Forage Yields from Five Years of Summer Annual Variety Trials

THE SAMUEL ROBERTS NOBLE FOUNDATION

by J.P. Johnson, S.L. Norton and J.A. Barrick

NF-SO-10-01

Introduction

In an effort to assist producers in Oklahoma and Texas, the Noble Foundation has conducted trials to determine hay yields of commercially available varieties of pearl millet and sorghum species, including forage sorghum, sudan and sorghum sudan hybrids. This report summarizes results from the 2001-2004 and 2008 trials. Trials were not conducted between 2005-2007.

Trial Procedures

The 2001-2004 trials were conducted at the Noble Foundation Headquarters Farm (HQ) near Ardmore, Okla., and the 2008 trial was conducted at the Noble Foundation Dupy Farm near Gene Autry, Okla. Soil types were Heiden clay (2001) and Wilson silt loam (2002-2004) at HQ and Dale silt loam (2008) at Dupy. Entries were provided by seed companies who market varieties in the region (Table 3). The 2001-2004 trials were all rain-fed, while in 2008 one rain-fed and one irrigated trial were conducted.

The entries were seeded into a clean-tilled seedbed each year around the end of April. Each entry was drilled in 7-inch rows at 1-inch depth using a Hege 500 drill. Plot size was 5 by 20 feet. Seeding rate was 15 lbs/ac for pearl millet and 25 lbs/ac for sorghum species. Soil testing was done each year and nitrogen fertilizer was broadcast so that applied and soil residual nitrogen totaled 70 lbs N/ac at emergence. In addition, 50 lbs N/ac was top-dressed after each harvest if another harvest was expected. Soil pH and potassium were acceptable and phosphorus was applied according to Noble Foundation soil test recommendations when necessary. In 2001-2004, plots were harvested with a Hege sickle bar forage plot harvester, and in 2008 plots were harvested with a Carter flail forage harvester. Harvest was done to simulate haying and occurred as near as possible to when the plants were approximately late boot to early flower stage. For pearl millet, this was once per year except for the 2008 irrigated trial when it was harvested twice. For sorghum species, plots were typically harvested two or three times per year.

The trials were randomized complete block designs with four replications. Entries were blocked by crop and randomized within each replication. Data was analyzed by year and species with general linear analysis of variance for the mean in Statistix 9.0, and means were separated by the least significant difference (LSD) method (alpha = 0.05).

Results and Discussion

Yields were highly variable, as was growing season rainfall, during the trial years. Precipitation (rainfall and irrigation) from the date of planting through Sept. 30 for each year and the 30-year average are shown in Table 5. It is interesting to compare the yields with the growing season total precipitation. The years with ▸

higher rainfall do not necessarily have higher yields, and the years with lower rainfall do not necessarily have lower yields. When the precipitation amounts by month are examined, it becomes clear that months with extreme amounts of precipitation are detrimental to yield. Test years with more uniform rainfall from month to month, such as 2002, 2008 and 2008 irrigated, tended to have higher total forage yields compared to years with wide variations in rainfall from month to month such as 2001, 2003 and 2004. The year of 2001 was very dry, causing all entries to reach the permanent wilting point during the month of July. In 2003 and 2004, the months of July and May, respectively, had less than 1 inch of rainfall which limited yields, but also had months of rainfall in excess of 8 inches, May and June, respectively, which delayed harvest and further reduced yields.

Yields varied from a low of 1,785 lbs/ac in 2001 to a high of 15,624 lbs/ac in 2002 for pearl millet and 1,779 lbs/ac in 2001 to 25,224 lbs/ac in 2008 irrigated for sorghum species. Since weather is unpredictable, look for varieties that have performed well over multiple site years. (Tables 1 and 2)

Test results for the forage quality factors of crude protein (CP), acid detergent fiber (ADF) and total digestible nutrients (TDN) varied by entry, harvest, location and year. Forage quality values from each harvest of each plot in 2008 are summarized in Table 4. While averages may vary for different harvests in different years, the minimum and maximum show the range of what should be expected.

Table 1. Forage yields (lbs/ac dry matter) of pearl millets at Ardmore, Okla., by year including mean yields and least significant differences at alpha = 0.05

Variety (Source)	2001	2002	2003	2004	2008 rain-fed	2008 irrigated
ETS 300 (ETS)					4,603	11,512
GrazeKing (MBS)					5,166	11,629
Grazer 63 (Warn)					4,851	10,659
Hybrid Pearl (Agri)		11,904	6,507	4,489		
Leafy 60 (MBS)	1,785	15,624	7,665	4,260		
Millex 32 (SorgP)					4,692	11,245
Pennleaf (Penn)	1,829	13,717	8,708	4,950	4,283	10,050
PP102M (ProP)					4,716	10,944
Mean	1,807	13,748	7,627	4,566	4,719	11,006
LSD	320	1,714	2,462	1,690	621	1,683

Pearl Millet

Pearl millet varieties tended not to have significant differences in yield within any given year. In the 2008 rain-fed test year, only the highest and lowest yielding varieties were significantly different from each other. Only in 2002 was each variety significantly different from every other variety. In other years, all varieties were statistically similar. Even though the average yields for pearl millet are less than the average yields for sorghum species in five of the six years, the savings in fertilizer and harvest costs for a single harvest versus multiple harvests may make pearl millet an attractive crop. Also note that the CP and TDN are higher and the ADF is lower for pearl millet than for sorghum species.

