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## Summer annual forages in south central Kansas

### Abstract

Six summer annuals and three forage sorghums were evaluated for forage yield and quality under south central Kansas dryland conditions. When cut in the late boot to early heading stage, all forage types (millet, sudan, sorghum-sudan, and forage sorghum) produced similar dry matter yields, with no consistent differences in nutritional quality. Allowing the forages to reach maturity prior to cutting increased total yield per acre but decreased the crude protein content. The millets were higher in protein at maturity than the sudans or forage sorghums. However, the forage sorghums produced the most mature forage, whereas common sudan yielded the least. Cool, moist conditions during the growing season allowed the forages to develop slowly.

### Keywords

Cattlemen's Day, 1993; Kansas Agricultural Experiment Station contribution; no. 93-318-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 678; Beef; Summer annuals; Forage sorghum; Yield; Forage quality; Nitrate

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## SUMMER ANNUAL FORAGES IN SOUTH CENTRAL KANSAS

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### Summary

Six summer annuals and three forage sorghums were evaluated for forage yield and quality under south central Kansas dryland conditions. When cut in the late boot to early heading stage, all forage types (millet, sudan, sorghum-sudan, and forage sorghum) produced similar dry matter yields, with no consistent differences in nutritional quality. Allowing the forages to reach maturity prior to cutting increased total yield per acre but decreased the crude protein content. The millets were higher in protein at maturity than the sudans or forage sorghums. However, the forage sorghums produced the most mature forage, whereas common sudan yielded the least. Cool, moist conditions during the growing season allowed the forages to develop slowly.

(Key Words: Summer Annuals, Forage Sorghum, Yield, Forage Quality, Nitrate.)

### Introduction

Summer annual forages offer Kansas livestock producers flexibility either as substitutes for perennial warm-season grasses in complementary forage grazing systems or as hedges for harvested forage during periods of low rainfall. Because summer annual forage types and cultivars have different growth characteristics, it is important that summer

annual selection be based on intended use (grazing, haying, or silage). This study compared the yield and nutritional quality of six summer annuals and three forage sorghums.

### Experimental Procedures

Field plots were established on the South Central Kansas Experiment Field in June of 1992. The plot area received a broadcast application of 91 lbs nitrogen and 40 lbs phosphate incorporated 2 to 4 inches deep with a field cultivator. Two side-by-side sets of the nine forages were planted on June 15 in four replications of 5 by 30 ft plots. The forage types evaluated included three millets, two sudans, one sorghum-sudan, and three forage sorghum hybrids. A modified KEM plot drill with a belt cone metering device was used to seed the forages about 3/4 inch deep in randomly assigned plots at 15 lbs per acre in 8-inch rows. One set of plots was harvested at the late boot to early heading stage and the regrowth was cut at first frost. The second set of plots was harvested at grain maturity.

The agronomic data collected for each plot included stage of maturity, plant height, and dry matter yield. At each harvest, forage samples were collected and sent to Peterson Laboratories, Inc. in Hutchinson, Kansas and analyzed for crude protein, acid detergent fiber (ADF), nitrate, and prussic acid. The

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plots were harvested using a Carter forage harvester set to a cutting height of 6 to 7 inches.

### **Results and Discussion**

Yield and forage quality results for the two sets of six summer annuals and three forage sorghum are shown in Table 1. The vegetatively cut plots were harvested on August 17, and the regrowth was cut on October 23. The second set of plots cut at grain maturity was harvested on September 17. The growing season in 1992 was considerably better than that of 1990, when the forage yield and quality in a similar study (1991 Cattlemen's Day Rept. of Prog. 623) were affected by abnormally dry, hot conditions. The 1992 growing season was cool and moist, allowing for excellent forage production.

Average dry matter yields at the vegetative cutting stage were similar across forage (millet, sudan, sorghum-sudan, and forage sorghum) types. However, cultivar differences were observed, with common sudan, German foxtail millet, and FF 555 forage sorghum having the lowest vegetative yields. When cut in the vegetative state, no consistent differences in crude protein, fiber, nitrate, or prussic acid were noted across forage types.

