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

Assembly and Evaluation of Texas Indian mallow Germplasm for Wildlife Habitat Restoration

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ABSTRACT


USDA-NRCS James E. "Bud" Smith PMC

Texas Indian mallow, *Abutilon fruticosum* (Guill. & Perr.), is a native, warm season, perennial sub-shrub occurring in Texas rangelands. It provides conservation benefits including range and pastureland improvement, food and cover for wildlife, and enhancement of water quality. Lack of an adapted cultivar limits the use of this forb in conservation plantings. The objective of this study is to assemble, evaluate, and identify elite Indian mallow germplasm for use in a cultivar or pre-varietal development program. Thirteen collections, from the thirty-four 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. Accessions 9049631, 9064878, 9064883, 9049560, and 9064859 exhibited desirable seed production potential, but poor seed quality and seed harvesting difficulties has halted further development of these accessions for release consideration from the James E. "Bud" Smith Plant Materials Center.

INTRODUCTION

Texas Indian mallow is a native, warm season, perennial subshrub occurring in Texas vegetational areas including the Blackland Prairies, Cross Timbers and Prairies, South Texas Prairies, Edwards Plateau, Rolling Plains, High Plains and Trans-Pecos (Linex, 2014). Texas Indian mallow begins growing in the early spring and will bloom from March to December (Ajilvsgi, 1984). It is readily eaten by deer, sheep, and goats and occasionally grazed by cattle. Crude protein averages have been between 12 to 14 percent during the growing season (Linex, 2014). Seed of Texas Indian mallow is eaten by mourning dove, bobwhite quail, and other songbirds (Lady Bird Johnson Wildflower Center, 2014). Proper grazing management is critical for maintaining plant vigor and persistence on rangelands (Ajilvsgi, 1984; Linex, 2014). Another benefit of including Texas Indian mallow in conservation plantings is it's attraction of various pollinator species. The conspicuous flowers attracts several species of

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bees and butterflies and the foliage is larval food for several species of skipper butterflies (Lady Bird Johnson Wildflower Center, 2014).

Currently, no cultivar or native seed source for conservation plantings has been developed for the Blackland Prairies, Cross Timbers and Prairies, South Texas Prairies, Edwards Plateau, Rolling Plains, High Plains, and Trans-Pecos vegetational areas. Therefore, the objective of this study is to assemble and evaluate Texas Indian mallow germplasm and identify superior ecotypes for wildlife habitat restoration in the southern plains. This is accomplished by contributions of Texas Indian mallow 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

Thirty-four original accessions received from field collections made in 1990-1992 were established in an evaluation nursery in 1992 at the USDA-Natural Resources Conservation Service (NRCS), James E. "Bud" Smith Plant Materials Center (PMC), Knox City, TX. Minimal observations were taken from 1992 to 2000 and the project was abandoned. In January 2009, the project was re-opened, although the original evaluation nursery had been terminated. The thirty-four accessions were started in the greenhouse in 3 March 2009. Only thirteen accessions germinated and produced viable seedlings (Table 1). On 3 May 2009, seedlings from the thirteen 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 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), flower color, 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 2011-2012 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

The thirteen accessions were established in 2009 and data collection began in the spring of 2010. A summary of the evaluations made in 2010-2013 are presented in Table 2. All the accessions had similar survival in 2010, but declined throughout the evaluation period. Variability was noted in plant height, seed maturity, flower color, and seed production potential. Genetic variability was observed in flower color during full bloom. Accessions 9049578, 9064870, 9064878, 9049589, 9049560, and 9064859 exhibited yellow blooms while the remaining accessions displayed orange blooms. Year to year variability in plant height, seed maturity, and seed production could be contributed to above and below precipitation during the growing season. Precipitation amounts from March to October for 2010, 2011, 2012, and 2013 were 30.2, 4.8, 15.59, and 17.97 inches respectively. The forty-four year average for this same period is 20.38 inches.

