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

Assembly and Evaluation of Vine Mesquite Germplasm for Rangeland Restoration

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ABSTRACT

Vine mesquite, *Panicum obtusum* Kunth, is a native, warm season, perennial grass occurring in Texas rangelands. It provides conservation benefits including range and pastureland improvement, food and cover for wildlife, and soil erosion control. Lack of an adapted cultivar limits the use of this grass in conservation plantings. The objective of this study is to assemble, evaluate, and identify elite vine mesquite germplasm for use in a cultivar or pre-varietal development program. Sixty-three collections 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. These sixty-three lines were culled to twenty-eight based on visual evaluations of seed production, vigor, maturity, and plant uniformity. Accessions 9093049, 9093053, 9093075, and 9093121exhibited desirable seed production potential, but poor seed germination has halted further development of these accessions for release consideration.

INTRODUCTION

Vine mesquite is a native, warm season, perennial grass occurring in Texas vegetational areas including the Gulf Prairies and Marshes, Post Oak Savannah, Blackland Prairies, Cross Timbers and Prairies, South Texas Prairies, Edwards Plateau, Rolling Plains, High Plains and Trans-Pecos (Hatch and Pluhar, 1993; Gould, 1978). Vine mesquite begins growing in April or May on sandy, sandy loam, clay loam or gravelly loam soils in small depressions or along waterways where water accumulates (Leithead et al., 1971). It forms large colonies or mats composed of erect, leafy stems and long, wiry stolons (Gould, 1978). Vine mesquite has potential for use in range and pasture plantings for livestock forage because of late summer, and early fall crude protein content of 7% and a digestible organic matter content greater than 50% (Huston et.al., 1981). It tends to be less palatable than other range and pasture grasses, which prevents overgrazing potential (Leithead et. al., 1971).

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Dense stands provide excellent soil erosion control in waterways, dams, ditches and small gullies. Vine mesquite also provides benefits to wildlife. Plant communities provide cover for many species of birds and small mammals. Seed is eaten by quail and dove during the fall and early winter months (Leithead et al., 1971). Another benefit of vine mesquite is it's attraction to various pollinator species. The foliage is larval food for the dotted roadside-skipper (Lady Bird Johnson Wildflower Center, 2017).

Currently, no cultivar or native seed source of vine mesquite is commercially available for conservation plantings. Therefore, the objective of this study is to assemble and evaluate vine mesquite germplasm and identify superior ecotypes for rangeland restoration, wildlife, and soil erosion control in the southern plains. This is accomplished by contributions of vine mesquite collections made by NRCS field office staff from known populations throughout Texas and evaluating them in a common nursery for superior plant characteristics.

MATERIALS AND METHODS

Eighty-seven original accessions received from field collections made from 2008-2011 were started in the greenhouse in March 2011. Sixty-three accessions germinated and produced viable seedlings. On 5 May 2011, seedlings from the sixty-three accessions were transplanted into a new evaluation nursery in non-replicated plots at the USDA-Natural Resources Conservation Service (NRCS), James E. "Bud" Smith Plant Materials Center (PMC), Knox City, TX (Table 1). A smooth, firm seedbed was prepared prior to transplanting. Plots consisted of ten plants from each accession spaced at twelve inches with 80 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 beginning in 2012 from late June to early September for survival, plant height (inches), seed maturity (early: late May to mid-June, Mid: late June- late July, and Late: August-September), plant vigor, uniformity (1=best, 5=worst), and seed production (1 = high producer, 10 = low producer). In August 2013, accessions were visually evaluated and culled to twenty-eight lines based on overall plant appearance and seed production potential. Measurements taken from the twenty-eight superior plots in 2012-2016 were averaged for comparison.

Seed was hand harvested annually from the twenty-eight accessions in August 2012-2016 from the evaluation nursery. Following a sixty day cold stratification, 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 (20/30 °C) and (12 h/12 h). Germination counts were taken every 7 days for 28 days.

RESULTS AND DISCUSSION

The sixty-three accessions were established in 2011 and data collection began in the spring of 2012. A summary of the evaluations of these culled accessions in 2012-2016 is presented in Table 2. All the accessions had similar survival throughout the evaluation remaining above seventy percent. Variability was noted in plant height, seed maturity, plant vigor, uniformity and seed production potential. Year to year variability in plant attributes could be contributed to above and below precipitation during the growing season. Precipitation amounts from March to October for 2011, 2012, 2013, 2014, 2015 and 2016 were 15.59, 17.97, 16.74, 27.20, and 16.79 inches respectively. The long-term rainfall average for this same period is 19.73 inches.

