

Final Report

2015 Field Demonstrations of Sorghum Forages for the California Dairy Industry

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Introduction

The San Joaquin Valley of California is home to a multi-million dollar dairy industry. Poor winter moisture this past year and inadequate water allocations created serious forage shortages in the Valley. We observed an increase in forage sorghum acres this past year as growers tried to make use of limited irrigation. The demand for water in California encouraged a renewed look at crops and cropping systems that conserve water and maintain both yield and quality. Sorghum is known for its inherent drought tolerance and this was the fifth year of sorghum forage trials planted at the Kearney Agricultural Research and Extension Center and the Westside Research and Extension Center to evaluate commercially available sorghum forages.

Methods and Materials

Six seed companies provided a total of 41 hybrids, which included traditional forage sorghums, Photoperiod Sensitive (PS) forage sorghums, and brown mid-rib (BMR) derivatives of both traditional and PS sorghums. Hybrids were planted in a randomized block design in four row plots planted on 30-inch raised beds and were analyzed as a split-plot design. Irrigation was applied using furrow irrigation at Kearney and a combination of overhead sprinklers and flood irrigation at the Westside Center. Fertility applications followed similar recommendation for forage sorghums for the region. The 2015 growing season was characterized by little winter precipitation and poor soil moisture reserves throughout the growing season. Both trials limited irrigation due to the drought and reduced water allocations at each Center. A preplant irrigation of 5.13 inches was applied May 21, 2015 and Kearney received a total of 16.88 inches of applied irrigation. Rainfall totals from January through June 2015 prior to planting at KARE were 2.88 inches, while 0.15 inches of rainfall were recorded throughout the growing season. Rainfall totals from January through June prior to planting at Westside were 1.00 inches, while 0.17 inches of rainfall were recorded throughout the growing season. At the West Side REC site, seed was planted into dry soil and then irrigated using a total of 2.82 inches delivered between June 4 through June 19 using sprinklers. Total irrigation applications of 17.23 inches were recorded for the full growing season. Trials were harvested 100 days after planting.

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Other cultural practices and study information are listed below:

Trial Location: Kearney Agricultural Research & Extension Center, Parlier
Cooperator: UC-ANR
Previous Crop: Beans (summer 2014)
Soil Type: Hanford sandy loam
Plot Size: Four, 30 inch rows by 20 ft
Replications: 3
Study Design: Split-Plot
Planting Date: June 1, 2015
Planting Rate: 100,000 seed acre⁻¹
Seed Method: John Deere Max-emerge Planter
Fertilizer: Urea at 225 lbs acre⁻¹
Herbicide: Dual Magnum at 1.3 pints per ac⁻¹ as a pre-plant
Irrigation: See narrative above
Silage Harvest Date: Plots were harvested with a mechanical forage cutter on September 11, 2015

Trial Location: Westside Research and Extension Center, Five Points
Cooperator: UC-ANR Extension
Previous Crop: Winter forage (wheat grown for silage-not taken to grain)
Soil Type: Panoche clay loam
Plot Size: Four, 30 inch rows by 20 ft
Replications: 3
Study Design: Split-Plot
Planting Date: June 6, 2014
Planting Rate: 100,000 seed acre⁻¹
Seed Method: John Deere Max-emerge Planter
Fertilizer: 200 lbs acre⁻¹ N-P-K 11-52-00 on June 1 and 100 lbs acre⁻¹ N on June 25
Herbicide: Dual Magnum at 24 oz ac⁻¹ as a pre-plant on June 2; Prowl-H₂O as layby at 24 oz ac⁻¹ on July 6
Irrigation: Sprinklers for pre-irrigation and stand establishment, gated pipe furrow irrigation – see narrative for amounts
Silage Harvest Date: Plots were harvested September 21, 2015

Data Collected:

1. Plant stands
2. Plant height (cm) at silage harvest
3. Lodging at silage harvest. Percent of fallen or significantly leaning plants per plot.
4. Moisture Content at Harvest.
5. Forage (silage) yield. The middle two rows of each plot were harvested with a John Deere forage chopper and placed into a modified weigh wagon. Yields are reported at 65% moisture in tons/acre.
6. Nutrient analysis: Samples were collected from the forage chopper in the field, weighed and then placed in forced air Gruenberg oven (Model T35HV216, Williamsport, PA) at 50° C until dried. These sub-samples were sent to Dairyland Laboratory, Inc, Arcadia, WI for analysis.

7. Key Nutrient Analysis Definitions

- a. Crude Protein: 6.25 times % total nitrogen
 - b. TDN: Estimate of Total Digestible Nutrients
 - c. NDF: Neutral Detergent Fiber; cell wall fraction of the forage
 - d. ADF: % Acid Detergent Fiber; constituent of the cell wall includes cellulose and lignin; inversely related to energy availability
 - e. NDFd30: amount of neutral detergent fiber digested in 30 hours; approximates the amount of fiber utilized by a cow
 - f. NDFd240: amount of neutral detergent fiber digested in 240 hours; approximates the amount of fiber utilized by a cow
 - g. RFV: Relative Feed Value is an index for comparing forages based on digestibility and intake potential. RFV is calculated from ADF and NDF. An RFV of 100 is considered the average score and represents alfalfa hay containing 41% ADF and 53% NDF on a dry matter digestibility.
 - h. Milk lbs/ton: A projection of potential milk yield per ton for forage dry matter.
- Data was analyzed using the SAS statistical package.

Results

A summary of yield, agronomic traits and nutritional analyses are reported by types of forage sorghums grown in the two locations, Kearney and Westside in Table 1. See Tables 2 and 3 for a comparison of the different hybrids agronomic, yield, and nutritional characteristics.