When cut at grain maturity, the forage sorghums had the highest dry matter yields, and common sudan had the lowest yield. The pearl and foxtail millets tended to be higher in crude protein at maturity. In general, those cultivars that tended to have higher leaf to stem ratios also had higher crude protein levels. This is consistent with previous work in Kansas. Forage nitrate levels were quite high in spite of advanced plant maturity in several cultivars. Prussic acid (cyanide) was very low in all cultivars at all cutting stages.

Two summer annuals, Haygrazer sorghum-sudan and Trudan 8 sudan, had the highest regrowth potential. Millet regrowth was surprisingly low. Indeed, there was insufficient regrowth of 404 GM pearl millet and German foxtail millet for harvest. The regrowth of all forage types was substantially lower in protein, fiber, and nitrate than vegetative or mature cuttings. However, Tifleaf pearl millet regrowth contained much more nitrate than other cultivars harvested.

The variation in forage yield and quality of the summer annuals utilized in this study emphasizes the importance of cultivar selection based on intended use for grazing, hay, or silage.

**Table 1. Yield and Nutritional Quality of Summer Annual Forages in 1992**

Cultivar <sup>1</sup>	Plant height	Dry matter	DM yield	Nitrate (NO <sub>3</sub> )	Prussic acid	Crude protein	ADF <sup>2</sup>
	inches	%	ton/A	----- PPM -----	-----	----- % -----	
----- Vegetative Cutting -----							
Common Sudan	78	26.0	3.22	3525	7.5	9.1	44
GM 404 HPM	81	18.1	4.36	7300	4.3	8.7	43
German Millet FM	44	23.6	3.59	3925	4.5	9.4	41
Haygrazer SS	103	21.8	4.30	6850	6.8	10.1	41
Tifleaf HPM	46	18.3	4.17	4130	4.8	11.5	39
Trudan 8 Sudan	106	20.4	4.21	6600	5.5	8.4	41
Silomaker FS	79	16.2	4.43	7225	8.3	8.2	42
Milk-A-Lot FS	69	18.1	4.28	9075	14.8	11.0	39
FF 555 FS	86	15.0	3.56	7900	4.8	8.5	41
LSD <sup>3</sup>	6.8	.02	.8	5430	3.7	2.0	2
% CV <sup>4</sup>	6	8	13	59	38	15	4
----- Regrowth Cutting -----							
Common Sudan	49	46.5	1.58	511	11.8	4.6	18
GM 404 HPM	---	---	---	---	---	---	---
German Millet FM	---	---	---	---	---	---	---
Haygrazer SS	47	27.0	2.70	726	17.3	3.2	9
Tifleaf HPM	16	60.3	.78	4855	21.0	8.0	25
Trudan 8 Sudan	39	28.0	2.43	722	24.3	3.3	10
Silomaker FS	34	27.1	1.95	633	28.8	3.1	10
Milk-A-Lot FS	30	29.5	2.08	779	29.3	4.0	10
FF 555 FS	34	27.3	1.49	840	16.8	3.3	9
LSD <sup>3</sup>	7	.05	.42	1260	15	.8	3
% CV <sup>4</sup>	13	10	15	65	47	12	16
----- Mature Cutting -----							
Common Sudan	82	43.8	3.39	3725	7.5	6.1	49
GM 404 HPM	94	41.4	5.98	12450	13.3	8.2	45
German Millet FM	49	58.9	4.76	9125	9.5	8.6	42
Haygrazer SS	104	37.6	6.28	4650	11.8	5.8	44
Tifleaf HPM	64	34.8	7.01	12900	10.5	9.2	42
Trudan 8 Sudan	106	43.7	6.89	7850	10.8	6.9	42
Silomaker FS	90	32.0	8.59	9250	20.8	6.0	40
Milk-A-Lot FS	76	33.9	7.86	15150	18.5	7.5	44
FF 555 FS	107	33.3	8.48	6100	13.8	6.8	35
LSD <sup>3</sup>	6.3	.04	1.26	8911	5.8	1.4	3
% CV <sup>4</sup>	5	6	13	68	31	13	5

<sup>1</sup>HPM = hybrid pearl millet; FM = foxtail millet; SS = sorghum × sudan; FS = forage sorghum.

<sup>2</sup>ADF = acid detergent fiber.

<sup>3</sup>LSD = least significant difference (P < .05).

<sup>4</sup>CV = coefficient of variation among cultivars.

<sup>5</sup>Insufficient regrowth for harvest.