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INITIAL EVALUATIONS OF EASTERN GAMAGRASS ECOTYPES FOR THE MID-SOUTH

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ABSTRACT

A collection of eastern gamagrass (*Tripsacum dactyloides* L.) ecotypes was assembled at the Jamie L. Whitten Plant Materials Center (JLW PMC) in 1989 and 1990. Seventy three accessions, collected over a 9 state area from Oklahoma to North Carolina, exhibited a wide range of genetic variability. Comparative evaluations taken from 1992 through 1994 assessed plant vigor, growth form and development, and disease resistance. Accessions 9062680 and 9062708 were selected as candidates for an Intercenter Strain Trial in which selections from each of the eight southern PMCs are simultaneously tested at each location. Superior performers from these trials will be considered for release and future conservation use in the southeastern United States.

INTRODUCTION

Eastern gamagrass is a perennial, robust, warm season bunchgrass and is native to large areas of the eastern United States. It is a very palatable, high quality forage plant, but overgrazing by livestock has eliminated it from much of its native range (Wright et al., 1983). Properly managed, eastern gamagrass has the potential for being utilized in southern forage production systems for grazing, hay, or silage. Eastern gamagrass may also be useful for field border plantings, concentrated flow barriers, interception zones below animal confinement areas, and for filtering sediments, uptaking concentrated nutrients and slowing rainfall runoff.

MATERIALS AND METHODS

Seventy three accessions of eastern gamagrass seed were received by the PMC in 1989 and 1990. Origin by state and major land resource area are presented in Table 1.

Prior to establishment to the field, seed were first stratified, then placed in the greenhouse for germination. For stratification, the seed were covered with a damp, ground sphagnum potting medium enclosed in a plastic bag and chilled at 50^{o} F for 60 days. After the stratification period, seed were individually planted in 1" x 8" cone shaped polystyrene cells filled with a ground, sphagnum based potting medium containing a balanced starter fertilizer.

All seed were germinated under greenhouse conditions and seedlings subsequently transplanted to the field. Seedlings were planted in non-replicated plots. The test area was chiseled, disked, and harrowed prior to planting. Plant numbers varied according to the success of seed germination. When available, 20 seedlings of each accession were planted. Plants were spaced at three foot intervals on rows 80 inches apart. The plants were allowed to become fully established before initial evaluations began. During the establishment year, fertilizer was applied at the rate of 400 pounds of 13-13-13 per acre and weeds were controlled by tillage and hand cultivation. In subsequent years, fertilizer was broadcast applied at the rate of 450 pounds of 13-13-13 per acre and atrazine was applied at 1.0 lb ai/acre in early March for early and mid season weed control. Prior to spring green-up each year, all plots were burned to remove residual foliage. Soil type was Oaklimeter silt loam (Coarse-silty, mixed, thermic Fluvaquentic Dystrochrepts).

RESULTS AND DISCUSSION

The eastern gamagrass assembly exhibited a wide array of genetic diversity which offers the potential for utilization in a number of ways, depending on user needs. Ecotypes varied as to foliage height; stem density and size; leaf color, size and texture; and resistance to lodging and disease. Ecotypes of moderate height with dense, slender stems perhaps would be better utilized for grazing or haying, whereas the taller, coarser ecotypes may have potential as a perennial silage crop. Utilization of the plant as a replacement for corn or sorghum silage would eliminate the need for annual planting and would significantly reduce erosion on sloping cropland. Types having stiff residual stems may also prove effective as vegetative hedges for slowing rainfall runoff and trapping sediments.

Unless grown for seed, eastern gamagrass needs to be grazed or clipped periodically during the growing season. It is subject to foliar diseases which are strongly influenced by environmental conditions (Handley et al., 1990). The warm, humid Mid-South climate is especially favorable for disease development on both foliage and seed which generally causes growth to cease after seed maturity. Periodical removal of the foliage at 45-60 day intervals allows for fresh regrowth and a longer growing season. If used for pasture, rotational grazing must be practiced and care taken for livestock to not overgraze and deplete plant reserves. Foliage should not be removed lower than a 4 inch minimum height.

Eastern gamagrass is a very inefficient seed producer. Quantity and fill are generally low (anonymous, 1987). Indeterminate maturity, shattering, and disease affect seed yield. Terminal seedcases mature first and ripening proceeds downward to the basal seedcase. Ripened seed shatter easily and fall to the ground. As a result, only a few high quality seed are available for harvest at any one time.

Tables 2 and 3 summarizes plant performance for each accession. Numerical ratings (i.e. 1-9) indicate plant performance. A rating of 1 is best and 9 is poor. Descriptive ratings such as wide, intermediate, or narrow are used to indicate relative stem or leaf size. Munsell Color Charts for Plant Tissues was used to describe foliage color (Munsell Color Charts, 1977).