Table 1. Summary of key forage characteristics by type of forage grown at two locations, Kearney and Westside.

Sorghum Type ¹	% Lodging @ Harvest ²	Tons/ac @65% Moist. ²	% Crude Protein ²	% ADF ²	% NDF ²	% Lignin ²	% Starch ²	% NDF D30 ²	% NDF D240 ²	Milk lbs/ton DM ²	Relative Feed Value (RFV) ²
PSBMR (7)	47.14 a	13.68 a	7.36 b	41.9 b	64.3 a	5.52 c	5.13 c	53.76 a	74.85 a	2203.6 b	82.36 bc
BMR (15)	36.01 a	14.15 a	7.98 a	37.5 c	56.9 c	5.23 d	11.86 a	52.17 a	70.24 b	2559.8 a	100.28 a
PSNonBMR (5)	37.68 a	13.34 a	6.07 d	44.1 a	65.6 a	6.39 a	3.74 c	44.61 b	66.96 c	1954.8 c	78.48 c
NonBMR (14)	35.66 a	14.17 a	6.78 c	41.3 b	61.5 b	6.07 b	8.38 b	45.83 b	66.27 c	2211.4 b	87.78 b
Trial Avg.	38.01	13.98	7.23	40.36	60.78	5.71	8.53	49.35	69.27	2306.2	90.29

¹Number in parenthesis is the number of hybrids in each sorghum type. BMR = brown midrib, PS = Photoperiod sensitive.

²Means followed by the same letter do not significantly differ using LSD (P=0.01)

Forage yields for the two locations ranged from a high of 18.1 to 11.4 tons acre⁻¹ with an average of 14.0 tons acre⁻¹ (see Tables 1 and 2). Highest yields were 6.1 tons acre⁻¹ less than the highest yields of 2014 and averages were 4.84 tons less than 2014. These lower yields are a direct reflection of the drought and the limited irrigations that were applied in an attempt to more efficiently use water allocations on the Centers. Forage yields were adjusted to 65% moisture. There were no significant differences in yield for the various types of forages, while in years past there were significant difference amongst types (Table 1). The different types may have different responses to drought and this could be reflected in the drops in yields from previous years. There was no significant difference in yields between Westside and Kearney.

Similar to previous reports, lodging can be a major issue for forage sorghums. Lodging ranged from 0.0 to 83% (Table 2). Lodging was consistent throughout the various types (Table 1), which was again a reflection of the stress that these forages were under this past year. Different management schemes are being contemplated to better understand the lodging issues seen at both locations. Planting studies and population work will be important in determining the correct stands for forage sorghums to reduce lodging issues. Better irrigation control (not over-irrigating), better control of nitrogen applications, and throwing dirt up around the stems to support brace root development are still appropriate management strategies for limiting the impact of lodging on overall yield.

Digestibility as measured by ADF, NDF, NDFd 30 and 240 and overall forage quality as measured by lbs of milk per dry ton and relative feed value was highest in the BMR sorghums (Table 1), though there were some excellent non-BMR forages as well (Table 3). Relative feed value and milk per dry ton were greater amongst hybrids grown at Kearney than those grown at Westside, which has been the case in other years. Nutritional information is important for establishing the baseline nutrition of the silage and is key to understanding the proper formulation of the feed for adequate nutrition for the dairy animal.

The top 25% hybrids were ranked in this study by taking those hybrids with the highest Milk lbs ton⁻¹ and eliminating those hybrids with lodging scores of greater than 17% (Table 4). Of these hybrids, yield ranged from a low of 12.3 tons acre⁻¹ with Chromatin/Sorghum Partners SP 3903 BD to a high of 17.9 tons acre⁻¹ with Chromatin/Sorghum Partners SPX 37214. Yields were influenced by the drought and overall yields were significantly lower than years past.

For many producers, yield is the greatest factor in their selection of sorghum forages. Table 5 highlights the top yielding hybrids that produced more than 14.0 tons acre⁻¹ of yield. The highest yielding forage sorghum was Gayland Ward Seed Co's Super Sugar Delayed Maturity (DM) at 18.1 tons acre⁻¹ followed closely Chromatin/Sorghum Partners' SPX 37214 at 17.9 tons acre⁻¹. Chromatin/Sorghum Partners SPX 37214 had no lodging and excellent estimated milk production.

Discussion

This was the fifth year that a wide range of forage sorghums (41), both commercially and experimental, were evaluated for both yield and quality parameters in large replicated trials in two locations in California. Drought throughout the state has caused severe water restrictions in many areas within the San Joaquin Valley and this severely impacted yields in this year's trials. Irrigations were restricted because of water allocations and attempts at each Center to conserve water. These water issues translated into less production in terms of yield. Work is continuing to evaluate management strategies to minimize lodging issues, optimize irrigation levels and management of fertilizer applications. Sorghum forages for the most part responded well to the limited irrigations and still produced respectable yields. Forage selection should be a combination of factors that optimize quality, yield and standability and will require additional management of feed rations to optimize the potential of these forage crops to supplement the feeding needs of dairies in the state.

Table 2. 2015 comparisons of sorghum forage hybrids and locations for agronomic characteristics and yield at Westside Research and Extension and Kearney Agriculture Research and Extension Centers by seed company.

