The Agriculture Program
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2001 Texas Panhandle Irrigated Sorghum SilageTrial

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Introduction:
The feedyard industry is currently the largest consumer of silage in the Texas High Plains. However, dairy production in the area is steadily increasing and should create additional demand for quality silage. With the decreasing water table and increasing demand for silage, irrigation water may soon be the limiting factor in beef cattle and dairy production.

Sorghum silage requires less water than corn, but growers have not widely produced this crop because of a preference for corn silage by the feedyards. Sorghum silage contains less energy but a similar roughage value as corn silage. However, new varieties of brown midrib sorghum have energy values intermediate to corn and conventional sorghum. Because of declining water levels and increased pumping costs, the production of corn silage in some locations cannot be sustained. However, new genetics in sorghum may provide an opportunity for an alternative crop to corn that would reduce water usage but produce acceptable silage for the cattle feeding and dairy industry.

In this study, different types and varieties of forage sorghum were compared for their silage yield and nutritional value. In addition, grain yields were compared to two traditional grain sorghum varieties since many forage sorghum varieties can be grown either for silage or grain production. This data will be useful in obtaining and setting loan deficiency payments and for obtaining insurance for forage sorghum varieties that are suitable to be used as a multi-purpose crop (hay, silage, or grain). Since corn is the primary source of silage in the Panhandle, four corn varieties were planted adjacent to the forage sorghum trial for comparison.

Materials and Methods:
In 2001 silage yield of fifty-three sorghum varieties were compared under full irrigation. Sorghum types included brown mid-ribs (BMRs), photoperiod sensitive, male sterile, sorghum/sudan crosses (haygrazer) and traditional grain producing varieties. It should be noted that grain was harvested in the male-sterile varieties because of cross-pollination from adjacent plots. Irrigation scheduling was determined by using moisture (gypsum) blocks placed in the soil at depths of 1, 2, and 3 feet. Moisture blocks were read two to three times weekly and plots were irrigated when readings of the average of the blocks fell below 60. A total of 13.2 inches of irrigation water along with 8.6 inches of rainfall from May through October were used to grow the crop. Other cultural practices are outlined below.

Sorghum Silage Trial

Trial Location:	Bush Farm. Located 1.5 miles north of Bushland, TX.
Cooperator:	Texas Agricultural Experiment Station

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Previous Crop:	Fallow
Previous Herbicide:	None
Soil Type:	Pullman Clay Loam, pH = 7.4
Plot Size:	Four, 30 inch rows by 25 feet long
Replications:	3
Study Design:	Randomized Complete Block
Planting Date:	May 16, 2001
Planting Rate:	120,000 seed/acre
Planting Depth:	1.5 inches
Seed Method:	Bedded
Soil Moisture:	Good at planting
Fertility:	Combination of 32-0-0 and 10-34-0. Applied 160 lbs N and 30 lbs P2O5 per acre and incorporated with a rolling cultivator.
Herbicide:	1.2 lb/acre atrazine plus 1 qt/acre crop oil applied the day after planting.
Irrigation:	13.2 inches of water was applied by furrow irrigation during the growing season.

Rainfall:		Irrigation Timing:	
May:	3.6 inches	Jul 5:	4.26 inches
June:	0.8 inches	Jul 18:	3.50 inches
July:	0.6 inches	Jul 27:	2.69 inches
Aug:	3.0 inches	Aug 8:	2.72 inches
Sept:	0.5 inches		
Oct:	0.1 inches		

Corn Silage Trial

Unless stated cultural practices were identical to those in the sorghum silage trial.

Corn Hybrids:	Four corn hybrids ranging from 93 to118 days in maturity were planted
Plot Size:	Six, 30 inch rows by 300 ft.
Replications:	None. Yield was obtained by collecting silage and grain from 4 sites in each corn hybrid strip.
Seeding Rate:	34,000 seed/acre
Planting Date:	April 23, 2001
Herbicide:	1 lb atrazine applied at planting
Irrigation:	Total irrigation water applied ranged from 25.4 to 30.9 inches depending on hybrid. Average irrigation water applied was 28.2 inches.

Data Collected:

Sorghum

- Height at silage harvest.
- Lodging as a percentage of fallen plants per plot at harvest (silage).
- Silage yield was collected from 1 meter of row in each plot and reported as tons/acre at 65% moisture. Silage yields were collected on Aug-30, Sep-06, Sep-20, and Oct-2 when each entry reached the soft-dough stage. Photoperiod sensitive entries were harvested on Oct-2.
- Grain yield was collected on Oct-23 from 10 feet of row in each plot. Samples were thrashed and yield reported at 14% moisture.

Corn

- Silage yield was determined from each hybrid by collecting silage from 1 meter of row at four sites within each hybrid and is reported as tons/acre at 65% moisture. Silage yields were collected from the 93 and 107 day hybrids on Aug-07, and from the 117 and 118 day hybrids on Aug-15.
- Grain yield was obtained from each hybrid by collecting ears from10 feet of row at four sites within each hybrid on Sep-06. Samples were thrashed and yield reported at 15.5% moisture.

Results and Discussion:

The average sorghum silage produced was 25.4 tons/acre using 13.2 inches of irrigation water (Table 1). Total tonnage was highest with the photoperiod sensitive varieties yielding an average of 33 tons/acre. The non-BMR forage sorghum varieties yielded 6.5% (1.5 tons/acre) more than the BMR sorghum. However, it is important to note that the BMR sorghum varieties ranged in yield from 14.6 to 36.7 tons/acre (Table 2). Interestingly, at silage harvest there was slightly less lodging in the BMR varieties (10.8%) than in the Non-BMR varieties (18.7%). This was also observed in a trial conducted in 2000 (http://soil-testing.tamu.edu/publications/862648-2000Foragesorghumtrail.pdf).