Four accessions, 9093049, 9093053, 9093074, and 9093121, showed a satisfactory seed production potential; however, hand collected seed from the evaluation nursery in August of 2012-2016 failed to germinate following stratification under laboratory conditions. Additionally, none of the other seed from the twenty-eight accessions germinated.

CONCLUSION

The twenty-eight accessions of vine mesquite were similar in survival with minimal differences observed in plant height, vigor, uniformity, and seed maturity from year to year. Accessions 9093049, 9093053, 9093075, and 9093121 had the highest seed production potential, but consistently produced poor seed quality with germination percent at 3.4, 4.0, 1.4, and 3.8 respectively. Data showed similarities between these accessions for other plant characteristics. Further testing, 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. Poor seed quality has halted further development of these accessions for release consideration from the James E. “Bud” Smith Plant Materials Center. Seed collections of vine mesquite accessions will be stored in a controlled environment for future germplasm screening by interested entities.

LITERATURE CITED

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Table 1. Vine Mesquite collections received and evaluated at the USDA-NRCS James E. "Bud" Smith Plant Materials Center, Knox City, TX 2012-2016

Accession	Origin	Accession	Origin
434177	Kimble Co., TX	9093108	Cochran Co., TX
441164	Pecos Co., TX	9093110	Hardeman Co., TX
9018881	Hansford Co., TX	9093111	Randall Co., TX
9028149	Randall Co., TX	9093115	Hall Co., TX
9093044	Knox Co., TX	9093117	Lamb Co., TX
9093045	Knox Co., TX	**9093118**	**Lamb Co., TX**
9093046	Knox Co., TX	9093119	Gaines Co., TX
9093047	Knox Co., TX	**9093121**	**Dawson Co., TX**
9093048	Knox Co., TX	**9093124**	**Carson Co., TX**
9093049	**Motley Co., TX**	9093125	Terrell Co, TX
9093050	**Lynn Co., TX**	9093127	Bailey Co., TX
9093051	**Lynn Co., TX**	9093129	Lipscomb Co., TX
9093053	**Moore Co., TX**	**9093131**	**Donley Co., TX**
9093054	Gaines Co., TX	9093134	Hemphill Co., TX
9093055	**Lubbock Co., TX**	9093138	Parmer Co., TX
9093056	Donley Co., TX	**9093142**	**Eastland Co., TX**
9093057	**Scurry Co., TX**	**9093143**	**Hansford Co., TX**
9093063	Coryell Co., TX	**9093144**	**Hansford Co., TX**
9093069	Bell Co., TX	**9093145**	**Lubbock Co., TX**
9093071	Stephen Co., TX	9093147	Floyd Co., TX
9093072	Throckmorton Co, TX	**9093149**	**Collingsworth Co., TX**
9093073	Dickens Co., TX	9093152	Mitchell Co., TX
9093074	**Wichita Co., TX**	**9093154**	**Lynn Co., TX**
9093075	**Wichita Co., TX**	9093156	Roberts Co., TX
9093077	Mill Co., TX	**9093157**	**Scurry Co., TX**
9093079	Foard Co., TX	9093158	Scurry Co., TX
9093080	Bosque Co., TX	9093159	Baca Co., Co
9093081	**Young Co., TX**	9107761	Howard Co., TX
9093082	**Cottle Co., TX**	**9107762**	**Wheeler Co., TX**
9093084	Clay Co., TX	**9107765**	**Briscoe Co., TX**
9093085	Clay Co., TX	9107766	Palo Pinto Co., TX
9093087	Baylor Co., TX	**9107768**	**Armstrong Co., TX**
9093089	Hockley Co., TX	9107769	Hartley Co., TX
9093091	Kent Co., TX	9107777	Brown Co., TX
9093094	Hale Co., TX	**9107781**	**Castro Co., TX**
9093095	Motley Co., TX	9107782	Runnels Co., TX
9093096	Shackelford Co., TX	9107783	Pecos Co, TX
9093097	Ochiltree Co., TX	9107785	Hamilton Co., TX
9093098	Archer Co., TX	9107786	Quay Co., NM
9093099	**Moore Co., TX**	9107787	Hamilton Co., TX
9093101	Parmer Co., TX	9107788	Reagan Co., TX
9093103	**Crockett Co., TX**	9107790	Tom Green Co., TX
9093105	Schleicher Co., TX	9107856	Knox Co., TX
9093106	**Sherman Co., TX**		

