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FINAL STUDY REPORT
James E. "Bud" Smith Plant Materials Center
Knox City, Texas

Assembly and Evaluation of Texas Cupgrass Germplasm for Rangeland Restoration

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ABSTRACT

USDA-NRCS James E. "Bud" Smith PMC

Texas cupgrass [*Eriochloa serica* (Scheele) Munro ex. Vasey] is a native, warm season, perennial grass occurring in Texas rangeland that is relished by livestock. Lack of an adapted cultivar limits the use of this grass for rangeland restoration. The objective of this study is to assemble and evaluate Texas cupgrass to identify elite germplasm for use in a cultivar or pre-varietal development program. Forty-four collections were received from the field but only sixteen were transplanted into a common nursery at the James E. "Bud" Smith Plant Materials Center, Knox City, Texas on a Miles fine sandy loam soil, and evaluated on plant attributes, seed production, and plant performance from 2011-2013. Accessions T53732, T53739, and 9049269 had good survival rates, but had poor seed quality. Poor seed production hinders the further development of these accessions for release consideration from the James E. "Bud" Smith Plant Materials Center.

INTRODUCTION

Texas cupgrass is a native, warm season, perennial grass occurring in Texas vegetational areas including the Gulf Prairies and Marshes, Blackland Prairies, and the Rolling Plains in grassy, open areas in scrub woodlands (Hatch and Pluhar, 1993; Gould, 1978). Texas cupgrass begins growth in late winter to earlier spring similar to cool season grasses and becomes semi-dormant in the midsummer (Leithead et al., 1971). These authors report that growth continues in the fall if moisture is available and leaves may remain green in the winter. New growth is desired by livestock and remains palatable year round (Leithead et al., 1971). It rarely dominates a site and if grazed during the winter, livestock must be fed a protein supplement to meet nutritional requirements of the livestock class. Texas cupgrass will not tolerate overgrazing (Hatch and Pluhar, 1993); therefore, a

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controlled grazing system should be part of the management for sustainable production.

There are no cultivars or native seed sources of Texas cupgrass commercially available for rangeland restoration plantings. Therefore, the objective of this study is to assemble and evaluate Texas cupgrass germplasm and identify superior ecotypes for range restoration in the southern plains. This is accomplished by contributions of Texas cupgrass collections made by field office staff from known populations occurring in Texas and evaluating them in a common nursery for superior plant characteristics.

MATERIALS AND METHODS

Forty-four accessions of Texas cupgrass were evaluated at the USDA-Natural Resources Conservation Service, James E. "Bud" Smith Plant Materials Center, Knox City, TX from 2011 to 2013. Seed collections were made by NRCS field office staff and provided to the PMC (Table 1). The assembly of collections were initially planted in the greenhouse in 15 February 2011 and seedlings transplanted to the evaluation nursery 5 May 2012. A smooth, firm seedbed was prepared prior to transplanting. Plots consisted of ten plants from each accession spaced at twelve inches with 40 inch row spacing in non-replicated plots. Soil type was a Miles fine sandy loam. Weeds were controlled by hand weeding and cultivation. Irrigation was applied the first year to ensure establishment. Accessions were rated annually in late June and early September for survival, plant height (inches), seed maturity (mid to late spring, early to mid-summer, and late summer to early fall), plant growth characteristics (erect/prostrate growth and lodging), and seed production (1 = worst, 9 = best). Measurements taken in June and September were averaged for each year for comparison.

Seed was hand harvested from the surviving accessions in August 2012-2013 from the evaluation nursery and 100 seed were placed on a Petri dish and moistened with 15 ml distilled water. Non replicated seed samples were placed in a germination chamber (Seedburo Equipment Co., Chicago, IL) with alternating day/night temperature (15/30 °C) and (12 h/12 h). Germination counts were taken every 7 days for total of 28 days.

RESULTS AND DISCUSSION

Many accessions failed to germinate the initial year of planting (data not shown). Of the forty-four planted in 2011, only 16 accessions were established in the field (Table 2). Several factors may have contributed to poor germination (i.e. immature seed, poor storage prior to shipment to PMC, or damaged during shipping and processing). A summary of the evaluations made in 2011-2013 are presented in Table 2. With the exception of T53732, T53739, and 9049269, most of the accessions declined in stand from 2011-2013. Accession T43231 died in 2011. All surviving accessions were similar in height, growth habit, and lodging with some variability in seed maturity and seed production potential. Accessions T53732, T53739, and 9049269 were similar in growth habit and varied in seed maturity.