Corn silage yields ranged from 18.9 to 29.9 tons/acre, averaging 23.8 tons/acre (Table 1). This was actually 6.3% less than the average of the sorghum silage. Similar to the sorghum silage, corn silage was irrigated based on moisture block readings. An average of 28.2 inches of irrigation water was applied to the corn silage. When irrigation water use efficiency was examined, sorghum produced over twice as much silage as corn for every acre-inch of water applied.

Table 1. Silage yield, lodging, and irrigation water use efficiency by sorghum type and corn.

Sorghum Type	Number of Entries	Silage Yield, Ton/acre	% Lodging at Silage Harvest	Irr. Water Use Eff., Tons/Inch
Forage Sorghum (Excludes PS, haygrazers, grain sorghums)	43	24.5	14.6	1.87
Haygrazer	2	23.5	29.2	1.79
Photoperiod Sensitive (PS)	6	33.0	6.4	2.51
Brown Mid-Rib (BMR)	20	23.1	10.8	1.76
Non-BMR (Excludes BMR, PS and grain sorghum)	25	25.6	18.7	1.94
Grain Sorghum	2	24.3	0	1.84
Test Average	53	25.4	13.6	1.93
Corn	4	23.8	0	0.84

Table 2. 2001 Comparison of Forage Sorghum Varieties for Standibility, Silage Production, and Grain Yield.

Entry	Variety	Company	Plant Characteristics[1)]			Silage					Grain Yield lb/Ac[3)]
			Maturity	Brown Midrib	Male Sterile	Harvest Date	Plant Ht.(Ft.)	% Lodged[2)]	% Plant Moisture	Yield Ton/Ac[2,3)]	
1	MAXI-GAIN	Coffey Forage Seeds, Inc	PS	N	N	2-Oct	7.8	0 j	72	41.0 ab	0 q
2	SUGAR GRAZE ULTRA	Coffey Forage Seeds, Inc	PS	N	N	2-Oct	9.3	8 ij	73	35.0 a-e	0 q
3	GW 9110F	Crosbyton Seed Company	ML	N	N	20-Sep	9.7	20 g-j	63	24.6 b-g	3,218 h-o
4	SILO N FEED	Crosbyton Seed Company	ML	N	N	20-Sep	7.9	60 abc	58	34.6 a-e	3,253 h-o
5	GW 8528 F BMR	Crosbyton Seed Company	M	Y	N	22-Aug	6.5	2 ij	70	17.7 efg	5,716 b-h
6	GW 9530F	Crosbyton Seed Company	ML	N	Y	30-Aug	6.6	0 j	68	25.9 b-g	6,962 a-e
7	GARST 344 BMR	Garst/Agripro Seed Company	L	Y	N	6-Sep	8.5	40 def	68	36.7 a-d	4,877 d-l
8	GARST NO348X	Garst/Agripro Seed Company	ML	Y	N	30-Aug	8.1	5 ij	71	21.7 c-g	2,328 l-q
9	GARST 335X	Garst/Agripro Seed Company	ML	Y	N	30-Aug	7.4	3 ij	65	20.0 d-g	4,874 d-l
10	H-45	Golden Harvest/J.C. Robinson	M	N	N	30-Aug	5.7	0 j	61	22.7 b-g	6,788 a-e
11	EX 47	Golden Harvest/J.C. Robinson	ML	Y	N	22-Aug	6.7	3 ij	63	23.8 b-g	4,643 e-m
12	SILAMAX BMR	Kelly Green Seeds	M	Y	N	30-Aug	8.3	7 ij	66	17.3 efg	2,690 j-p
13	MMR 304/24	MMR Genetics	L	N	N	22-Aug	4.5	0 j	62	13.8 g	6,266 a-f
14	DEKALB FS-5	Monsanto	ME	N	N	30-Aug	8.5	0 j	70	28.4 a-g	4,943 d-k
15	DEKALB DKS 59-09	Monsanto	ME	N	N	30-Aug	5.7	0 j	69	21.9 c-g	7,638 abc
16	DEKALB FS25E	Monsanto	ML	N	N	2-Oct	8.6	58 bc	66	33.1 a-f	3,562 h-n
17	4EVER GREEN	Walter Moss Seed Company	PS	N	N	2-Oct	10	10 hij	76	39.8 abc	0 q
18	MEGA GREEN	Walter Moss Seed Company	PS	N	N	2-Oct	8.8	5 ij	72	27.2 b-g	0 q
19	MILLENIUM BMR	Walter Moss Seed Company	L	Y	N	30-Aug	7.2	13 hij	67	27.2 b-g	2,190 m-q
20	NC+ NUTRI-CANE II	NC+ Hybrids	M	N	Y	2-Oct	7	0 j	65	29.4 a-g	5,339 c-i
21	NC+ NUTRI-CHOICE II	NC+ Hybrids	ML	N	N	20-Sep	6.3	2 ij	66	29.0 a-g	5,422 c-i
22	NC+ NUTRI-TON	NC+ Hybrids	M	N	N	2-Oct	7	10 hij	49	28.0 b-g	4,813 d-l
23	NC+ 8R18	NC+ Hybrids	ML	N	N	6-Sep	4.2	0 j	61	25.8 b-g	8,350 a
24	811F	Pioneer Hi-Bred Int. Inc.	PS	N	N	2-Oct	9.5	8 ij	74	26.3 b-g	0 q
25	979	Pioneer Hi-Bred Int. Inc.	ML	N	Y	30-Aug	7.3	25 f-i	65	25.3 b-g	591 pq
26	NUTRI PLUS BMR	Production Plus	ML	Y	N	30-Aug	7.1	33 d-g	68	21.6 c-g	1,232 n-q
27	RED TOP PLUS BMR	Production Plus	ML	Y	Y	30-Aug	7.5	2 ij	69	26.0 b-g	3,269 h-o
28	SILO PLUS BMR	Production Plus	ML	Y	N	30-Aug	6.6	17 g-j	64	17.3 efg	3,290 h-o
29	DAIRY MASTER BMR	Richardson Seeds, Inc.	ML	Y	N	30-Aug	7.5	5 ij	66	28.4 a-g	2,458 k-p
30	PACESETTER	Richardson Seeds, Inc.	PS	N	N	2-Oct	10	7 ij	73	28.5 a-g	0 q
31	SILO 600D	Richardson Seeds, Inc.	M	N	N	30-Aug	6.1	0 j	65	17.0 efg	7,224 a-d
32	SILO 700D	Richardson Seeds, Inc.	ML	N	N	20-Sep	6.9	10 hij	61	31.2 a-g	6,714 a-e
33	SILO MASTER D	Richardson Seeds, Inc.	L	N	N	20-Sep	9.2	30 e-h	66	33.1 a-f	2,740 j-p
34	X32735 BMR	Richardson Seeds, Inc.	M	Y	N	30-Aug	6.9	3 ij	67	19.4 d-g	3,923 f-m
35	X32736 BMR	Richardson Seeds, Inc.	ML	Y	N	2-Oct	8.4	12 hij	70	31.3 a-g	1,231 n-q
36	CANEX	Sharp Brothers Seed	E	N	Y	22-Aug	6.2	0 j	72	15.7 fg	3,612 g-n
37	CANEX BMR 208	Sharp Brothers Seed	ME	Y	N	22-Aug	7.2	5 ij	66	19.4 d-g	5,052 d-j
38	CANEX BMR 310	Sharp Brothers Seed	ME	Y	N	22-Aug	6.3	0 j	65	20.5 d-g	4,924 d-k