Hybrid Information ¹					Lodging, Height and Forage Yield ²		
Hybrid	Company	Type	Maturity	BMR	% Lodging	Height (cm)	Ton ac ⁻¹ 65% Moist.
AF 7102	Alta (Advanta)	F	E	Y	40.0 g-m	211.9 no	14.2 a-e
AF 7202	Alta (Advanta)	F	ME	Y	46.7 e-j	189.4 p	12.0 de
AF 7401	Alta (Advanta)	F	L	Y	0.0 p	161.3 rs	14.0 a-e
AS-6402	Alta (Advanta)	SS	L	N	0.0 p	230.7 k-n	14.8 a-e
AS-9302	Alta (Advanta)	S	M	Y	55.8 c-h	242.7 j-l	13.6 a-e
EJ7281	Ceres	F	L	N	52.5 c-h	280.3 d-g	17.2 ab
F2P134	Ceres	F	PS	N	25.8 i-n	275.9 d-g	14.3 a-e
Hikane II	Chromatin/Sorghum Partners	F	M	N	80.8 ab	254.7 h-j	13.7 a-e
NK300	Chromatin/Sorghum Partners	F	M	N	16.7 m-p	213.1 no	12.7 b-e
SDH 2942 BMR	Chromatin/Sorghum Partners	F	PS	Y	71.7 a-d	233.5 k-m	11.6 e
Sordan Headless	Chromatin/Sorghum Partners	F	PS	N	19.2 l-p	263.2 g-i	11.9 de
SP 1615	Chromatin/Sorghum Partners	F	PS	N	22.5 k-p	225.2 l-n	11.9 de
SP 3903 BD	Chromatin/Sorghum Partners	F	ML	Y	3.33 n-p	187.5 pq	12.3 c-e
SPX 23514	Chromatin/Sorghum Partners	F	M	N	70.0 a-e	263.2 g-i	11.4 e
SPX 27514	Chromatin/Sorghum Partners	F	L	N	24.2 j-o	337.9 a	11.4 e
SPX 27614	Chromatin/Sorghum Partners	F	L	N	42.5 g-l	341.8 a	15.6 a-e
SPX 28414	Chromatin/Sorghum Partners	F	L	N	48.3 d-i	331.1 ab	15.5 a-e
SPX 37114	Chromatin/Sorghum Partners	F	PS	Y	0.0 p	141.7 s	13.9 a-e
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	0.0 p	167.4 qr	17.9 a
SPX 59014	Chromatin/Sorghum Partners	F	PS	Y	83.3 a	227.4 l-n	12.2 c-e
SS 405	Chromatin/Sorghum Partners	F	L	N	63.3 a-g	344.7 a	12.9 b-e

Table 2. continued.

Hybrid Information ¹					Lodging, Height and Forage Yield ²		
Hybrid	Company	Type	Maturity	BMR	% Lodging ³	Height (cm) ⁴	Ton ac ⁻¹ 65% Moist.
Ensile Master	Gayland Ward Seed Co	F	ML	N	68.3 a-f	269.1 f-i	11.5 e
GW-2120	Gayland Ward Seed Co	F	M	N	57.5 b-g	249.6 i-k	15.1 a-e
GW-400 BMR	Gayland Ward Seed Co	F	ME	Y	70.0 a-d	295.8 cd	13.8 a-e
GW-600 BMR	Gayland Ward Seed Co	F	M	Y	71.7 a-d	286.1 d-f	13.6 a-e
Nutra King BMR	Gayland Ward Seed Co	SS	ME	Y	70.0 a-e	277.5 d-g	13.2 b-e
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	1.7 op	202.1 op	17.9 a
Super Sugar	Gayland Ward Seed Co	SS	ME	N	32.5 h-m	263.4 g-i	15.2 a-e
Super Sugar DM	Gayland Ward Seed Co	SS	L	N	21.7 l-p	295.2 cd	18.1 a
Sweet Forever BMR	Gayland Ward Seed Co	SS	PS	Y	46.7 e-j	291.2 de	12.9 b-e
Sweet Six BMR	Gayland Ward Seed Co	SS	E	Y	66.7 a-f	312.7 bc	13.1 b-e
9500W	Richardson Seed	F	ML	N	1.7 p	201.2 op	14.6 a-e
Double 7 BMR	Richardson Seed	F	L	Y	1.7 p	225.7 l-n	16.7 a-c
Silo 700D	Richardson Seed	F	ML	N	0.0 p	228.6 l-n	13.7 a-e
X08084	Richardson Seed	F	L	Y	41.7 g-l	272.2 e-h	16.5 a-d
X451041	Richardson Seed	F	L	Y	45.8 f-k	216.2 m-o	14.3 a-e

Table 2. continued.

Hybrid Information ¹					Lodging, Height and Forage Yield ²		
Hybrid	Company	Type	Maturity	BMR	% Lodging ³	Height (cm) ⁴	Ton ac ⁻¹ 65% Moist.
Great Scott BMR -R	Scott Seed Co.	F	L	Y	0.0 p	203.6 op	15.5 a-e
Great Scott BMR W	Scott Seed Co.	F	L	Y	0.0 p	220.1 m-o	11.8 e
Premium Stock LS	Scott Seed Co.	F	PS	N	40.0 g-m	264.5 g-i	13.7 a-e
X51423	Scott Seed Co.	F	ML	Y	80.8 ab	286.4 d-f	14.1 a-e
X5143	Scott Seed Co.	F	ML	Y	73.3 a-c	273.9 e-h	12.9 b-e
Means					38.0	250.24	13.98
CV					53.84	7.07	28.72
<i>Location</i>							
Kearney					51.1 a	242.4 b	14.0 a
Westside					24.9 b	258.1 a	14.0 a

¹Hybrid information provided by seed companies. SS=Sorghum-Sudangrass, FS=Forage sorghum, E=Early, ME=Medium Early, M=Medium, ML=Medium Late, L=Late, PS=Photoperiod Sensitive.