*Bold indicates superior accessions selected in 2013 based on visual rating for seed prodcution, vigor, uniformity, & maturity

Table 2. 2012-2016 Plant attributes evaluation of Vine Mesquite, *Panicum obtusum*, at the USDA-NRCS James E. "Bud" Smith Plant Materials Center in Knox City, TX.

Accession	Origin	Survival[1]	Vigor[2]	Height[3]	Seed Maturity[4]	Uniformity[5]	Seed Production[6]	Injury[7] Insect	Disease	Heat	Cold	% Germ[8]
9093049	Knox	10	2	20	E	2.9	4.9	1	1	1	1	3.4
9093050	Lynn	9	3	17	M	3.1	5.4	1	1	1	1	2.6
9093051	Lynn	9	3	19	M	3.0	5.1	1	1	1	1	2.2
9093053	Moore	10	3	19	E	2.9	4.8	1	1	1	1	4.0
9093055	Lubbock	9	3	18	M	3.1	5.3	1	1	1	1	2.4
9093057	Scurry	10	3	18	M	3.4	5.1	1	1	1	1	1.4
9093074	Wichita	10	3	18	E	2.9	5.1	1	1	1	1	5.0
9093075	Wichita	7	3	19	E	3.1	4.8	1	1	1	1	1.4
9093081	Young	7	3	19	M	3.0	5.1	1	1	1	1	4.4
9093082	Cottle	7	2	19	M	2.8	5.0	1	1	1	1	1.8
9093103	Crockett	9	3	18	M	2.9	5.4	1	1	1	1	1.8
9093099	Moore	9	3	16	L	3.0	5.4	1	1	1	1	0.4
9093106	Sherman	10	3	19	M	3.0	5.5	1	1	1	1	4.6
9093118	Lamb	9	3	19	E	3.1	5.3	1	1	1	1	2.4
9093121	Dawson	10	3	18	E	3.2	4.8	1	1	1	1	3.8
9093124	Carson	10	3	18	M	3.2	5.3	1	1	1	1	5.2
9093131	Donley	10	3	21	M	2.9	5.1	1	1	1	1	4.2
9093142	Eastland	10	3	18	M	2.9	5.4	1	1	1	1	2.0
9093143	Hansford	9	4	19	M	3.4	5.9	1	1	1	1	6.0
9093144	Hansford	9	3	19	E	3.3	5.1	1	1	1	1	5.4
9093145	Lubbock	8	3	19	M	3.1	5.0	1	1	1	1	3.6
9093149	Collingsworth	9	3	21	L	3.0	5.1	1	1	1	1	5.8
9093154	Lynn	10	3	19	M	3.1	5.4	1	1	1	1	5.0
9093157	Scurry	8	3	19	M	3.4	5.4	1	1	1	1	0.8
9107762	Wheeler	10	3	19	M	3.0	5.4	1	1	1	1	2.4
9107765	Brisco	9	3	18	E	3.1	5.5	1	1	1	1	0.6
9107768	Armstrong	10	3	18	M	2.9	6.1	1	1	1	1	1.4
9107781	Castro	10	3	19	L	2.9	5.8	1	1	1	1	2.8

[1]Survival=number plants alive at end of evaluation from original ten transplanted

[2]Visual rating (1-very, 5-not) of plant vigor taken at stem elongation

[3]Height of seed head taken at seed maturity

[4]Seed maturity recorded when hard seed present (E=late May to mid June, M=late June to late July, L=August)

[5]Visual rating of plant uniformity within the plot (1=very uniform, 5=not uniform)

[6]Visual rating of seed produciton within plot (1=high producer, 10=low producer)

[7]Visual rating of injury due to insects, disease, heat, & cold throughout growing season (1=none observed, 5=heavy)

[8]Percent germination of 100 seeds following 60 days cold stratificaiton (12/hr 30°C and 12/hr 20°C for 28 days)