Table 2. 2001 Comparison of Forage Sorghum Varieties for Standibility, Silage Production, and Grain Yield.

Entry	Variety	Company	Plant Characteristics[1)]			Silage					Grain Yield lb/Ac[3)]
			Maturity	Brown Midrib	Male Sterile	Harvest Date	Plant Ht.(Ft.)	% Lodged[2)]	% Plant Moisture	Yield Ton/Ac[2,3)]	
39	CANEX BMR 702	Sharp Brothers Seed	ME	Y	Y	30-Aug	6.7	0 j	66	14.6 g	5,014 d-j
40	CANEX II	Sharp Brothers Seed	ME	N	N	22-Aug	6.7	0 j	68	22.9 b-g	4,048 f-m
41	BIG CROP 101E	Seed Inc.	ML	N	N	20-Sep	9.6	70 ab	66	46.1 a	2,996 i-o
42	BIG CROP 101FS	Seed Inc.	ML	N	Y	30-Aug	6.5	2 ij	68	20.6 d-g	6,160 a-g
43	FAME	Seed Resource	ME	N	N	22-Aug	6.5	0 j	62	17.6 efg	6,649 a-e
44	FS-555	Seed Resource	M	N	N	20-Sep	10	60 abc	64	20.0 d-g	4,430 e-m
45	SUG-R-CANE	Seed Resource	M	N	Y	30-Aug	6.3	0 j	70	20.1 d-g	5,628 b-h
46	BMR 100	Seed Resource	M	Y	N	30-Aug	7.4	50 cd	70	29.4 a-g	4,714 d-m
47	2-WAY SRS	Warner Seeds, Inc.	ML	N	N	20-Sep	9.5	77 a	68	23.6 b-g	2,742 j-p
48	3-WAY F-145	Warner Seeds, Inc.	ML	N	N	20-Sep	9.7	45 cde	66	27.6 b-g	3,633 g-n
49	WXF-104	Warner Seeds, Inc.	M	Y	N	22-Aug	6.4	3 ij	66	17.1 efg	5,047 d-j
50	WXF-107	Warner Seeds, Inc.	M	Y	N	30-Aug	7.5	5 ij	65	24.1 b-g	3,649 g-n
51	WXF-108	Warner Seeds, Inc.	ML	Y	N	2-Oct	8.3	8 ij	69	29.0 a-g	1,016 opq
52	CHECK 1 (A571)	TAES - Grain Sorghum	ML	N	N	30-Aug	4.2	0 j	61	25.5 b-g	7,904 ab
53	CHECK 2 (84G62)	TAES - Grain Sorghum	M	N	Y	30-Aug	3.9	0 j	57	23.3 b-g	8,220 a
LSD (P=.05)								12.8		9.9	1380.3
Standard Deviation								7.9		6.2	853.8
CV								57.9		24.2	21.4

[1)] Maturity: PS=photoperiod sensitive, ML=medium-long, M=medium, L=late or full season, ME=medium-early, E=Early or short season.

[2)] Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls).

[3)] Silage was harvested at the soft dough stage. Photoperiod sensitive varieties were harvested Oct. 2. Silage data is reported at 65% moisture.