²Means followed by the same letter do not significantly differ using LSD (P=0.01)

Table 3. 2015 comparisons of sorghum forage hybrids and locations for nutrient composition and calculations at Westside Research and Extension and Kearney Agriculture Research and Extension Centers by seed company.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% Crude Protein	% ADF	% NDF	% Lignin	% Starch	% Fat
AF 7102	Alta (Advanta)	F	E	Y	8.2 b-g	35.5 n-r	53.6 p-s	4.8 m-o	14.6 a-d	2.5 b
AF 7202	Alta (Advanta)	F	ME	Y	8.4 b-e	36.0 m-r	54.2 o-s	4.8 m-o	15.2 a-d	2.3 b-d
AF 7401	Alta (Advanta)	F	L	Y	7.3 e-m	40.7 f-l	62.8 f-j	4.8 no	5.3 i-o	2.0 f-j
AS-6402	Alta (Advanta)	SS	L	N	8.0 b-h	39.1 h-n	59.9 h-n	4.9l-o	9.6 e-j	2.2 b-f
AS-9302	Alta (Advanta)	S	M	Y	9.2 b	34.6 o-r	51.7 q-s	5.1 k-o	19.0 a	2.8 a
EJ7281	Ceres	F	L	N	5.5 pq	41.1 e-k	62.9 f-j	5.6 g-k	2.8 m-o	1.5 n-p
F2P134	Ceres	F	PS	N	6.1 l-q	45.9 a-d	67.8 a-f	6.8 ab	2.0 o	1.4 p
Hikane II	Chromatin/Sorghum Partners	F	M	N	7.9 b-h	33.8 qr	49.8 s	5.5 h-l	17.4 ab	2.2 b-f
NK300	Chromatin/Sorghum Partners	F	M	N	7.0 f-o	40.6 f-l	60.5 h-n	5.8 f-j	12.7 b-f	1.9 g-l
SDH 2942 BMR	Chromatin/Sorghum Partners	F	PS	Y	7.8 c-i	46.7 ab	70.2 a	6.2 b-f	2.4 no	1.6 m-p
Sordan Headless	Chromatin/Sorghum Partners	F	PS	N	6.3 k-q	47.5 a	69.6 a-c	7.1 a	3.1 m-o	1.4 p
SP 1615	Chromatin/Sorghum Partners	F	PS	N	6.4 j-q	45.9 a-d	68.4 a-e	6.6 a-d	2.9 m-o	1.5 n-p
SP 3903 BD	Chromatin/Sorghum Partners	F	ML	Y	7.8 c-i	41.8 e-i	64.7 b-h	5.4 i-m	7.1 g-n	2.0 f-k
SPX 23514	Chromatin/Sorghum Partners	F	M	N	7.4 e-m	40.4 g-l	60.8 h-n	6.0 e-h	8.8 e-k	1.9 h-m
SPX 27514	Chromatin/Sorghum Partners	F	L	N	5.4 q	46.6 a-c	69.2 a-d	6.8 a-c	3.0 m-o	1.4 op
SPX 27614	Chromatin/Sorghum Partners	F	L	N	5.7 o-q	47.6 a	69.9 ab	7.1 a	2.9 m-o	1.3 p
SPX 28414	Chromatin/Sorghum Partners	F	L	N	6.8 h-p	44.8 a-e	67.3 a-g	6.4 b-f	2.4 no	1.5 n-p
SPX 37114	Chromatin/Sorghum Partners	F	PS	Y	10.6 a	34.2 p-r	51.7 q-s	5.2 k-o	16.0 a-c	2.4 bc
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	9.1 bc	33.6 r	51.4 rs	4.7 o	15.5 a-c	2.3 b-d
SPX 59014	Chromatin/Sorghum Partners	F	PS	Y	9.0 b-d	42.7 d-h	64.8 a-h	5.5 h-l	3.9 l-o	2.0 f-j
SS 405	Chromatin/Sorghum Partners	F	L	N	5.5 pq	42.3 d-h	63.1 e-j	6.0 d-h	4.9 j-o	1.6 m-p

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% Crude Protein	% ADF	% NDF	% Lignin	% Starch	% Fat
Ensile Master	Gayland Ward Seed Co	F	ML	N	6.1 m-q	39.9 g-l	59.5 h-o	5.8 f-j	7.9 f-l	1.9 g-l
GW-2120	Gayland Ward Seed Co	F	M	N	7.7 d-j	37.6 j-p	55.8 n-r	5.6 g-k	9.7 e-i	2.2 b-h
GW-400 BMR	Gayland Ward Seed Co	F	ME	Y	7.1 e-n	37.8 j-p	57.0 l-q	5.4 i-m	9.2 e-k	2.1 d-j
GW-600 BMR	Gayland Ward Seed Co	F	M	Y	7.5 e-l	39.2 h-m	59.0 i-p	5.3 j-n	10.7 d-h	2.2 b-g
Nutra King BMR	Gayland Ward Seed Co	SS	ME	Y	7.2 e-n	37.4 l-q	56.1 m-r	5.6 g-k	13.3 b-e	2.2 b-g
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	8.3 b-f	37.5 k-p	58.8 j-p	4.8 m-o	8.2 f-l	2.3 b-f
Super Sugar	Gayland Ward Seed Co	SS	ME	N	7.5 e-l	38.2 i-o	55.6 n-r	6.3 b-f	12.7 b-f	2.2 b-g
Super Sugar DM	Gayland Ward Seed Co	SS	L	N	5.5 pq	44.2 a-f	64.5 b-h	6.6 a-d	4.7 k-o	1.6 l-p
Sweet Forever BMR	Gayland Ward Seed Co	SS	PS	Y	5.7 o-q	42.3 d-h	64.3 c-i	6.1 c-g	5.6 i-o	1.6 l-p
Sweet Six BMR	Gayland Ward Seed Co	SS	E	Y	5.8 n-q	42.9 c-g	63.8 d-j	6.2 c-f	8.1 f-l	1.8 j-n
9500W	Richardson Seed	F	ML	N	7.9 b-h	38.1 j-o	56.7 l-r	5.6 g-k	15.7 a-c	2.0 e-j
Double 7 BMR	Richardson Seed	F	L	Y	6.9 g-p	39.2 h-m	61.0 h-n	5.1 k-o	7.5 g-m	2.0 f-k
Silo 700D	Richardson Seed	F	ML	N	6.9 g-p	42.1 e-h	64.3 c-i	5.9 f-i	6.7 h-o	1.8 i-m
X08084	Richardson Seed	F	L	Y	6.5 i-q	42.1 e-h	63.0 e-j	6.1 d-g	8.4 f-l	1.7 k-o
X451041	Richardson Seed	F	L	Y	7.6 e-k	41.2 e-j	64.6 b-h	5.4 i-l	6.7 h-o	1.9 h-m

