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

Assembly and Evaluation of Threeflower Melicgrass, *Melica nitens*, Germplasm for Rangeland Improvement

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ABSTRACT

Threeflower melicgrass, [*Melica nitens* (Scribn.) Nutt. ex Piper], is a native, cool season, perennial bunchgrass occurring in Texas rangelands. It provides conservation benefits including range and pastureland improvement, food and cover for wildlife, and buffers for riparian forests. Lack of an adapted cultivar limits the use of this grass in conservation plantings. The objective of this study is to assemble and evaluate threeflower melicgrass to identify elite germplasm for use in a cultivar or pre-varietal development program. Nineteen collections, from the forty-two received from the field, 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 for plant growth and seed attributes. After two years of data collection, accession 9107800, 9107795 and 9107796 exhibited desirable survival, maturity, plant height, plant width, seed production potential, and uniformity. 9107800 is slightly preferred due to the higher germination percent of seed in 2014. Additional data will be collected before advancement of these accessions for release consideration from the James E. "Bud" Smith Plant Materials Center.

INTRODUCTION

Threeflower melicgrass is a native, cool season, perennial bunchgrass occurring in central and western regions of Texas on undisturbed sites in open woodlands, moist canyon slopes and valley bottoms, and rocky pasturelands (Gould, 1978) It is found often in partial shade in calcareous or sandy loams along bluffs, streams, and roads in the Cross Timbers and Prairies, Edwards Plateau, Rolling Plains, High Plains, and Trans-Pecos vegetational areas (Correll, 1970; Linex, 2014). Threeflower melicgrass really begins growing in late summer and early spring. Seed is produced from April to June (Gould, 1978). In many instances, threeflower melicgrass will go dormant during the hot dry summer months, but could

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continue to grow in years of mild wet conditions. Threeflower melicgrass is being evaluated for its high forage value and palatability for livestock. Forage analysis conducted in 2006 showed crude protein levels at 14-18%. It is also being evaluated for its benefit to wildlife habitat. It provides seed which is consumed by various species of birds including turkey and cover for small mammals and ground nesting birds (Linex, 2014).

Currently, no cultivar or native seed source for conservation plantings has been developed for the Cross Timbers and Prairies, Edwards Plateau, Rolling Plains, High Plains and Trans-Pecos vegetational areas. Therefore, the objective of this study is to assemble and evaluate threeflower melicgrass germplasm and identify superior ecotypes for range and pasture improvement in the southern plains. This is accomplished by contributions of threeflower melicgrass collections made by field office staff from known populations throughout Texas and evaluating them in a common nursery for superior plant characteristics.

MATERIALS AND METHODS

Nineteen original accessions of forty-two threeflower melicgrass received from field collections made in 2009-2012 were established in an evaluation nursery in 2012 at the USDA-Natural Resources Conservation Service (NRCS), James E. “Bud” Smith Plant Materials Center (PMC), Knox City, TX (Table 1). The accessions were started in the greenhouse in 18 July 2012. On 19 September 2012, seedlings from the nineteen surviving accessions were transplanted into a new evaluation nursery in non-replicated plots. 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. 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. No commercial fertilizer was applied or soil test conducted prior to planting. Accessions were rated annually from February through June for survival, vigor, plant height (inches), uniformity, seed maturity (early- late March to early April, mid- mid to late April, late- early to mid-May), lodging, plant width (inches), seed production (1 = worst, 9 = best), and seed germination.

Seed was hand harvested from the surviving accessions in at seed maturity (April-June) 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 21 days.

RESULTS AND DISCUSSION

The nineteen accessions were established in 2013 and data collection began in the winter of 2014. A summary of the evaluations made are presented in Table 2. Survival was high in all the accessions except 9093018 and 9107940, which decreased from 80% to 40%. Differences were observed in plant height, uniformity, maturity, lodging, plant width, seed production potential, and germination. No differences were seen in the vigor of the plants in each accession. Plant height ranged from two to three feet and plant width was six to twenty inches. Accessions 909017, 9107795, and 107796 showed the most uniformity when comparing the plants within each plot. Differences in seed maturity, lodging, and seed

production potential could be attributed to the amount of rainfall received through the growing season. Total rainfall from February through June in 2014 was 8.84 inches compared to 18.76 inches in 2015. Seed maturity in 2014 occurred from May to June, while maturity occurred earlier in 2015 (April-May). Record rainfall (11.05 inches) and hail damage in May 2015 contributed to the differences in lodging observed. The severe hail damage in May also prevented the harvest of seed for germination testing in 2015. Differences in seed germination were observed in 2014. Accessions 9107799, 9107940, 9107941, and 9107862 set the most viable seed, however, the survival of these lines was only 40-50%. Accessions 9107795, 9107796, and 9107800 had the highest overall survival, height, uniformity, plant width, and seed production potential rating. 9107800 had a germination of 29%, but the other two top rated accessions (9107795 and 9107796) only had 14% and 5% germination.