Nutrient Analysis

Materials and Methods:
The plots were harvested when each entry was in or near soft dough stage. Forage was harvested from 1 meter of row in each plot. Forage was chopped at harvest and subsampled. Subsamples were immediately frozen. The Dairy One Laboratory, Ithaca, NY, analyzed samples. All nutritional constituents were adjusted to a 100% moisture-free basis.

Definitions:

Rank:	Relative ranking of variety based on nutritional constituent; 1 = best
Crude Protein:	6.25 * % total nitrogen.
NDF:	% neutral detergent fiber; cell wall fraction of the forage.
ADF:	% acid detergent fiber; constituent of the cell wall includes cellulose and lignin; inversely related to energy availability.
Lignin:	constituent of ADF; considered indigestible.
IVTD:	% in vitro true digestibility; positively related to energy availability.
NEl:	Estimate of Net Energy for lactation.
NEm:	Estimate of Net Energy for maintenance.
NEg:	Estimate of Net Energy for gain.
P =	% Phosphorus.
P/ac =	%P * forage yield (lbs DM/ac); reported because of interest in crops that will remove P from soils fertilized with livestock manure.
IVTD/ac:	%IVTD * forage yield (lbs DM/ac).

Results:
A listing of each individual variety is available in the accompanying table 3. A more detailed report containing more mineral constituents and estimates of various protein fractions is available upon request.

A statistical analysis comparing the brown mid-rib to other types of sorghum silage is presented in the following table.

Type	CP, %	ADF, %	NDF, %	Lignin, %	IVTD, %	CP, lbs/ac	IV Digestible Dry Matter, lbs/ac
BMR	9.2	27.6	45.9	3.6	81.3	1482	13133
Range	6.9 to 10.5	24.3 to 35.0	40.7 to 60.1	2.8 to 4.5	75.1 to 84.22	935 to 2362	8500 to 20751
Non-BMR	8.3	29.9	49.1	4.4	75.5	1492	13670
Range	6.3 to 10.8	21.3 to 41.7	33.9 to 67.5	2.7 to 6.4	60.9 to 83.6	916 to 2139	8050 to 22617
P-value	0.0001	0.01	0.02	0.0001	0.0001	0.89	0.42

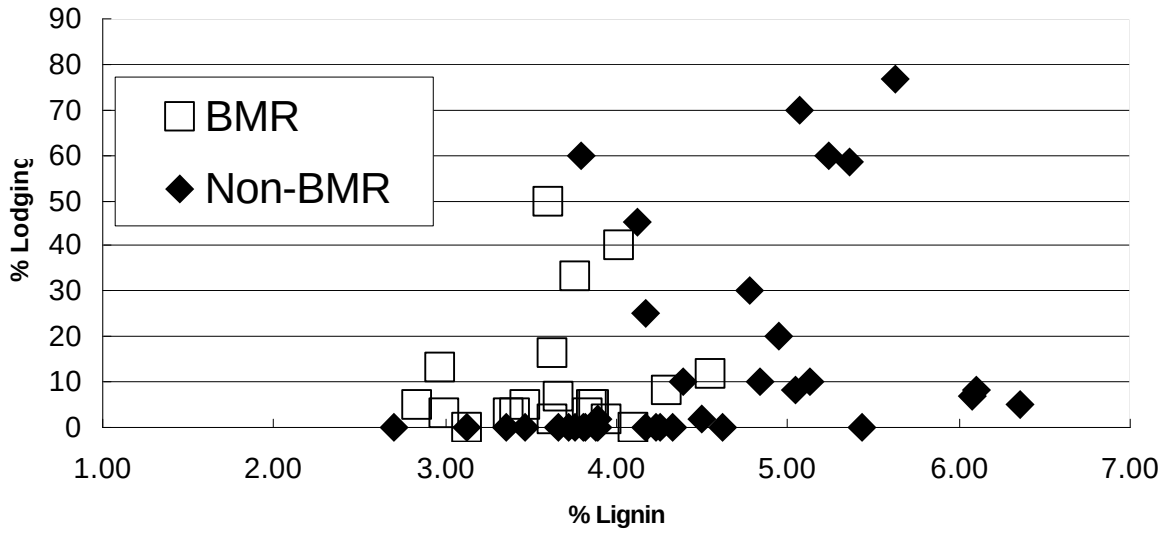
On average, the BMR varieties contained more CP, less ADF and NDF, and less lignin. The lower fiber and lignin contents resulted in silage that had a 5.8% unit higher in vitro digestibility indicating that the BMR silage on average contained more available energy. Expanding to a per acre production value, there were no differences in yield of CP or in-vitro digestible dry matter. Therefore, the yield of nutrients per acre was the same for the two types but the nutrient density

was greater in the BMR varieties. All of these observations reflect those from the 2000 variety test. The data discussed above are averages of the two types. An important point is the variation within the varieties. Note that despite the averages being different for the protein, fiber, lignin, and digestibility, there was a great deal of overlap among the BMR and non-BMR types. For instance, the average in-vitro digestibility values for BMR and non-BMR were 81.3% and 75.5%, but there were some BMR varieties that were less digestible than the high end of the non-BMR varieties and some non-BMR varieties that were as digestible as the high end of the BMR varieties. So the designation of "BMR" or non-BMR does not necessarily mean an individual variety was better or worse than other alternatives.

The corn varieties were not included in the type comparison above. The means and ranges for the four corn varieties are presented in the following table.