Sorghum Species

The forage sorghum varieties we evaluated did not yield as well as sorghum sudan and sudan varieties under rain-fed conditions. Specialty traits for sorghum species include brown midrib (BMR) and photoperiod sensitive (PS or PPS). This trial was not designed to compare the quality of BMR or PPS varieties with non-BMR or non-PPS varieties, so no direct comparisons for nutritive value of these will be made. Again, with such large differences in weather and yield from year to year, look for varieties that have performed well over multiple site years. ■

Table 2. Forage yields (lbs/ac dry matter) of forage sorghum (FS), sorghum sudan (SS) and sudan (SU) at Ardmore, Okla., by year including mean yields and least significant differences at alpha = 0.05						
Variety (Source) Type	2001	2002	2003	2004	2008 rain-fed	2008 irrigated
1990 (SorgP) FS					7,962	22,611
8493 (Warn) SS					16,029	25,224
2 Way (Warn) FS					9,349	22,661
2S (Warn) SS					17,464	22,901
4Ever Green PPS (Moss) FS	1,989		5,514	5,355		
Century BMR (Moss) SS	4,168	13,665	3,376	5,556		
Fastgrass 5 (MBS) SS	4,635	18,114	4,847	11,296	19,253	25,063
FS 6810 BMR (Coff) FS					10,163	19,331
Gotcha Plus (MBS) SS			4,229	7,681	16,653	23,572
Gotcha PPS (MBS) SS	1,779		9,613	3,681		
Haymaster BMR (MBS) SS	3,916	12,476	4,186	7,764		
Hegari (MBS) FS	2,607		4,648	4,944		
Maxigain (Coff) SS			5,192	8,201	13,299	16,799
Mega Green PPS (Moss) SS	2,038		8,112	6,568		
Millenium BMR (Moss) FS	2,459		4,987	4,812		
Nutri Plus (ProP) SS		11,701	3,119	7,872		
Pacesetter PS (MBS) SS					15,410	21,415
Penn02 BMR (Penn) FS			5,683	6,552		
Piper (MBS) SU		15,713	3,640	5,107	17,322	21,982
Planter's Pride 2000 (ETS) SS					14,798	19,784
Redtop+ BMR (ProP) FS			4,657	8,345		
Silo 700d (MBS) FS					9,622	18,623
Sordan Headless (SorgP) SS					13,577	22,363
Su 2 LM (Moss) SS		7,862	3,398	8,028		
Sugar Graze Ultra PS (Coff) SS					13,415	22,078
Sumac (MBS) FS	2,849		6,016	6,348		
Summergrazer III (Penn) SS	4,604	16,110	4,826	8,867	17,908	25,147
Surpass BMR (Coff) SS					14,737	16,289
Sweet Grazin (John) SS	4,096	16,404	4,812	11,187		
Sweet Sunnysue (ProP) SS		18,080	4,150	6,836	17,411	24,104
Trudan 8 (SorgP) SU					16,468	22,833
Mean	3,194	14,458	5,001	7,105	14,491	21,821
LSD	809	4,508	2,345	2,353	3,871	3,380

Table 3. Contributors to the summer annual variety trials	
Agri	Agri Products, Ardmore, Okla.
Coff	Coffey Seed, Plainview, Texas
ETS	East Texas Seed, Tyler, Texas
John	Johnston Seed, Enid, Okla.
MBS	MBS Seed, Denton, Texas
Penn	Pennington Seed, Madison, Ga.
ProP	Production Plus, Plainview, Texas
SorgP	Sorghum Partners, New Deal, Texas
Moss	Walter Moss Seed, Waco, Texas
Warn	Warner Seed, Hereford, Texas

Table 4. Minimum, average and maximum values for crude protein (CP), acid detergent fiber (ADF) and total digestible nutrients (TDN) from all pearl millet and sorghum species plots at Ardmore, Okla., in 2008

	Minimum	Average	Maximum
Pearl Millet CP	7.3	13.9	19.4
Pearl Millet ADF	33.9	36.8	43.2
Pearl Millet TDN	55.2	60.3	62.5
Sorghum Species CP	6.9	10.9	14.9
Sorghum Species ADF	35.6	42.1	52.9
Sorghum Species TDN	47.7	56.1	61.1

Table 5. Monthly precipitation (inches) and 30-year (1971-2000) average precipitation for the Ardmore mesonet from planting thru the end of the season

Year	Apr	May	Jun	Jul	Aug	Sep	Growing Season Total
30-year	3.19	5.08	4.26	2.48	2.51	4.17	21.69
2001	aaa	3.01	3.21	0.0	xxx	xxx	6.22
2002	1.07	2.44	2.08	2.18	5.77	1.26	14.80
2003	0.41	8.32	4.71	0.14	1.13	3.90	18.61
2004	5.11	0.53	9.83	5.23	2.0	0.31	23.01
2008	aaa	4.5	2.4	1.42	3.22	1.88	13.42
2008 irrigated	aaa	4.75	2.9	4.32	3.22	1.88	17.07

aaa plots not planted until May
xxx permanent wilting point reached in July terminating plot growth

THE SAMUEL ROBERTS
NOBLE
FOUNDATION

The Samuel Roberts Noble Foundation
2510 Sam Noble Parkway
Ardmore, Oklahoma 73401
Phone: (580) 223-5810
www.noble.org