Five accessions, 9049631, 9064878, 9064883, 9049560 and 9064859, showed a satisfactory seed production potential; however, hand collected seed from the evaluation nursery in August of 2011 and 2012 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

The thirteen accessions of Texas Indian mallow were similar in survival with minimal differences observed in plant height, seed maturity, and seed maturity from year to year. Accessions 9049631, 9064878, 9064883, 9049560, and 9064859 had the highest seed production potential, but poor seed quality. 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 and harvesting difficulties has halted further development of these accessions for release consideration from the James E. "Bud" Smith Plant Materials Center. Seed collections of Texas Indian mallow accessions will be stored in a controlled environment for future germplasm screening by interested entities.

LITERATURE CITED

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Table 1. Texas Indian mallow collections received and evaluated at the USDA-NRCS James E. “Bud” Smith Plant Materials Center, Knox City, TX 1990-2013.

Accession	County (TX)
9049534	Williamson
9049539	Caldwell
9049542	Guadalupe
9049544	Bell
9049553	Bell
9049559	Palo Pinto
9049560	Parker
9049561	Williamson
9049564	Burnet
9049567	McLennan
9049578	Schleicher
9049589	Real
9049590	Coryell
9049599	Lampasas
9049609	Callahan
9049618	Llano
9049621	Menard
9049623	Concho
9049630	Williamson
9049631	Caldwell
9064849	Lampasas
9064850	Lampasas
9064853	Bell
9064856	Burnet
9064857	Burnet
9064858	Burnet
9064859	Coleman
9064862	Refugio
9064870	Bell
9064878	Coryell
9064883	Gonzales
9064889	Guadalupe
9064891	Brown
9064893	Schleicher

*Red indicates the thirteen accessions that were established into an evaluation nursery in 2009

Table 2. Summary of Texas Indian mallow collections evaluated at the USDA-NRCS James E. “Bud” Smith Plant Materials Center, Knox City, TX 2010-2013.

		% Stand 1/				Height 2/				Maturity 3/				Flower Color 4/				Seed Production 5/			
Accession	County (TX)	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
9049561	Williamson	77%	77%	63%	60%	35	24	25	28	Early	Late	Mid	Mid	Orange	Orange	Orange	Orange	4	4	3	3
9049578	Schleicher	47%	47%	43%	43%	37	30	30	32	Late	Late	Late	Late	Yellow	Yellow	Yellow	Yellow	5	4	4	4
9049534	Williamson	67%	67%	63%	63%	34	28	27	30	Early	Early	Early	Early	Orange	Orange	Orange	Orange	4	3	3	4
9049630	Williamson	67%	67%	54%	54%	38	24	26	30	Early	Early	Early	Early	Orange	Orange	Orange	Orange	2	4	2	3
9049631	Caldwell	67%	67%	57%	55%	40	26	26	25	Early	Early	Early	Early	Orange	Orange	Orange	Orange	7	6	7	7
9064870	Bell	57%	57%	55%	55%	37	29	31	32	Mid	Early	Mid	Mid	Yellow	Yellow	Yellow	Yellow	5	4	5	5
9064878	Coryell	67%	67%	60%	57%	40	36	35	28	Mid	Mid	Early	Mid	Yellow	Yellow	Yellow	Yellow	5	6	6	6
9049589	Real	60%	60%	57%	55%	36	25	28	30	Mid	Mid	Mid	Mid	Yellow	Yellow	Yellow	Yellow	3	3	3	4
9064853	Bell	63%	63%	53%	50%	34	29	28	30	Early	Mid	Mid	Mid	Orange	Orange	Orange	Orange	4	3	3	4
9064883	Gonzales	60%	60%	60%	60%	40	26	27	31	Mid	Mid	Mid	Late	Orange	Orange	Orange	Orange	8	7	8	7
9049560	Parker	67%	67%	50%	43%	38	33	34	27	Mid	Mid	Late	Mid	Yellow	Yellow	Yellow	Yellow	7	6	7	7
9049539	Caldwell	73%	73%	70%	70%	35	29	28	31	Early	Early	Early	Early	Orange	Orange	Orange	Orange	4	4	5	3
9064859	Coleman	73%	73%	67%	53%	34	26	30	30	Late	Late	Late	Mid	Yellow	Yellow	Yellow	Yellow	6	7	7	5

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 to early fall)
4/ Flower color taken in full bloom between June to August
5/ Seed production is visual for potential yield on a scale 1-9 (1=poor, 9=good) Taken in late July