Type	CP, %	ADF, %	NDF, %	Lignin, %	IVTD, %	CP, lbs/ac	IV Digestible Dry Matter, lbs/ac
Corn	9.0	23.9	41.2	3.5	82.7	1493	13697
Range	8.4 to 9.7	18.2 to 27.4	33.7 to 45.8	2.7 to 4.2	78.3 to 88.1	1175 to 1759	11668 to 16488

One concern with the BMR varieties has been the potential for lodging because of reduced lignin in the stem. Below is a scattergram with the % of lignin (bottom axis) and the % lodging (side axis). Note that despite the lower lignin values, the BMR varieties were no more susceptible to lodging than the non-BMR varieties.



These results indicate that variety selection must be based on comparative data for individual varieties. Simply choosing a variety based on the "type" (i.e. BMR or non-BMR or corn) does not guarantee that nutrient density and other characteristics will be more or less desirable.

For a more detailed report of chemical and nutrient composition, contact Ted McCollum, Extension Beef Cattle Specialist, Amarillo (806-359-5401; ft-mccollum@tamu.edu).

Table 3. 2001 Forage Sorghum Variety Trial Nutrient Analysis.

Entry	Variety	Brown Midrib	Male Sterile	Type	% Crude Protein	% Crude Protein Rank	% ADF	% ADF Rank	% NDF	% NDF Rank	% Lignin	% Lignin Rank	% IVTD	% IVTD Rank
1	MAXI-GAIN	N	N	PS	7.23 n-r	43	37.16 a-d	50	61.68 a-d	50	5.43 b-d	51	66.32 s-v	52
2	SUGAR GRAZE ULTRA	N	N	PS	6.71 p-r	50	40.36 a	54	64.58 a-c	52	6.10 ab	54	62.55 uv	54
3	GW 9110F	N	N	forage sorghum	6.58 qr	51	32.83 d-i	43	54.89 d-g	45	4.94 c-i	45	68.81 rs	49
4	SILO N FEED	N	N	forage sorghum	7.37 m-r	42	34.99 b-e	49	58.12 c-f	47	5.23 b-f	49	69.50 p-s	46
5	GW 8528 F BMR	Y	N	forage sorghum	9.78 a-f	12	26.26 k-r	17	42.76 k-o	14	3.94 j-s	29	82.80 a-g	11
6	GW 9530F	N	Y	forage sorghum	9.80 a-f	11	25.88 l-s	16	43.06 k-o	16	3.80 l-u	20	77.40 g-n	34
7	GARST 344 BMR	Y	N	forage sorghum	9.38 b-i	20	27.78 i-q	25	46.12 h-n	29	4.01 j-s	30	81.25 b-k	19
8	GARST NO348X	Y	N	forage sorghum	7.93 j-p	37	29.58 f-o	36	48.17 g-m	35	3.86 l-u	24	83.76 a-d	4
9	GARST 335X	Y	N	forage sorghum	10.09 a-d	6	25.77 m-s	15	44.26 j-o	18	3.00 t-w	4	83.43 a-e	8
10	H-45	N	N	forage sorghum	9.05 c-j	26	26.51 k-r	19	42.95 k-o	15	4.23 g-r	35	75.21 l-o	40
11	EX 47	Y	N	forage sorghum	10.28 a-c	3	25.04 n-s	10	41.18 m-p	9	3.36 r-w	7	84.22 a-c	3
12	SILAMAX BMR	Y	N	forage sorghum	8.63 f-l	31	27.56 j-q	23	46.05 i-n	28	3.66 m-v	15	82.57 b-h	13
13	MMR 304/24	N	N	forage sorghum	9.98 a-e	7	24.85 o-s	6	40.70 m-p	6	3.87 l-t	25	83.02 a-f	9
14	DEKALB FS-5	N	N	forage sorghum	8.65 f-l	30	27.98 h-q	27	44.90 j-n	22	4.62 d-l	42	78.31 e-n	31
15	DEKALB DKS 59-09	N	N	forage sorghum	9.71 a-g	13	22.25 r-t	3	37.09 op	3	3.13 s-w	6	82.00 b-j	17
16	DEKALB FS25E	N	N	forage sorghum	7.10 o-r	46	34.95 b-e	47	58.49 b-f	48	5.36 b-e	50	69.26 q-s	48
17	4EVER GREEN	N	N	PS	7.52 l-r	41	38.44 a-c	51	63.97 a-c	51	5.13 c-g	48	66.51 s-u	51
18	MEGA GREEN	N	N	PS	6.43 r	54	41.70 a	55	67.48 a	55	6.36 a	55	60.94 v	55
19	MILLENIUM BMR	Y	N	forage sorghum	9.32 b-i	21	25.46 m-s	12	42.70 k-o	13	2.96 u-w	3	83.50 a-e	7
20	NC+ NUTRI-CANE II	N	Y	forage sorghum	8.50 g-m	33	25.66 m-s	14	42.33 k-o	11	3.66 m-v	15	78.48 d-n	29
21	NC+ NUTRI-CHOICE II	N	N	forage sorghum	7.87 j-p	39	29.85 f-o	37	49.27 g-k	38	3.89 k-t	27	76.16 k-n	39
22	NC+ NUTRI-TON	N	N	forage sorghum	6.53 qr	53	31.18 e-k	41	51.12 f-j	41	4.83 c-j	44	74.83 m-p	42
23	NC+ 8R18	N	N	forage sorghum	9.94 a-e	8	21.13 st	2	33.93 p	2	3.36 r-w	7	83.61 a-e	6
24	811F	N	N	PS	7.77 k-q	40	39.52 ab	52	65.98 ab	54	5.04 c-h	46	68.30 r-t	50
25	979	N	Y	sorhum x sudan	10.22 a-c	4	28.08 h-q	28	44.49 j-o	21	4.17 h-r	33	76.67 j-n	37
26	NUTRI PLUS BMR	Y	N	sorhum x sudan	10.52 ab	2	27.73 j-q	24	45.20 j-n	24	3.76 l-u	18	75.08 l-o	41
27	RED TOP PLUS BMR	Y	Y	forage sorghum	9.70 a-g	14	26.92 k-r	21	45.35 j-n	25	3.63 n-v	13	79.42 c-m	24
28	SILO PLUS BMR	Y	N	forage sorghum	9.94 a-e	8	24.89 o-s	8	40.77 m-p	7	3.63 n-v	13	82.62 b-g	12
29	DAIRY MASTER BMR	Y	N	forage sorghum	8.26 i-o	36	24.86 o-s	7	43.43 k-o	17	2.84 vw	2	82.34 b-h	15
30	PACESETTER	N	N	PS	6.32 r	55	40.35 a	53	65.16 a-c	53	6.08 ab	53	62.90 t-v	53
31	SILO 600D	N	N	forage sorghum	10.13 a-c	5	29.98 e-n	38	49.81 g-k	40	3.89 k-t	27	76.27 k-n	38
32	SILO 700D	N	N	forage sorghum	8.52 g-m	32	29.10 g-p	34	46.96 h-n	32	4.39 f-o	39	78.68 d-m	28
33	SILO MASTER D	N	N	forage sorghum	7.14 n-r	45	32.84 d-h	44	53.71 e-h	44	4.77 c-k	43	73.15 n-r	44