CONCLUSION

The nineteen accessions of threeflower melicgrass showed similarities in vigor, but differences in survival, plant height, maturity, uniformity, plant width, seed production potential, and germination. Accession 9107800 was among the three top performers and is separated because of the increase of viable seed production. Accessions 9107795 and 9107796 were other top performers, but additional data, including replicated plots, would be necessary to determine if the accessions collected in Texas could provide a more suitable conservation plant for the service area. This evaluation nursery will continue to be evaluated for the following year before superior lines are moved into replicated testing.

LITERATURE CITED

Correll, D.S., and M.C. Johnston. 1970. Manual of the Vascular Plants of Texas. Texas Research Foundation, Renner, TX.

Gould, F.W. 1978. Common Texas grasses. Texas A&M Univ. Press College Station.

Linex, Ricky. 2014. Range Plants of North Central Texas- A Land User's Guide to Their Identity, Value, and Management, USDA, NRCS Weatherford, TX.

Table 1. Threeflower melicgrass collections evaluated at the USDA-NRCS James E. "Bud" Smith Plant Materials Center, Knox City, TX 2014-2015.

Accession	County (Texas)
421116	Bandera
441143	Edwards
441144	Bexar
441145	Mason
9049226	N/A
9049326	McLennan
9049414	N/A
9049435	Erath
9093016	Sutton
9093017	Sutton
9093018	Sutton
9093059	Concho
9093060	Runnels
9107778	Palo Pinto
9107791	Pecos
9107792	Menard
9107793	Mason
9107794	Sutton
9107795	Bandera
9107796	Mason
9107797	Crockett
9107798	Crockett
9107799	Bosque
9107800	Runnels
9107801	Runnels
9107802	Howard
9107803	Edwards
9107860	Palo Pinto
9107861	Palo Pinto
9107862	Palo Pinto
9107863	Lampasas
9107864	Lampasas
9107940	Edwards
9107941	Palo Pinto
9107942	Sutton
9107943	Runnels
9107944	Erath
9110632	Mason
9110691	Crockett
9110696	Kimble
9110995	Palo Pinto
9110996	Mason

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

Table 2. 2014-2015 data summary of threeflower melicgrass collections evaluated at the USDA-NRCS James E. "Bud" Smith Plant Materials Center, Knox City, TX.

		Survival[1]		Vigor[2]		Height[3]		Uniformity[4]		Maturity[5]		Lodging[6]	Plant Width[7]		Seed Production[8]		Germination[9]
Accn. No	County	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015		2014	2015	2014	2015	2014
9093017	Sutton	10	8	3	3	24	33	3	2	Early	Early	2	6	16	5	6	15%
9093018	Sutton	7	4	3	4	21	28	6	6	Late	Early	4	7	14	5	5	4%
9093059	Concho	10	10	3	3	23	28	6	4	Early	Early	2	9	16	5	5	0%
9093060	Runnels	8	8	3	3	31	29	5	5	Early	Mid	2	11	19	5	5	15%
9107791	Pecos	5	5	3	3	30	30	6	4	Late	Mid	2	9	14	5	5	14%
9107793	Mason	6	6	3	3	25	30	6	4	Early	Early	3	10	19	6	6	4%
9107794	Sutton	9	9	3	3	22	24	4	4	Late	Early	3	10	19	5	6	5%
9107795	Bandera	10	10	3	3	25	28	3	3	Late	Early	1	11	15	2	3	14%
9107796	Mason	10	10	3	3	22	29	2	3	Late	Early	2	11	19	3	3	5%
9107797	Crockett	10	9	3	3	24	22	3	4	Late	Early	3	8	16	2	4	10%
9107799	Bosque	6	4	3	3	23	33	7	4	Early	Early	1	10	17	5	5	68%
9107800	Runnels	9	9	3	3	24	28	3	4	Mid	Mid	2	10	16	4	5	29%
9107801	Runnels	10	10	3	3	23	29	5	4	Mid	Mid	2	9	14	4	5	10%
9107803	Edwards	8	8	3	3	23	27	7	5	Early	Early	3	10	19	5	5	31%
9107862	Palo Pinto	5	5	3	3	26	31	3	4	Early	Early	2	9	17	2	4	34%
9107863	Lampasas	3	3	3	3	30	32	3	5	Mid	Mid	3	9	17	5	5	6%
9107864	Lampasas	6	5	3	4	26	32	6	4	Mid	Early	2	8	14	5	6	32%
9107940	Edwards	8	5	3	3	27	23	7	5	Mid	Early	1	9	16	6	5	34%
9107941	Palo Pinto	4	4	3	3	26	24	5	5	Early	Early	1	10	17	5	5	35%

1/ Percent of plants survived taken at stem elongation

2/ Rating of overall vigor of plants within population (1=vigorous, 5=not vigorous)

3/ Maximum plant height in inches taken at seed maturity

4/ Uniformity is visual rating of plant similarities within population (1=uniform, 5=not uniform)

5/ Maturity ratings (Early:late March-early April---Mid:mid to late April---Late-early to mid May)

6/ Rating of lodging observed at seed maturity (1=upright, 3=lodge to an angle greater than 45° from vertical, 5=horizontal touching soil surface)

7/ Plant width is measurement in inches of plant from outside edges

8/ Seed production is visual for potential yield on a scale of 1-10 (1=high producer, 10=low producer) Taken at seed maturity

9/ Germination on hand picked seed expressed as a percent