, several other turf related resources, and the Texas Agricultural Experiment Station. The primary goal for this center has been to identify genetic lines of several species of turfgrass with resistance to the primary pests of each turfgrass and to characterize the mechanisms of resistance.

Work is continuing to identify the degree of heritability of fall armyworm resistance [*Spodoptera frugiperda* (J.E. Smith)] among the hybrids between Cavalier (resistant) and Diamond (susceptible) zoysiagrass. Approximately 250 hybrids between Cavalier and Diamond were made and grown in the greenhouse. We are evaluating each of these hybrids to determine the range of resistance among the hybrids and gain enough information to characterize the heritability of the resistance factors for zoysiagrass.

Research is continuing to identify the degree of heritability of fall armyworm resistance among the hybrids between Cavalier (resistant) and Diamond (susceptible) zoysiagrass.

Many of the hybrids have retained the high level of resistance characteristic of the Cavalier parent. Others are similar to Diamond, the susceptible parent, but a few are even more susceptible and have provided no fall armyworm mortality at all. Most important, however, we are finding a complete gradation of resistance levels from 0% to 100% among the hybrids.

Sixty-four zoysiagrass hybrids have been made between Cavalier (resistant to fall armyworm and tropical sod webworm, but susceptible to zoysiagrass mite) and DALZ8516 (susceptible to fall armyworm and tropical sod webworm and resistant to zoysiagrass mite). The hybrids are being expanded in the greenhouse to provide enough plant material to evaluate them for resistance to these pests. If we can identify a genotype with resistance to both caterpillars and the zoysiagrass mite, we can make a significant improvement to Cavalier.

In cooperation with Dr. George Snyder, University of Florida, Belle Glade Research & Education Center, Belle Glade, FL, we are evaluating many of the zoysiagrass cultivars and hybrids for their silica content. Silica may be an important component of the resistance mechanism for zoysiagrass. It has been identified as a mechanism of resistance to caterpillar and leafhopper pests in related crops, sugar cane and rice.

TBPC 25-11-25 Texas bluegrass (*Poa arachnifera* Terr.) was hybridized with 'Mystic' Kentucky bluegrass (*P. pratensis* L.) to produce 53 interspecific hybrids. These hybrids were characterized for fall armyworm resistance. The hybrids exhibited a wide range of resistance to the fall armyworm (as reported last year). Mystic provided 100% mortality and many of the hybrids produced 87.5% or greater mortality. The susceptible TBPC 25-11-25 Texas bluegrass parent provided from 4 to 33% mortality, while 20 of the other hybrids also only provided 33% mortality, or less.

Results of this experiment have provided us with a good indication of the heritability of the fall armyworm resistance in the *Poa spp*. In cooperation with Dr. Maurice Snook, University of Georgia, Athens, we have begun to characterize the plant components that contribute to the resistance mechanisms.

Fresh plant materials representing the extremes (highly resistant vs. susceptible) are being evaluated to identify the chemical components contributing to fall armyworm resistance. When components are identified, we should have another set of tools available to assay germplasm for fall armyworm resistance.

Summary Points

- Evaluating insect resistance/tolerance of bermudagrass, zoysiagrass, buffalograss, seashore paspalum, bentgrass, and Kentucky bluegrass.
- Nine bermudagrass lines have been identified with resistance to bermudagrass mite, *Eriophyes cynodoniensis*.
- Hunting billbug resistance found in zoysiagrass.
- Bermudagrass and zoysiagrass screened for resistance to armyworm and other *Lepidoptera* species.