Table 3. 2001 Forage Sorghum Variety Trial Nutrient Analysis.

Entry	Variety	Brown Midrib	Male Sterile	Type	% Crude Protein	% Crude Protein Rank	% ADF	% ADF Rank	% NDF	% NDF Rank	% Lignin	% Lignin Rank	% IVTD	% IVTD Rank
34	X32735 BMR	Y	N	forage sorghum	9.61 a-h	17	25.13 n-s	11	40.65 m-p	5	3.40 q-w	9	81.42 b-k	18
35	X32736 BMR	Y	N	forage sorghum	6.98 p-r	48	34.97 b-e	48	60.09 a-e	49	4.55 d-m	41	77.57 g-n	33
36	CANEX	N	Y	forage sorghum	9.55 b-h	19	26.63 k-r	20	45.09 j-n	23	3.82 l-u	22	80.99 b-k	22
37	CANEX BMR 208	Y	N	forage sorghum	9.94 a-e	8	25.56 m-s	13	42.49 k-o	12	3.87 l-t	25	81.09 b-k	21
38	CANEX BMR 310	Y	N	forage sorghum	9.66 a-g	16	24.27 p-s	5	41.62 l-o	10	3.12 s-w	5	83.63 a-e	5
39	CANEX BMR 702	Y	Y	forage sorghum	9.06 c-j	24	27.90 h-q	26	48.22 g-m	36	4.09 i-r	31	82.20 b-i	16
40	CANEX II	N	N	forage sorghum	9.13 c-j	22	28.54 h-q	31	44.46 j-o	20	4.33 g-p	38	80.42 c-l	23
41	BIG CROP 101E	N	N	forage sorghum	6.56 qr	52	32.54 d-j	42	51.56 f-j	42	5.06 c-h	47	70.09 o-s	45
42	BIG CROP 101FS	N	Y	forage sorghum	8.84 d-k	28	29.49 f-o	35	47.94 g-m	33	4.50 e-n	40	77.17 h-n	35
43	FAME	N	N	forage sorghum	10.84 a	1	24.99 n-s	9	39.96 n-p	4	3.72 l-v	17	82.81 a-g	10
44	FS-555	N	N	forage sorghum	7.07 o-r	47	28.21 h-q	29	45.87 i-n	27	3.80 l-u	20	79.20 c-m	25
45	SUG-R-CANE	N	Y	forage sorghum	8.40 h-n	34	28.93 g-q	33	47.98 g-m	34	4.25 g-r	36	78.70 d-m	27
46	BMR 100	Y	N	forage sorghum	9.06 c-j	24	30.94 e-l	40	49.36 g-k	39	3.59 o-v	12	77.91 f-n	32
47	2-WAY SRS	N	N	forage sorghum	7.16 n-r	44	33.61 c-g	45	53.32 e-i	43	5.63 a-c	52	69.43 p-s	47
48	3-WAY F-145	N	N	forage sorghum	7.92 j-p	38	30.22 e-m	39	48.92 g-l	37	4.12 i-r	32	74.50 m-q	43
49	WXF-104	Y	N	forage sorghum	8.82 e-k	29	28.57 g-q	32	46.53 h-n	31	3.83 l-u	23	81.22 b-k	20
50	WXF-107	Y	N	forage sorghum	9.61 a-h	17	28.25 h-q	30	46.21 h-n	30	3.46 p-w	10	82.43 b-h	14
51	WXF-108	Y	N	forage sorghum	6.94 p-r	49	34.28 c-f	46	57.80 c-f	46	4.29 g-q	37	76.81 i-n	36
Corn1	NC+ 7117	N	N	corn	9.69 a-g	15	27.36 k-q	22	45.79 i-n	26	4.17 h-r	33	78.33 d-n	30
Corn2	NC+ 3709	N	N	corn	8.86 d-k	27	18.20 t	1	33.73 p	1	2.70 w	1	88.07 a	1
Corn3	Novartis N3030	N	N	corn	9.08 c-j	23	23.88 q-s	4	41.01 m-p	8	3.47 p-w	11	85.92 ab	2
Corn4	Novartis N83-N5	N	N	corn	8.39 h-n	35	26.28 k-r	18	44.45 j-o	19	3.76 l-u	18	78.75 d-m	26

Table 3. 2001 Forage Sorghum Variety Trial Nutrient Analysis.