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% Crude Protein	% ADF	% NDF	% Lignin	% Starch	% Fat
Great Scott BMR -R	Scott Seed Co.	F	L	Y	8.2 b-f	39.7 g-l	61.5 h-m	5.1 k-o	8.4 f-l	2.1 d-j
Great Scott BMR W	Scott Seed Co.	F	L	Y	7.7 d-j	37.8 j-p	57.4 k-p	5.2 k-o	12.5 c-f	2.1 c-i
Premium Stock LS	Scott Seed Co.	F	PS	N	5.9 n-q	43.3 b-g	63.6 e-j	6.6 a-e	6.2 h-o	1.6 l-p
X51423	Scott Seed Co.	F	ML	Y	7.3 e-m	40.6 f-l	62.1 g-l	5.5 h-l	4.5 k-o	2.2 b-f
X5143	Scott Seed Co.	F	ML	Y	8.0 b-h	32.5 r	49.4 s	4.7 o	11.9 c-g	2.3 b-e
Means					7.23	40.36	60.79	5.71	8.53	1.95
CV					16.47	7.93	7.82	8.79	49.08	13.73
<i>Location</i>										
Kearney					7.85 a	29.30 b	59.95 b	5.56 b	7.21 a	1.89 b
Westside					6.62 b	41.42 a	61.62 a	5.86 a	9.86 b	1.99 a

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% TDN	30 hr NDFd	240 hr NDFd	% Ca	% P	% Mg
AF 7102	Alta (Advanta)	F	E	Y	57.4 a-d	53.4 c-h	70.9 c-e	0.37 b-i	0.23 c-g	0.21 g-l
AF 7202	Alta (Advanta)	F	ME	Y	56.6 b-e	52.8 e-h	70.6 de	0.35 c-k	0.25 a-c	0.21 i-l
AF 7401	Alta (Advanta)	F	L	Y	53.4 d-j	57.5 a-c	77.5 a	0.40 a-d	0.23 b-f	0.22 d-k
AS-6402	Alta (Advanta)	SS	L	N	54.5 c-i	55.9 a-e	75.7 ab	0.36 c-k	0.23 b-f	0.22 f-l
AS-9302	Alta (Advanta)	S	M	Y	58.4 a-c	49.3 h-m	66.6 f-l	0.33 g-l	0.24 a-e	0.20 k-m
EJ7281	Ceres	F	L	N	51.1 f-n	50.0 g-l	68.2 e-k	0.36 c-k	0.15 n	0.22 d-k
F2P134	Ceres	F	PS	N	42.1 st	42.8 o-r	66.5 f-l	0.37 c-j	0.21 f-k	0.24 a-g
Hikane II	Chromatin/Sorghum Partners	F	M	N	57.2 a-d	45.2 m-q	61.2 n	0.33 g-l	0.20 g-k	0.22 d-k
NK300	Chromatin/Sorghum Partners	F	M	N	49.4 j-p	45.5 m-q	66.7 f-l	0.31 j-l	0.22 d-i	0.24 b-i
SDH 2942 BMR	Chromatin/Sorghum Partners	F	PS	Y	43.3 r-t	48.2 i-m	74.9 ab	0.42 ab	0.26 ab	0.26 ab
Sordan Headless	Chromatin/Sorghum Partners	F	PS	N	39.1 t	39.9 r	66.6 f-l	0.39 b-f	0.19 j-m	0.26 a-c
SP 1615	Chromatin/Sorghum Partners	F	PS	N	43.1 r-t	43.0 o-r	66.8 f-l	0.32 i-l	0.18 k-m	0.24 b-h
SP 3903 BD	Chromatin/Sorghum Partners	F	ML	Y	50.5 h-o	53.6 b-g	74.5 a-c	0.37 b-i	0.23 c-g	0.24 b-i
SPX 23514	Chromatin/Sorghum Partners	F	M	N	51.0 g-n	47.4 k-n	66.3 g-l	0.34 f-l	0.19 i-m	0.23 b-j
SPX 27514	Chromatin/Sorghum Partners	F	L	N	43.0 r-t	42.8 o-r	64.9 j-n	0.31 kl	0.15 n	0.21 h-l
SPX 27614	Chromatin/Sorghum Partners	F	L	N	41.7 st	41.6 p-r	63.9 l-n	0.31 j-l	0.17 mn	0.21 g-l
SPX 28414	Chromatin/Sorghum Partners	F	L	N	45.7 p-s	45.8 l-p	68.2 e-k	0.37 c-j	0.19 k-m	0.24 b-h
SPX 37114	Chromatin/Sorghum Partners	F	PS	Y	58.8 a-c	52.9 e-h	70.0 d-g	0.34 d-l	0.24 a-e	0.23 b-j
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	61.3 ab	59.0 a	72.6 b-d	0.33 g-l	0.23 c-g	0.23 b-j
SPX 59014	Chromatin/Sorghum Partners	F	PS	Y	47.5 n-r	52.0 e-j	77.1 a	0.45 a	0.26 a	0.27 a
SS 405	Chromatin/Sorghum Partners	F	L	N	48.8 j-p	46.3 l-o	64.5 k-n	0.33 h-l	0.15 n	0.21 g-l