CONCLUSION

Eastern gamagrass has the potential of being of considerable economic and agronomic value. A distant relative of corn (*Zea mays*), it may possess desirable traits of value to plant breeders or genetic engineers (de Wet. et al., 1976). The plant is highly productive, palatable to livestock and could become an important forage resource for Mid-South livestock producers. For eastern gamagrass to become widely accepted and utilized, however, affordable and adapted seed sources must become available, dependable establishment techniques must be developed, and end users must be educated to the management of its needs, potentials, and limitations.

LITERATURE CITED

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TABLE 1. EASTERN GAMAGRASS ORIGIN

State	Total	MajorLand	Total

of Origin	Accession PerState	Resource Area(MLRA)	Accessionsper MLRAperState
Arkansas	8	118	1
		119	3
		131	2
		133B	2
Mississippi	14	133A	4
		134	7
		135	2
		135L1	
Tennessee	6	122	6
Georgia	10	133A	6
		136	4
North Carolina	4	130	1
		136	3
South Carolina	12	133A	3
		136	5
		137	2
		153A	2
Oklahoma	7	112	4
		118	3
Alabama	11	128	1
		133A	5
		134	1
		135	4
Texas	1	81	1

TABLE 2. PLANT GROWTH

Accession Number	Average Foliage Height (inches)	Stem Lodging (Percent)	Basal Stem Density	Vigor Early Season	Vigor Mid Season	Munsell Foliage Color Rating	Leaf Size
9058453	60	50	3	2	1	5gy5/8	IN
9052691	48	20	5	4	3	5gy5/8	IN
9062664	54	30	5	4	4	5gy6/10	IN

9058411	54	40	1	3	2	5gy4/6	IN
9062681	60	75	3	1	1	5gy4/8	WD
9062695	42	20	3	3	3	5gy5/8	WD
9062666	60	10	5	4	3	5gy5/10	WD
9062704	42	10	5	3	3	5gy5/6	IN
9062698	60	90	1	2	1	5gy5/8	WD
9062680	48	60	1	2	1	5gy4/6	WD
9062712	72	20	3	3	2	5gy5/6	IN
9062683	66	50	1	3	2	5gy5/6	WD
9062709	60	10	1	3	2	5gy5/6	IN
9058444	62	60	1	3	2	5gy5/8	NA
9058447	60	20	3	3	2	5gy4/6	IN
9062697	60	25	3	2	2	5gy5/8	WD
9062710	48	70	1	3	2	5gy5/10	NA
434493	48	50	1	3	1	5gy4/8	IN
9062674	60	15	3	3	3	5gy5/10	IN
9062686	48	20	5	3	3	5gy6/8	NA
9062688	60	30	3	3	2	5gy6/8	WD
9062689	48	10	3	4	3	5gy5/10	NA
9058552	48	50	3	3	2	5gy4/8	WD
9062685	48	30	3	3	3	5gy6/8	NA
9062690	60	30	3	3	2	5gy6/6	IN
9062707	60	60	3	3	1	5gy5/8	WD
9062667	60	20	3	4	3	5gy5/8	IN
9062700	48	30	3	3	3	5gy5/8	IN
9058454	48	40	5	3	2	5gy4/8	IN
9062682	48	00	3	3	2	5gy5/8	NA
9062678	60	90	3	2	1	5gy4/8	IN
9062693	42	80	1	2	2	5gy5/8	NA
9068584	60	40	5	3	2	5gy4/6	IN
9062687	60	20	3	3	2	5gy5/8	NA
9058571	48	40	5	4	3	5gy5/8	IN
9062701	48	75	3	3	2	5gy5/10	IN
9058550	60	70	3	3	1	5gy4/8	IN
9062714	60	10	3	4	2	5gy5/6	NA
9058547	48	30	3	3	4	5gy5/4	IN
9058956	48	10	5	4	4	5gy6/8	IN
9058947	60	20	5	2	1	5gy4/6	IN
9055008	48	10	5	3	2	5gy5/8	WD
9055010	48	60	5	2	2	5gy5/6	NA
9055006	60	5	5	3	2	5gy6/8	NA
9058951	60	15	3	3	2	5gy5/8	IN
9058952	42		5	4	4	5gy5/10	
9058958			3	3	2	5gy6/8	
9055004	60	25	5	3	2	5gy7/8	NA
9055001	53	60	5	3	2	5gy5/10	NA
9055002	48	60	5	4	3	5gy6/10	IN
9055007	48	60	5	3	3	5gy7/8	IN
9058954	60	20	3	3	2	5gy5/8	IN
9055003	48	40	5	3	2	5gy7/8	NA
9055000	60	5	5	4	3	5gy6/8	IN
9055005	66	25	5	3	2	5gy7/8	IN
9058518	48	40	3	2	2	5gy5/8	WD

9062699	42	70	3	2	2	5gy5/8	IN
9062684	48	30	3	4	4	5gy5/6	IN
9062705	60	30	5	3	2	5gy5/6	WD
9062713	54	10	3	3	2	5gy5/8	WD
9058386	48	50	3	3	3	5gy5/6	NA
9062707	72	40	3	3	1	5gy5/6	WD
9062692	36	90	1	3	2	5gy6/10	IN
9058543	60	50	3	3	1	5gy5/6	IN
9062708	48	20	3	3	3	5gy5/8	WD
9062703	60	20	5	4	4	5gy5/10	NA
9062665	48	10	3	3	3	5gy5/8	IN
9063706	48	20	5	3	4	5gy6/8	IN
9062708	60	30	5	5	5	5gy5/8	WD
9062711	78	40	3	3	1	5gy5/8	IN
9062677	60	0	5	4	3	5gy6/10	IN
9058569	48	40	5	3	2	5gy5/6	IN
9062694	36	70	1	3	2	5gy6/8	IN

Rating scale for vigor, density, and disease - 1 = best, 5 = average, 9 = very poor, 0 = none or dead.