Entry	% TDN	% TDN Rank	NEL (Mcal/lb)	NEL (Mcal/lb) Rank	NEM (Mcal/lb)	NEM (Mcal/lb) Rank	NEG (Mcal/lb)	NEG (Mcal/lb) Rank	% P	% P Rank	P (lbs/ac)	P (lbs/ac) Rank	IVTD (lbs/ac)	IVTD (lbs/ac) Rank
1	58.28 r-u	50	0.52 o-r	50	0.52 p-s	50	0.27 s-w	50	0.19 k-p	46	55.5 a	2	19103 a-c	3
2	56.37 u	54	0.48 q-s	52	0.49 rs	53	0.24 vw	53	0.19 k-p	46	46.8 a-d	8	15342 b-n	18
3	64.10 k-q	41	0.61 j-n	42	0.62 i-o	41	0.36 k-r	41	0.17 op	53	27.4 f-k	50	11422 h-r	40
4	61.79 o-s	46	0.57 n-p	47	0.58 m-q	46	0.32 p-u	47	0.16 p	55	39.6 a-k	25	17185 a-f	6
5	68.06 c-k	20	0.70 b-h	16	0.69 c-h	18	0.42 c-j	18	0.24 b-h	11	30.1 d-k	45	10311 l-r	47
6	68.69 b-j	16	0.71 b-h	14	0.70 b-h	15	0.43 b-i	15	0.23 c-j	20	41.6 a-j	21	14034 c-p	24
7	67.17 d-m	29	0.68 d-k	27	0.67 d-k	29	0.41 d-m	24	0.22 e-k	24	55.3 a	3	20751 ab	2
8	66.49 e-n	32	0.66 d-l	33	0.66 e-l	32	0.40 d-n	31	0.21 f-m	37	32.5 d-k	42	12780 d-r	29
9	69.76 b-h	10	0.71 b-h	14	0.72 b-g	9	0.44 b-h	11	0.24 b-i	11	33.6 d-k	38	11680 g-r	36
10	67.57 d-l	25	0.69 c-i	19	0.68 c-i	24	0.41 c-k	24	0.21 g-n	37	33.5 d-k	39	11909 f-r	35
11	70.10 b-g	8	0.73 b-e	5	0.73 b-e	5	0.45 b-e	8	0.26 a-c	5	44.2 a-g	17	14026 c-p	25
12	67.44 d-l	27	0.68 d-j	27	0.68 d-j	24	0.41 c-k	24	0.21 h-n	37	25.3 i-k	53	10062 m-r	49
13	68.80 b-j	15	0.72 b-g	9	0.71 b-h	12	0.44 b-i	11	0.27 a-c	2	26.1 h-k	52	8050 r	55
14	66.21 f-o	34	0.67 d-k	31	0.66 d-l	32	0.40 e-n	31	0.22 d-k	24	44.5 a-g	15	15516 b-m	16
15	72.15 a-c	3	0.76 a-c	3	0.76 a-c	3	0.48 ac	3	0.27 ab	2	40.7 a-j	22	12553 d-r	30
16	60.94 q-t	49	0.56 n-p	48	0.57 n-q	48	0.31 q-u	48	0.20 i-o	44	46.1 a-d	11	15946 b-k	14
17	57.91 s-u	51	0.50 p-s	51	0.51 p-s	51	0.26 t-w	51	0.21 f-m	37	55.3 a	3	17920 a-d	4
18	54.56 u	55	0.44 s	55	0.46 s	55	0.21 w	55	0.20 i-o	44	38.9 a-k	28	11572 h-r	38
19	70.54 b-f	6	0.73 b-f	5	0.73 b-e	5	0.46 b-e	4	0.24 b-h	11	46.4 a-d	9	15960 b-k	13
20	69.51 b-i	11	0.72 b-h	9	0.71 b-g	12	0.44 b-i	11	0.22 d-k	24	47.2 a-d	7	16171 b-k	11
21	66.14 f-o	35	0.65 f-l	37	0.65 f-m	36	0.39 f-o	35	0.22 e-k	24	44.7 a-f	14	15475 b-m	17
22	64.10 k-q	41	0.62 i-n	41	0.62 i-o	41	0.36 j-r	41	0.18 m-p	50	34.3 d-k	37	14524 c-o	21
23	72.70 ab	2	0.78 ab	2	0.77 ab	2	0.49 ab	2	0.24 b-i	11	43.0 a-h	19	15136 c-o	19
24	57.69 s-u	52	0.48 q-s	52	0.51 q-s	51	0.26 u-w	52	0.22 e-k	24	39.4 a-k	27	12468 d-r	32
25	67.81 c-k	23	0.69 c-i	19	0.69 c-i	18	0.42 c-k	18	0.26 a-d	5	45.9 a-e	12	13556 d-q	27
26	67.53 d-l	26	0.69 c-i	19	0.68 c-i	24	0.41 c-k	24	0.25 a-f	8	38.6 a-k	29	11366 i-r	41
27	68.01 c-k	21	0.69 c-i	19	0.69 c-i	18	0.42 c-k	18	0.22 f-l	24	39.6 a-k	25	14420 c-o	22
28	69.17 b-j	13	0.72 b-g	9	0.71 b-h	12	0.44 b-i	11	0.23 c-i	20	27.9 f-k	48	9983 n-r	50
29	70.74 b-e	5	0.72 b-g	9	0.73 b-e	5	0.46 b-f	4	0.22 d-k	24	44.8 a-f	13	16573 b-i	9
30	56.70 tu	53	0.48 rs	52	0.49 rs	53	0.24 vw	53	0.18 l-p	50	36.8 c-k	32	12535 d-r	31
31	65.44 h-p	38	0.64 h-m	40	0.64 g-n	38	0.38 g-p	38	0.24 b-i	11	27.9 f-k	48	8950 p-r	52
32	65.86 g-p	37	0.66 e-l	33	0.65 f-m	36	0.39 f-o	35	0.22 d-k	24	54.6 ab	5	17801 a-e	5
33	63.35 l-q	43	0.61 k-n	42	0.61 j-o	43	0.35 l-r	43	0.22 e-k	24	52.3 a-c	6	17103 b-g	7