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% TDN	30 hr NDFd	240 hr NDFd	% Ca	% P	% Mg
Ensile Master	Gayland Ward Seed Co	F	ML	N	50.4 i-p	47.4 k-m	66.7 f-l	0.38 b-h	0.17 l-n	0.24 a-g
GW-2120	Gayland Ward Seed Co	F	M	N	52.8 d-m	47.9 i-m	68.2 e-j	0.39 b-e	0.20 h-l	0.25 a-f
GW-400 BMR	Gayland Ward Seed Co	F	ME	Y	55.1 c0h	51.4 f-k	69.3 d-h	0.33 h-l	0.19 j-m	0.20 k-m
GW-600 BMR	Gayland Ward Seed Co	F	M	Y	53.0 d-k	51.4 f-k	70.3 d-f	0.34 d-l	0.21 f-k	0.20 j-l
Nutra King BMR	Gayland Ward Seed Co	SS	ME	Y	54.4 c-i	47.7 j-m	65.8 h-l	0.34 f-l	0.21 f-k	0.19 lm
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	55.8 c-f	57.8 ab	75.0 ab	0.38 b-h	0.22 d-h	0.23 c-j
Super Sugar	Gayland Ward Seed Co	SS	ME	N	51.0 f-n	41.2 qr	62.0 mn	0.34 f-l	0.21 f-k	0.22 e-l
Super Sugar DM	Gayland Ward Seed Co	SS	L	N	43.8 q-t	43.1 n-r	65.7 h-m	0.40 a-c	0.17 mn	0.26 a-c
Sweet Forever BMR	Gayland Ward Seed Co	SS	PS	Y	50.3 i-p	50.0 g-l	69.5 d-h	0.34 e-l	0.15 n	0.25 a-f
Sweet Six BMR	Gayland Ward Seed Co	SS	E	Y	48.3 k-q	45.3 m-q	65.2 j-m	0.30 l	0.17 l-n	0.17 m
9500W	Richardson Seed	F	ML	N	52.8 d-m	47.9 i-m	65.5 i-m	0.33 h-l	0.22 c-h	0.22 e-k
Double 7 BMR	Richardson Seed	F	L	Y	55.7 c-g	58.5 a	76.0 ab	0.36 c-k	0.18 k-m	0.25 a-e
Silo 700D	Richardson Seed	F	ML	N	48.2 l-q	48.4 i-m	70.9 c-e	0.34 e-l	0.21 f-k	0.25 a-d
X08084	Richardson Seed	F	L	Y	48.1 m-q	47.6 k-m	68.1 e-k	0.34 f-l	0.19 i-m	0.24 b-h
X451041	Richardson Seed	F	L	Y	53.4 d-j	57.2 a-d	76.6 a	0.33 g-l	0.2 h-l	0.26 a-c

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²					
Hybrid	Company	Type	Maturity	BMR	% TDN	30 hr NDFd	240 hr NDFd	% Ca	% P	% Mg
Great Scott BMR -R	Scott Seed Co.	F	L	Y	51.8 e-n	53.2 d-h	75.1 ab	0.39 b-g	0.25 a-d	0.24 a-g
Great Scott BMR W	Scott Seed Co.	F	L	Y	55.3 c-g	52.1 e-i	70.3 d-f	0.34 e-l	0.24 b-e	0.21 g-l
Premium Stock LS	Scott Seed Co.	F	PS	N	45.8 o-s	42.6 o-r	64.2 l-n	0.36 c-k	0.18 k-m	0.24 b-i
X51423	Scott Seed Co.	F	ML	Y	52.9 d-l	53.0 d-h	72.4 b-d	0.35 c-k	0.22 e-j	0.21 j-l
X5143	Scott Seed Co.	F	ML	Y	61.5 a	55.1 a-f	69.2 d-i	0.36 c-k	0.19 k-m	0.21 g-l
Mean					51.08	49.35	69.27	0.35	0.20	0.23
CV					8.15	7.56	4.73	13.56	11.74	12.07
<i>Location</i>										
Kearney					53.81 a	51.62 a	70.63 a	0.39 a	0.20 b	0.26 a
Westside					48.35 b	47.08 b	67.91 b	0.32 b	0.21 a	0.19 b