Seed production of T53732 and T53739 were rated poor in 2012 and good in 2013. However, hand collected seed from the evaluation nursery in early August of 2012 and 2013 failed to germinate in the germination chamber (data not shown). None of the other seed harvested from the surviving accessions germinated either. It is anticipated above average temperatures and below average precipitation during pollination may have attributed to poor seed quality. Adverse heat and moisture stress during the reproductive phase significantly reduces grain and pod yields and decreases seed quality of some agricultural crops (Vara Prasad et al., 1999; Fougereux et al., 1997; Schoper et al., 1987).

CONCLUSION

Accessions T53732, T53739, and 9049269 had the highest percent survival and persistence compared to the other 13 accessions of Texas cupgrass. Due to poor seed quality exhibited by these accessions, a decision was made to discontinue the evaluation and close the study. Seed collections of Texas cupgrass accessions will be stored in a controlled environment for future germplasm screening by interested entities.

LITERATURE CITED

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Table 1. Texas cupgrass collections evaluated at the USDA-NRCS James E. “Bud” Smith Plant Materials Center, Knox City, TX 2011-2013.

Accn. No	Origination
9049269	Milam
9049270	Milam
9107829	Crockett
T38705	Grayson
T43229	Parker
T43230	Tarrent
T43231	Palo Pinto
T43254	Blanco
T43290	Rockwell
T43294	Mason
T43295	Kaufman
T43298	Goliad
T45759	Baylor
T53730	Hill
T53732	Navarro
T53739	Uvalde
T 38695	Parker
T 38706	Goliad
T 38735	Jack
T 38757	Cladwell
T 38794	Tarrent
T 38811	Milam
T 38812	Dallas
T 38813	Comal
T 38816	Hays
T 43209	Karnes
T 43264	Hays
T 43269	Throckmorton
T 43272	Brazos
T 43299	Grayson
T 45764	Brown
T 45780	Washington
T 45809	Caldwell
T 45812	Throckmorton
T 52765	Hill
T 53667	Ellis
T 53715	Hill
T 38694	Parker
T 38707	Johnson
T 43219	Hood
T 43268	Crockett
T 38692	Bell
T 45793	Kendall
T 38704	Williamson

*RED indicates that collections were not successful outside of the greenhouse

Table 2. Summary of Texas cupgrass collections evaluated at the USDA-NRCS James E. “Bud” Smith Plant Materials Center, Knox City, TX 2011-2013.

	Survival (%)[1/]			Height (in)[2/]		Seed Maturity[3/]		Growth Habit[4/]		Lodging[5/]		Seed Production[6/]	
Accn. No	2011	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
9049269	90	90	90	33	29	Mid	Mid	Erect	Erect	0	0	2	1
9049270	40	40	20	24	25	Mid	Late	Erect	Erect	0	0	6	4
9107829	60	50	10	31	28	Mid	Mid	Erect	Erect	0	0	6	4
T38705	40	50	30	28	22	Mid	Early	Erect	Erect	0	0	8	8
T43229	80	50	10	25	23	Mid	Mid	Erect	Erect	0	0	9	1
T43230	30	30	10	24	29	Early	Late	Erect	Erect	0	0	9	1
T43231[7/]	40	0	0										
T43254	60	70	20	25	25	Mid	Late	Erect	Erect	0	0	4	6
T43290	20	20	10	31	30	Mid	Late	Erect	Erect	0	0	7	3
T43294	40	40	10	28	24	Late	Mid	Erect	Erect	0	0	4	6
T43295	50	40	10	29	25	Mid	Mid	Erect	Erect	0	0	6	2
T43298	40	40	20	29	26	Mid	Mid	Erect	Erect	0	0	8	8
T45759	40	30	10	26	23	Late	Mid	Erect	Erect	0	0	7	3
T53730	80	80	10	32	29	Mid	Mid	Erect	Erect	0	0	3	7
T53732	90	90	90	33	26	Mid	Mid	Erect	Erect	0	0	3	7
T53739	100	100	90	35	28	Mid	Early	Erect	Erect	0	0	1	8

1/ Percent of plants survived taken in June and September
2/ Maximum plant height in inches taken in September
3/ Seed Maturity ratings (Early: mid to late spring--- Mid: early to mid-summer--- Late: late summer/early fall)
4/ Growth Habit (Erect grows at 90° angle; prostrate grows flat at 0° angle). Taken in June and September
5/ Lodging rated on scale 0-5 (0=none; 5= completely lodged). Taken in June and September
6/ Seed production is visual for potential yield on a scale 1-9 (1=poor, 9=good) Taken in late July
7/ Plant did not survive 2011 growing season