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 disease and pest resistance, and stress-tolerant germplasm using plant breeding methods, molecular techniques, and statistical approaches.

Start Date: 2006
Project Duration: three years
Total Funding: $90,000

In 2007, 400 selections were evaluated for winter survival, early spring green-up, density, color, quality, and low mowing height tolerance. About 100 accessions were identified for their superior performance and potential turfgrass quality characteristics. Their ploidy levels were determined and these selections will be used to initiate a replicated advanced line trial in 2008.

Two hundred forty three advanced genotypes were tested in a randomized complete block design with three replications at Mead, NE. Significant differences were observed among genotypes for winter survival, early spring green-up, fall color retention, color, density, and quality. Genotypes with good turfgrass color, density, quality, spring green-up, and winter survival were identified.

Based on multiple traits selection, eight poly-crosses were established for seed increase in 2006. The parents were selected based on female inflorescence height, heavy pollen production, bur yield potential, false smut resistance, and superior turf quality. Seeds harvested at Mead were high which will be used as source of replicated experimental line evaluation at five locations and foundation seed. Summary of the variations that exist among the lines included in poly-cross seed increase, and crossing blocks were indicated in Table 1.

These lines were from different genetic background which buffered performance for the traits. Six crossing blocks between high yielding female parents and heavy pollen producing male parents of proven turf quality were initiated to assess their combining ability for seed yield potential. The stands were established. Burs were harvested and are being characterized for yield components.

Some vegetative lines selected on multiple trait performance were placed in a management study consisting of two nitrogen rates (1 and 3 lb. N/1,000 sq. ft.) and two mowing heights (5/8 and 2 inches). Results indicate some genotypes had superior turf performance under low mowing height and reduced nitrogen nutrition. This trial is a long-term study to determine mowing and nitrogen effects on genotype performance.

Progenies of diploid mapping populations were evaluated with their parents for some phenotypic differences in a field trial conducted near Mead, NE. Markers were selected to identify genetic differences between the parents and develop a linkage map for buffalograss.

Buffalograss turf is limited by its extended winter dormancy and lack of green color in early spring and late fall. In 2004, research was initiated to determine the effect of blue fescue over-seeding rates on buffalograss performance when maintained under fairway mowing heights and conditions. Significant differences were observed between seeding rates and genotypes for most traits. Over-seeding blue fescue enhanced spring green-up, turfgrass color, stand density, species plant count, and overall turfgrass quality of the mixture. The 5 gm^{-2} over-seeding rate resulted in significant green color retention in the autumn and turfgrass quality enhancement over the control. 'Legacy' had the highest overall performance.

Genotypes	Winter Survival	Spring Green-up	Density	Color	Quality	Inflorescence Height
	(1-9) †	(1-9) ‡	(1-9) §	(1-9) *	(1-9) ††	(cm) †††
2838	7.0	3.0	7.1	6.2	4.3	-
2995	5.3	5.2	7.2	6.3	5.5	12
2996	5.7	5.6	7.8	6.0	5.8	16
3000	5.7	5.0	7.4	6.0	5.2	12
3001	5.0	5.4	6.8	5.9	4.8	5
3004	4.7	5.2	7.2	6.6	5.6	10
3005	5.0	4.5	7.0	6.4	5.2	11
3007	5.0	5.9	7.4	6.9	5.9	4
3008	5.3	5.4	8.0	6.4	5.2	7
3009	5.0	5.1	7.8	6.3	5.8	5
3010	4.3	5.1	7.8	6.5	6.0	6
3011	4.7	5.7	7.2	6.9	5.9	8
3012	5.0	5.5	8.0	6.8	5.9	25
3013	5.3	5.9	8.0	6.7	6.0	22
2964	5.3	4.9	7.4	6.9	6.0	12
2976	5.3	5.2	7.6	6.1	5.3	21
2989	5.7	4.6	7.8	7.0	6.1	18
2990	6.3	6.2	7.9	6.2	5.4	17
3016	6.0	4.4	7.8	6.8	6.6	6
3023	5.7	5.1	7.9	7.1	6.5	9

† Winter survival based on 1-9 visual rating scale with 1= poorest and 9= best.
‡ Spring green-up based on 1-9 visual rating scale with 1= light tan and 9= dark green.
§ Density based on 1-9 scale with 1=0-10% and 9= 90-100%.
* Color based on 1-9 visual rating scale with 1= straw brown, 6= light green, and 9= dark green.
†† Quality based on 1-9 visual rating scale with 1= poorest and 9= best.
††† Inflorescence height is an average of 3 measurements per treatment plot. Values are means from 3 replications.

Table 1. Winter survival, spring green up, density, color, quality and inflorescence height of genotypes grown at Mead, Nebraska (2005-2007) of many advanced lines with improved turfgrass color, quality, and seed production characteristics.

Summary Points

- Genotypes with superior turf quality and yield potential have been identified and promoted.
- Seeds of superior lines have been increased and are being studied for turfgrass performance and potential release.
- Blue fescue over-seeding on buffalograss has improved the overall quality, performance, and duration of the mixture over buffalograss monostand when maintained under fairway conditions.
- A diploid population has been evaluated for phenotypic differences among the progenies. Markers were selected to develop a genetic linkage map for buffalograss.