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²				
Hybrid	Company	Type	Maturity	BMR	% K	% S	Milk Lbs ton ⁻¹	Rel. Feed Value	Rel. Forage Quality
AF 7102	Alta (Advanta)	F	E	Y	1.93 l-q	0.13 c-j	2702.8 a-e	110.59 a-c	116.71 a-c
AF 7202	Alta (Advanta)	F	ME	Y	2.05 g-n	0.13 b-i	2659.0 b-f	107.23 a-d	111.14 b-e
AF 7401	Alta (Advanta)	F	L	Y	2.39 c-e	0.12 c-k	2317.0 g-m	85.30 g-l	96.72 d-i
AS-6402	Alta (Advanta)	SS	L	N	2.27 d-i	0.13 b-i	2439.3 e-k	91.19 e-j	100.21 c-h
AS-9302	Alta (Advanta)	S	M	Y	1.73 p-s	0.14 a-f	2854.5 a-c	113.60 ab	113.10 b-d
EJ7281	Ceres	F	L	N	1.98 j-q	0.08 op	2318.3 g-m	84.79 g-l	85.37 h-m
F2P134	Ceres	F	PS	N	2.60 a-c	0.11 h-m	1757.0 s-u	73.30 l-n	57.89 q-s
Hikane II	Chromatin/Sorghum Partners	F	M	N	1.60 rs	0.11 h-m	2823.2 a-d	117.74 a	110.18 b-f
NK300	Chromatin/Sorghum Partners	F	M	N	2.06 f-n	0.11 i-m	2241.5 h-o	89.46 e-j	79.32 i-o
SDH 2942 BMR	Chromatin/Sorghum Partners	F	PS	Y	2.76 ab	0.14 b-g	1708.5 tu	70.11 mn	60.52 p-s
Sordan Headless	Chromatin/Sorghum Partners	F	PS	N	2.41 c-e	0.11 f-m	1570.2 u	70.45 mn	49.42 s
SP 1615	Chromatin/Sorghum Partners	F	PS	N	2.31 d-h	0.10 j-n	1837.8 q-u	72.64 l-n	57.94 q-s
SP 3903 BD	Chromatin/Sorghum Partners	F	ML	Y	2.49 b-d	0.14 a-e	2175.8 j-p	81.89 h-n	85.40 h-m
SPX 23514	Chromatin/Sorghum Partners	F	M	N	2.05 f-n	0.12 c-k	2337.0 f-m	88.16 f-k	82.70 h-n
SPX 27514	Chromatin/Sorghum Partners	F	L	N	2.13 e-l	0.09 m-p	1849.5 p-u	70.83 mn	56.93 rs
SPX 27614	Chromatin/Sorghum Partners	F	L	N	2.16 e-l	0.09 l-p	1776.2 r-u	69.46 n	54.215 rs
SPX 28414	Chromatin/Sorghum Partners	F	L	N	2.34 c-f	0.10 k-o	1973.3 n-t	74.89 k-n	65.59 n-s
SPX 37114	Chromatin/Sorghum Partners	F	PS	Y	1.93 l-q	0.16 ab	2835.2 a-d	115.54 a	122.11 ab
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	1.98 k-q	0.14 a-c	2946.7 ab	113.71 ab	133.43 a
SPX 59014	Chromatin/Sorghum Partners	F	PS	Y	2.82 a	0.16 a	1945.5 o-t	79.96 i-n	75.94 k-q
SS 405	Chromatin/Sorghum Partners	F	L	N	2.06 f-m	0.07 p	2205.8 i-o	83.13 h-m	76.92 j-p

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²				
Hybrid	Company	Type	Maturity	BMR	% K	% S	Milk Lbs ton ⁻¹	Rel. Feed Value	Rel. Forage Quality
Ensile Master	Gayland Ward Seed Co	F	ML	N	2.02 h-o	0.11 i-m	2290.5 g-n	91.25 e-j	84.98 h-m
GW-2120	Gayland Ward Seed Co	F	M	N	2.12 e-l	0.14 a-f	2448.2 e-j	100.48 b-f	94.85 d-j
GW-400 BMR	Gayland Ward Seed Co	F	ME	Y	1.75 o-s	0.11 i-m	2577.7 c-g	97.97 c-g	100.47 c-h
GW-600 BMR	Gayland Ward Seed Co	F	M	Y	1.83 m-q	0.12 c-k	2410.5 e-l	92.91 e-i	93.37 e-k
Nutra King BMR	Gayland Ward Seed Co	SS	ME	Y	1.70 q-s	0.11 h-m	2576.2 c-g	100.88 b-f	96.13 d-i
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	2.19 e-l	0.14 a-d	2511.8 d-i	95.065 d-h	107.74 b-g
Super Sugar	Gayland Ward Seed Co	SS	ME	N	1.77 n-s	0.12 c-k	2416.7 e-l	99.33 c-f	82.36 h-n
Super Sugar DM	Gayland Ward Seed Co	SS	L	N	2.27 d-j	0.10 k-n	1858.2 p-u	78.94 j-n	63.37 o-s
Sweet Forever BMR	Gayland Ward Seed Co	SS	PS	Y	2.00 i-p	0.08 n-p	2241.5 h-o	81.61 h-n	81.19 i-o
Sweet Six BMR	Gayland Ward Seed Co	SS	E	Y	1.74 o-s	0.09 m-p	2170.7 j-p	81.12 i-n	71.26 l-r
9500W	Richardson Seed	F	ML	N	1.99 i-p	0.13 b-i	2450.0 e-j	100.67 b-f	95.37 d-i
Double 7 BMR	Richardson Seed	F	L	Y	2.26 d-k	0.11 e-l	2492.5 e-j	89.18 e-j	105.28 b-g
Silo 700D	Richardson Seed	F	ML	N	2.33 c-g	0.12 d-k	2100.2 l-r	81.98 h-n	75.40 k=q
X08084	Richardson Seed	F	L	Y	2.24 d-k	0.12 c-k	2113.5 k-q	83.31 h-m	76.20 k-q
X451041	Richardson Seed	F	L	Y	2.37 c-e	0.12 c-k	2335.5 f-m	82.92 h-n	95.518 d-i

Table 3. continued.

