Germplasm Development and Management of Buffalograss Varieties

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Objectives:

1. Identify and evaluate seeded and vegetative buffalograss biotypes with improved resistance to biotic and abiotic stresses.
2. Develop protocols for establishing vegetative and seeded biotypes of buffalograss cultivars.
3. Develop improved turf-type buffalograsses with superior pest resistance and stress tolerance, using plant breeding methods, statistical approaches, and applying biotechnological tools.

Start Date: 1998
Project Duration: 5 years
Total Funding: $200,000

The Nebraska Buffalograss breeding and genetics program has extensive germplasm collections differing in origins and ploidy levels. In 2003, we selected over 200 promising buffalograss genotypes, using two different selection intensities. This germplasm was planted in replicated trials for turfgrass performance and seed production evaluations.

This plant material was advanced as selections from the germplasm evaluated for low mowing height from 1998 to 2001. We established over 250 new, vegetative single-clone, tiller plots, and 600 buffalograss evaluation plots. About 20,000 plants were established.

Two new crossing blocks were designed to develop genetically stable progeny and to create diversity for evaluation germplasm with enhanced resistance to biotic and abiotic stress. Next spring, progeny will be established in spaced-plant nurseries for inheritance studies and evaluation of parental effects on turfgrass quality and seed production characteristics. The impact of inbreeding will also be evaluated.

Over 250 new, vegetative single-clone, tiller plots, and 600 buffalograss evaluation plots were established at the John Seaton Anderson Turfgrass Research Facility, University of Nebraska. In all, nearly 20,000 plants were established.

Buffalograss dormancy in the late fall and spring limits its acceptance and use. Fine fescues have desirable drought resistance and low maintenance characteristics and offer minimal competition with buffalograss during its optimal growth period. These features make fine fescues a desirable candidate for overseeding buffalograss turfs in an attempt to enhance color retention in the spring and fall.

Overseeding trials were conducted with the fine leaf fescues (i.e. hard, blue and Chewings). To date, blue fescue/buffalograss mixtures have given the best turf color and quality. Overseeding in the fall resulted in better turfgrass color, cover, and quality than similar attempts done in the spring. Overseeding with fine-leaved fescue to enhance fall and spring color retention is promising. Color retention of mixtures was extended by three months when compared with buffalograss growing alone.

Buffalograss cultivars currently being used throughout the United States and additional populations that may be added to the USDA germplasm system were evaluated using molecular marker techniques. Germplasm evaluation results provided a useful reference for selection of appropriate parents in the development of crossing schemes, sampling strategies, and managing buffalograss germplasm repositories.

It is now our intention to build a buffalograss genetic linkage map to test utility and distribution of available markers and identify genetic markers associated with agronomicaly important traits. To be able to obtain genetically well-defined buffalograss germplasm, mitochondrial (mtDNA) and chloroplast DNA (CpDNA) variations of germplasm were also evaluated.

From these analyses, it was evident that many genotypes were found to

RNA fingerprinting will be used to isolate and characterize genes corresponding to resistance to diseases and insects. Dr. Robert Shearman points out chinch bug resistant germplasm that is being studied in the greenhous experiment shown above.

overlap showing redundancy in these accessions. Hence, eliminating overlapping genotypes and identifying a base collection will save time and resources in our effort to improve buffalograss performance in turfs.

In order to understand and manipulate the genetic basis for broad-spectrum resistance to major buffalograss diseases and insect pests, comparative genetic studies across species were used. Putative resistance gene candidates for buffalograss germplasm were identified by this approach. RNA fingerprinting will also be used to isolate and characterize genes corresponding to resistance to diseases and insects.

Summary Points

- Significant progress has been made to identify germplasm and management practices that enhance turfgrass color retention.
- Two new crossing blocks were established to create germplasm with enhanced resistance to biotic and abiotic stress.
- A base population representing a diverse origin and ploidy levels has been established using nuclear, mitochondrial, and chloroplast markers.
- The focus of next year will be the building a genetic linkage map, RNA fingerprinting, and cDNA library construction.