Table 3. 2001 Forage Sorghum Variety Trial Nutrient Analysis.

Entry	% TDN	% TDN Rank	NEL (Mcal/lb)	NEL (Mcal/lb) Rank	NEM (Mcal/lb)	NEM (Mcal/lb) Rank	NEG (Mcal/lb)	NEG (Mcal/lb) Rank	% P	% P Rank	P (lbs/ac)	P (lbs/ac) Rank	IVTD (lbs/ac)	IVTD (lbs/ac) Rank
34	69.89 b-g	9	0.73 b-f	5	0.72 b-f	9	0.45 b-f	8	0.24 b-i	11	32.4 d-k	43	11002 k-r	45
35	60.98 q-t	48	0.55 n-q	49	0.56 o-r	49	0.31 r-v	48	0.19 k-p	46	42.8 a-i	20	16877 b-h	8
36	67.84 c-k	22	0.69 c-i	19	0.69 c-i	18	0.42 c-k	18	0.25 a-g	8	27.1 g-k	51	8929 p-r	53
37	68.27 b-k	17	0.70 b-h	16	0.70 b-h	15	0.43 b-i	15	0.27 a-c	2	35.8 c-k	35	11080 j-r	42
38	71.00 a-d	4	0.74 a-d	4	0.74 a-d	4	0.46 a-d	4	0.24 b-h	11	35.3 c-k	36	12012 f-r	34
39	66.66 d-n	31	0.67 d-l	31	0.67 d-k	29	0.40 d-m	31	0.21 f-m	37	22.6 k	55	8500 qr	54
40	67.29 d-l	28	0.69 c-i	19	0.68 d-j	24	0.41 d-l	24	0.22 d-k	24	36.0 c-k	34	12860 d-r	28
41	62.78 m-q	44	0.61 j-n	42	0.60 k-o	44	0.34 m-r	44	0.17 n-p	53	55.8 a	1	22617 a	1
42	64.83 j-q	40	0.65 g-m	37	0.64 h-n	38	0.38 i-q	38	0.23 c-j	20	32.9 d-k	41	11064 j-r	43
43	69.34 b-i	12	0.72 b-f	9	0.72 b-g	9	0.45 b-g	8	0.26 a-e	5	32.1 d-k	44	10206 l-r	48
44	68.12 c-k	19	0.69 d-j	19	0.69 c-i	18	0.42 c-k	18	0.23 c-i	20	28.5 e-k	47	10965 k-r	46
45	66.38 e-n	33	0.66 d-l	33	0.66 e-l	32	0.40 e-n	31	0.21 g-n	37	29.8 d-k	46	11039 j-r	44
46	65.29 i-q	39	0.65 g-m	37	0.64 g-n	38	0.38 h-q	38	0.22 f-l	24	43.9 a-g	18	16106 b-k	12
47	61.63 p-s	47	0.59 l-n	45	0.58 m-q	46	0.32 o-s	46	0.19 j-p	46	33.2 d-k	40	11543 h-r	39
48	66.12 f-o	36	0.66 e-l	33	0.66 f-m	32	0.39 f-o	35	0.22 f-l	24	44.3 a-g	16	14968 c-o	20
49	67.65 d-l	24	0.68 c-i	27	0.68 c-i	24	0.41 c-k	24	0.21 g-n	37	24.9 jk	54	9690 o-r	51
50	68.17 c-k	18	0.69 c-i	19	0.69 c-i	18	0.42 c-j	18	0.24 b-i	11	39.9 a-k	24	13843 c-q	26
51	62.54 n-r	45	0.58 m-q	46	0.59 l-p	45	0.33 n-s	45	0.18 l-p	50	36.5 c-k	33	15577 b-l	15
Corn1	66.81 d-n	30	0.68 d-k	27	0.67 d-k	29	0.41 d-m	24	0.24 b-i	11	37.5 b-k	30	12420 e-r	33
Corn2	75.19 a	1	0.81 a	1	0.81 a	1	0.53 a	1	0.28 a	1	37.4 b-k	31	11668 g-r	37
Corn3	70.36 b-f	7	0.73 a-e	5	0.73 b-e	5	0.46 b-e	4	0.25 a-h	8	40.5 a-j	23	14214 c-p	23
Corn4	68.85 b-j	14	0.70 b-h	16	0.70 b-h	15	0.43 b-i	15	0.22 e-k	24	46.4 a-d	9	16488 b-j	10