TECHNICAL NOTES

COFFEEVILLE PLANT MATERIALS CENTER

No. 1 Coffeeville, Mississippi 1985

INITIAL EVALUATION OF YELLOW BLUESTEMS

Abstract

Three outstanding experimental yellow bluestems from the Southern Great Plains Research Center in Floodward, Oklahoma were tested at the Coffeeville PMC to determine which would be better adapted to the Southeast. 'Plains' and 'King Ranch' bluestems were used for comparison. The best producer of forage was an experimental variety, WW-477 (PI-301477), but it was more susceptible to cold injury and matured later. than the others. Because of much variation among the varieties, the variety to be used would depend on the climate of the region and the part of the summer when peak production is desired.

Introduction

Yellow bluestem (Bothriochloa ischaemum (L.) Keng.) is a perennial, warm-season grass that is native to Eurasia. It was first brought to the United States in the early part of the twentieth century. One variety (P. ischaemum var. songarica), 'King Ranch', named for the ranch in Texas where it was grown in the 1930's, has been widely grown in the southwest. Yellow bluestems are very diverse genetically. Several varieties have been blended to produce the variety 'Plains'. Much research on yellow bluestems has been done at the Southern Great Plains Research Station and elsewhere in Oklahoma (Sims and Dewald, 1982; Dalrymple et. al., *1984).*

In 1982, three of the superior accessions developed at the Southern Great Plains Research Station at Woodward, Oklahoma were sent to the Coffeeville PMC to determine which of their outstanding accessions would be better adapted in the Coffeeville area.

Materials and Methods

Plant materials assembled at the Coffeeville Plant Materials Center for this initial evaluation included:

PI Number	Cultivar
301477	ww-477
301535	Selection from Plains
301573	WW-Spar
433944	Plains
476987	King Ranch

Plant materials received as seed were planted in rows 1/4 inch deep in May 1982. Prior to planting, the field (Oaklimeter sil., 0-2 percent slopes) had been pulverized and treated with methyl bromide for weed control. Fertilizer (13-13-13) had been applied at the rate of 600 lbs./acre.

Each accession was planted in a single row 6 meters long and 2 meters apart. The plants were cultivated and fertilized when necessary.

Evaluations were made periodically throughout the growing season (1982-84) according to standard procedures described in the National Plant Materials Manual. Data were stored in the National Plant Materials Data Base at Fort Collins, Colorado. Emphasis was placed or factors related to foliage and seed production, hardiness, and date of maturity. King Ranch was the standard for comparison.

Clippings were taken from each row in 1983 and 1984. They were oven dried and a portion was sent to Mississippi State University for forage analysis.

Results

Except for height and width measured in centimeters, other evaluations were rated subjectively on a scale of 1 to 9 with 1 considered to have the best appearance. Evaluations were grouped by factors (forage, seed production, and vigor) that were considered important for selection. The visual rating (1-9) was subtracted from 10 to give the best the highest number. Then a composite score was calculated for each factor by an equation that gave higher values to accessions having the best individual evaluations. Decimals were moved so the values would be in the 10 to 100 order of magnitude. Means were compared using the Duncan's Multiple Range test. Evaluations are given in Table I.

Scores for foliage productivity (FOL PROD) were computed by the equation FOL PROD = FOL HT x FOL WD x (FOL ABN + FOL UNI) where:

1) FOL HT = Foliage height
2) FOL WD = Foliage width
3) FOL ABN = Foliage abundance
4) FOL UNI = Foliage uniformity

Duncan's Multiple Range test showed difference in the composite scores at both the 95 and 99 percent levels of confidence as follows:

CULTIVAR	MEAN	
w-477	213.2	a
Selection from Plains	105.7	b
King Ranch	101.9	b
WW Spar	101.5	b
Plains	94.8	b

Seed production (SD PROD) was calculated as follows:

SD PROD = (SD AMT x SD FIL) x (SD UNI + SD LOD) where:

1) SD AMT = Seedhead amount
2) SD FIL = Seedhead fill
3) SD UNI = Seed uniformity
4) SD LOD = Lodging

An analysis of variance showed no significant difference between species or years for seed production.

Vigor (VIG) or overall appearance was calculated by the equation VIG = (V1 - V2)/2 where:

1) V1 = Early season vigor
2) V2 = Mid-season vigor

Differences in vigor were not significant except for WW-477 where the early season vigor was low reflecting its susceptibility to cold.

Discussion

Data for these initial evaluations are mostly qualitative rather than quantitive. However, a few clippings were made in 1983 and 1984. Plots consisted of one meter of row and were 1/2 meter wide. Oven dry weights in grams/plot (tons/acre) were as follows:

Cultivar	1983	1984a	1984b
King Ranch	41 (0.35)	1050 (9.06)	1100 (9.49)
Plains	215 (1.85)	750 (6.47)	950 (8.20)
WW spar	457 (3.94)	925 (7.98)	1025 (8.84)
Selection from Plains	863 (7.45)	825 (7.12)	825 (7.12)
ww-477	151 (1.30)	1175 (10.14)	1100 (9.49)

Production could not be compared for the two years because of difference in sampling procedures. In 1983, only one sample was taken per accession at the boot stage. King Ranch was clipped May 26 and the others were taken June 13, thus accounting for the low production of King Ranch. In 1984, duplicate samples (a & b) were taken near maturity on September 9. Statistical analysis of 1984 clipping data still showed WW-477 to be the best producer.