Hybrid Information ¹					Nutrient Composition & Calculations ²				
Hybrid	Company	Type	Maturity	BMR	% K	% S	Milk Lbs ton ⁻¹	Rel. Feed Value	Rel. Forage Quality
Great Scott BMR -R	Scott Seed Co.	F	L	Y	2.31 d-g	0.13 b-h	2274.8 g-n	88.34 f-k	89.33 g-l
Great Scott BMR W	Scott Seed Co.	F	L	Y	2.08 f-m	0.12 d-k	2561.8 c-h	101.94 b-e	105.11 b-g
Premium Stock LS	Scott Seed Co.	F	PS	N	2.06 f-n	0.10 k-o	2039.8 m-s	82.66 h-n	68.18 m-r
X51423	Scott Seed Co.	F	ML	Y	2.06 f-n	0.11 g-m	2384.8 e-l	87.45 f-k	92.05 f-k
X5143	Scott Seed Co.	F	ML	Y	1.52 s	0.12 d-k	3025.8 a	120.11 a	133.19 a
Mean					2.11	0.12	2306.2	90.30	87.88
CV					11.81	19.51	12.42	13.11	18.27
<i>Location</i>									
Kearney					1.95 b	0.12 a	2481.2 a	92.4 a	95.6 a
Westside					2.27 a	0.11 b	2131.2 b	88.2 b	80.15 b

¹Hybrid information provided by seed companies. SS=Sorghum-Sudangrass, FS=Forage sorghum, E=Early, ME=Medium Early, M=Medium, ML=Medium Late, L=Late, PS=Photoperiod Sensitive.

²Means followed by the same letter do not significantly differ using LSD (P=0.01)

Table 4. Top 25% of hybrids in the 2015 Kearney and Westside trials based on Milk lbs ton⁻¹*

Hybrid	Company	Type	Maturity	BMR	% Lodging	T ac ⁻¹ 65% Moist.	% Crude Prot.	30 hr NDFd	Milk lbs ton ⁻¹	Rel. Fedd Value
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	0.0	17.9	9.1	59.0	2946.7	113.7
SPX 37114	Chromatin/Sorghum Partners	F	PS	Y	0.0	13.9	10.6	52.9	2835.2	115.5
Great Scott BMR W	Scott Seed Co.	F	L	Y	0.0	11.8	7.7	52.1	2561.8	101.9
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	1.7	17.9	8.3	57.8	2511.8	95.1
Double 7 BMR	Richardson Seed	F	L	Y	1.7	16.7	6.9	58.5	2492.5	89.2
9500W	Richardson Seed	F	ML	N	1.7	14.6	7.9	47.9	2450.0	100.7
AS-6402	Alta (Advanta)	SS	L	N	0.0	14.8	8.0	55.9	2439.3	91.2
AF 7401	Alta (Advanta)	F	L	Y	0.0	14.0	7.3	57.5	2317.0	85.3
Great Scott BMR -R	Scott Seed Co.	F	L	Y	0.0	15.5	8.2	53.2	2274.8	88.3
NK300	Chromatin/Sorghum Partners	F	M	N	16.7	12.7	7.0	45.5	2241.5	89.5
SP 3903 BD	Chromatin/Sorghum Partners	F	ML	Y	3.33	12.3	7.8	53.6	2175.8	81.9

*The top 25% list was derived by taking those hybrids with the highest milk production per ton of silage and eliminating those hybrids that lodged by more than 25%.

Table 5. Top yielding hybrids that yielded over 14.0 tons acre⁻¹ averaged over Kearney and Westside trials in 2015.

Hybrid ¹	Company	Type	Maturity	BMR	% Lodging	Ton acre ⁻¹ 65% Moist	30 hr NDFd	Milk lbs ton ⁻¹
Super Sugar DM	Gayland Ward Seed Co	SS	L	N	21.7 l-p	18.1 a	43.1 n-r	1858.2 p-u
SPX 37214	Chromatin/Sorghum Partners	F	PS	Y	0.0 p	17.9 a	59.0 a	2946.7 ab
Silo Pro BMR	Gayland Ward Seed Co	F	M	Y	1.7 op	17.9 a	57.8 ab	2511.8 d-i
EJ7281	Ceres	F	L	N	52.5 c-h	17.2 ab	50.0 g-l	2318.3 g-m
Double 7 BMR	Richardson Seed	F	L	Y	1.7 p	16.7 a-c	58.5 a	2492.5 e-j
X08084	Richardson Seed	F	L	Y	41.7 g-l	16.5 a-d	47.6 k-m	2113.5 k-q
SPX 27614	Chromatin/Sorghum Partners	F	L	N	42.5 g-l	15.6 a-e	41.6 p-r	1776.2 r-u
SPX 28414	Chromatin/Sorghum Partners	F	L	N	48.3 d-i	15.5 a-e	45.8 l-p	1973.3 n-t
Great Scott BMR -R	Scott Seed Co.	F	L	Y	0.0 p	15.5 a-e	53.2 d-h	2274.8 g-n
Super Sugar	Gayland Ward Seed Co	SS	ME	N	32.5 h-m	15.2 a-e	41.2 qr	2416.7 e-l
GW-2120	Gayland Ward Seed Co	F	M	N	57.5 b-g	15.1 a-e	47.9 i-m	2448.2 e-j
AS-6402	Alta (Advanta)	SS	L	N	0.0 p	14.8 a-e	55.9 a-e	2439.3 e-k
9500W	Richardson Seed	F	ML	N	1.7 p	14.6 a-e	47.9 i-m	2450.0 e-j
F2P134	Ceres	F	PS	N	25.8 i-n	14.3 a-e	42.8 o-r	1757.0 s-u
X451041	Richardson Seed	F	L	Y	45.8 f-k	14.3 a-e	57.2 a-d	2335.5 f-m
AF 7102	Alta (Advanta)	F	E	Y	40.0 g-m	14.2 a-e	53.4 c-h	2702.8 a-e
X51423	Scott Seed Co.	F	ML	Y	80.8 ab	14.1 a-e	53.0 d-h	2384.8 e-l
AF 7401	Alta (Advanta)	F	L	Y	0.0 p	14.0 a-e	57.5 a-c	2317.0 g-m

¹Hybrid information provided by seed companies. SS=Sorghum-Sudangrass, FS=Forage sorghum, ME=Medium Early, M=Medium, ML=Medium Late, L=Late, PS=Photoperiod Sensitive.