Key:

Leaf Size
WD = Wide
IN = Intermediate
NA = Narrow

Stem Size
LG = Large
IN = Intermediate
SL = Slender

TABLE 3. FLOWERING AND SEED PRODUCTION

Accession Number	Average Seed head Height (inches)	Seed Abundance	Average Flower Emergence Date	Average Bloom Date	Average Maturity Date
9058453	96	2	Early June	Mid June	Late August
9052691	84	5	Mid June	Late June	Mid August
9062664	96	4	Mid June	Late June	Late August
9058411	84	2	Early June	Mid June	Early August
9062681	84	4	Early June	Mid June	Mid August
9062695	84	5	Mid June	Late June	Mid August
9062666	84	3	Late June	Early July	Mid August
9062704	72	4	Mid June	Late June	Late August
9062698	96	3	Early June	Late June	Late August
9062680	84	3	Early June	Late June	Late August
9062712	120	3	Early June	Early July	Mid August
9062683	108	5	Late June	Early July	Mid August
9062709	84	2	Early June	Late June	Late August
9058444	96	3	Early June	Late June	Late August
9058447	108	2	Early June	Late June	Late August
9062697	108	3	Early June	Late June	Late August

9062710	72	2	Late May	Late June	Late August
434493	84	2	Early June	Late June	Mid August
9062674	96	5	Mid June	Late June	Mid August
9062686	90	1	Mid June	Late June	Mid August
9062688	96	3	Early July	Late July	Late August
9062689	84	2	Mid June	Early July	Mid August
9058552	108	2	Early June	Late June	Mid August
9062685	84	1	Mid June	Late June	Late August
9062690	96	2	Mid June	Late June	Late August
9062707	96	3	Late June	Mid July	Mid August
9062667	84	3	Mid June	Late June	Late August
9062700	84	3	Late June	Mid July	Mid August
9058454	84	4	Mid June	Late June	Mid August
9062682	84	2	Mid June	Late June	Mid August
9062678	60	3	Mid June	Late June	Mid August
9062693	72	3	Early June	Late June	Mid August
9068584	96	2	Mid June	Late June	Mid August
9062687	90	2	Mid June	Late June	Mid August
9058571	84	3	Early June	Late June	Mid August
9062701	90	2	Mid June	Late June	Mid August
9058550	96	4	Early June	Late June	Mid August
9062714	84	3	Early July	Mid July	Late August
9058547	90	4	Early June	Late June	Mid August
9058956	96	2			
9058947	108	3	Mid June	Late June	Mid August
9055008	84	3	Mid June	Late June	Mid August
9055010	84	2	Mid June	Late June	Mid August
9055006	84	5	Late June	Mid July	Mid August
9058951	96	3	Mid June	Early July	Late August
9058952	72		Mid June	Late June	Late August
9058958					Late August
9055004	84	3	Mid June	Late June	Late August
9055001	96	4	Late June	Early July	Mid August
9055002	84	3	Late June	Early July	Mid August
9055007	84	3	Mid June	Late June	Mid August
9058954	84	3	Mid June	late June	Mid August
9055003	84	5	Mid June	Early July	Mid August
9055000	72	5	Mid June	Late June	Mid August
9055005	96	3	Late June	Early July	Late August
9058518	84	2	Early June	Mid June	Mid August
9062699	84	3	Early June	Mid June	Mid August
9062684	84	3	Late June	Early July	Mid August
9062705	96	2	Early June	Mid June	Mid August
9062713	84	2	Mid June	Early June	Late August
9058386	84	3	Early June	Mid June	Late August
9062707	108	3	Early June	Mid June	Mid August
9062692	72	2	Late May	Early June	Late August
9058543	108	3	Mid June	Late June	Mid August
9062708	96	3	Mid June	Late June	Late August
9062703	84	3			Late August
9062665	90	1	Mid June	Early July	Mid August
9063706	84	3	Mid June	Late June	Late August
9062708	96	3	Mid June	ate June	Late August

9062711	108	3	Late June	Late June	Mid August
9062677	96	5	Late June	Early July	Mid August
9058569	96	2	Early June	Mid June	Mid August
9062694	72	3	Early June	Mid June	Mid August

Rating scale for abundance and disease - 1 = best, 5 = average, 9 = very poor, 0 = none or dead.

[1] Joe Snider is a biologist at the Jamie L. Whitten Plant Materials Center, Coffeeville, MS.