Duncan's Multiple Range Test for the 1984 clippings showed no difference between accessions at the 99 percent confidence level. At the 95 percent level, differences were as follows:

CULTIVAR	AVERAGE GRAMS/PLOT	AVERAGE TONS/ACRE
ww-477	1137.5 a	9.81
WW spar	1087.5 ab	9.38
King Ranch	1075.0 abc	9.27
Plains	850.0 bc	7.33
Selection from Plains	825.0 c	7.12

Clippings were sent to the Forage Laboratory at Mississippi State University with the following results:

	Calculated Digestible Protein (%)	Calculated TDN (%)	Energy Therms/cwt	Apparent Quality
King Ranch				
1983	9.01	53.37	39.72	Fair
1984	4.69	51.09	36.54	Poor
Average	6.85	52.23	38.13	
Plains				
1983	11.32	52.36	38.30	Fair
1984	3.89	50.97	36.54	Poor
Average	6.75	51.66	37.42	
301573				
1983	11.12	50.88	36.25	Poor
1984	4.37	49.47	34.28	Poor
Average	7.74	50.18	35.26	
301535				
1983	10.68	53.40	39.75	Fair
1984	4.18	46.63	30.33	Poor
Average	7.43	50.02	35.04	
ww-477				
1983	7.65	50.89	36.26	Poor
1984	6.15	53.17	39.43	Fair
Average	6.90	52.03	37.84	
ALL				
1983	9.96	52.18	38.06	
1984	4.65	50.27	35.42	
Average	7.31	51.22	36.74	

The data were too few to show statistically that one accession has the best forage quality, but they do indicate what forage quality is at the boot stage and when the plant is approaching maturity.

Conclusion

All of these yellow bluestems performed well at the Coffeeville PMC. They had good forage and seed production and were excellent reseeders. They stood heat and drought well and were reasonably resistent to insects and disease. WW-477 winter suffered injury but once regrowth started, it became the best forage producer although it matured later than the others.

The proper cultivar to use in the area served by the Coffeeville PMC would depend on the climate and time one wanted peak production. Perhaps the varieties are also influenced differently by soil characteristics. More testing in field plantings and field evaluation plantings would be needed to show which variety is best adapted to each MLRA and climatic region. Some tests are underway but not enough data have been collected to be conclusive.

One probable solution, if one wishes to use yellow bluestems, would be to use a mixture and let nature select for the genotype that is best adapted when a recommended variety is lacking.

Reference

Dalrymple, R. L., Jerry Rogers, and Lynn Timberlake. ***1984.*** Old World bluestem comparison. Agricultural Division, Noble Foundation Report ***AB-84.***

Sims, Phillip L., and Chester L. Dewald. ***1982.*** "Old World Bluestems and Their Forage Potential for the Southern Great Plains." United States Department of Agriculture - Agricutlural Reasearch Service Bulletin ***ARM-S-28.***

TABLE 1. EVALUATION FOR YELLOW BLUESTEMS AT COFFEEVILLE PMC
Project 28I582G

PI NUMBER	YR RC	FOL HT	FOL WD	FOL ABN	FOL UNI	% STD	VIG 1	VIG 2	SD AMT	SD FIL	SD UNI	SD LOD	SD HT	BLOOM DATE	MATUR DATE
301477	82	90	130	1	1	100	3	1	1	3	1	3	106	09/30	11/05
	83	86	122	1	1	100	3	1	3	3	1	3	122	07/07	08/04
	84	92	145	1	1	100	6	1	3	1	3	1	120	09/20	10/06
301535	82	61	120	3	1	100	1	3	1	3	1	3	110	08/12	09/15
	83	46	110	1	3	100	1	1	3	3	1	3	93	06/20	07/17
	84	61	122	3	1	100	1	1	1	4	1	3	120	06/20	07/24
301573	82	71	100	3	5	100	3	5	3	3	1	3	90	07/27	09/15
	83	46	96	3	1	100	1	1	1	3	1	5	88	06/13	07/14
	84	75	110	1	1	100	1	1	1	5	1		125	06/20	07/24
434944	82	61	100	3	1	100	3	3	3	3	1	3	90	08/12	09/07
	83	38	90	3	1	100	3	3	3	3	1	5	90	06/20	07/20
	84	75	110	3	1	100	2	1	1	3	1	1	115	06/20	07/24
476987	82	86	100	3	1	100	3	1	3	5	1	7	76	08/26	09/23
	83	38	86	3	1	100	3	3	1	3	1	5	90	05/25	07/14
	84	61	135	3	3	100	2	1	1	3	1	2	130	06/20	07/24

Legend:

YR RC = Year of Record
FOL HT = Foliage Height (cm)
FOL WD = Foliage Width (cm)
FOL ABN = Foliage Abundance (a)
FOL UNI = Foliage Uniformity (a)
% STD = Percent Stand
VIG 1 = Early Season Vigor (a)
VIG 2 = Mid-season Vigor (a)
SD AMT = Seedhead Amount (a)
SD FIL = Seedhead Fill (a)
SD UNI = Seed Uniformity (a)
SD LOG = Lodging (a)
SD HT = Seedhead height (cm)
MATUR DATE = Date of Seed Maturation

(a) = Rated on scale of 1 to 9 (1=Excellent, 5=Average, 9=Very poor)