Final Report
2014 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. This past year was difficult for all agriculture producers in the state because of the severity of the current drought, limiting water availability and quality throughout the region. The demand for water in California is encouraging 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 forth 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 42 hybrids, which included traditional forage sorghums, Photoperiod (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 2014 growing season was characterized by little winter precipitation and poor soil moisture reserves throughout the growing season. The long hot summer months necessitated the need for some additional irrigation. Trials at both Kearney and Westside were irrigated as needed. A preplant irrigation of 4.3 inches was applied April 25, 2014 and Kearney received a total of 22.04 inches of applied irrigation, 1.8 inches more than 2013. Rainfall totals from January through June 2014 prior to planting at KARE were 4.19 inches, while no rainfall was recorded throughout the growing season.

Rainfall totals from January through June prior to planting at Westside were 2.73 inches, while no rainfall was recorded throughout the growing season. At the West Side REC site, pre-plant irrigation with sprinklers totaled 4.73 inches. Total irrigation applications of 25.23 inches were recorded for the full growing season, which was 7.17 inches less than 2013.

Each hybrid was harvested for forage yield when grain reached soft dough stage or in the case of the PS sorghum, with the last harvest of late forage sorghum producing some grain.

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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:	Winter forage (Oats)
Soil Type:	Hanford sandy loam
Plot Size:	Four, 30 inch rows by 20 ft
Replications:	3
Study Design:	Split-Plot
Planting Date:	May 21, 2014
Planting Rate:	100,000 seed $acre^{-1}$
Seed Method:	John Deere Max-emerge Planter
Fertilizer:	Ammonium sulfate at 250 lbs $acre^{-1}$ providing 52 units of N
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 August 28, 2014

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:	N-P-K 11-52-00 at 100 lbs $acre^{-1}$
Herbicide:	Dual Magnum at 24 oz ac^{-1} as a pre-plant; Prowl-H_20 as layby at 40 oz ac^{-1}
Irrigation:	Sprinklers for pre-irrigation and stand establishment, gated pipe furrow irrigation subsequent irrigations – see narrative for amounts
Silage Harvest Date:	Plots were harvested September 18, 2014

Data Collected:

1. Plant stands
2. Plant height (ft) 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 60º 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. NEl: Estimate of Net Energy for lactation
    f. NEm: Estimate of Net Energy for maintenance
    g. NEg: Estimate of Net Energy for gain
    h. IVTD: % In Vitro True Digestibility; positively related to energy availability
    i. 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.
    j. 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]	% NDFd[2]	% IVTD[2]	Milk lbs/ton DM[2]	Relative Feed Value (RFV)[2]
PSBMR (3)	61.67 a	16.33 b	5.63 b	43.5 b	65.6 a	5.43 bc	4.00 b	54.85 a	70.30 b	2075.2 b	79.62 b
BMR (16)	27.60 b	18.01 b	7.31 a	39.0 c	59.7 b	5.15 c	8.16 a	57.04 a	74.31 a	2462.8 a	94.05 a
PSNonBMR (9)	26.94 b	21.36 a	4.66 c	46.2 a	68.4 a	6.69 a	3.05 b	45.30 c	62.29 c	1848.3 c	72.94 b
NonBMR (14)	24.21 b	18.63 b	5.98 b	40.0 c	59.8 b	5.74 b	9.03 a	50.11 b	69.96 b	2338.9 a	94.00 a
Trial Avg.	28.78	18.82	6.18	41.17	62.02	5.70	7.06	52.06	70.00	2262.2	88.47

[1]Number in parenthesis is the number of hybrids in each sorghum type. BMR = brown midrib, PS = Photoperiod sensitive.
[2]Means 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 24.2 to 11.0 tons acre^{-1} with an average of 18.8 tons acre^{-1} (see tables 1 and 2). Highest yields were 5.4 tons acre^{-1} less than the highest yields of 2013 and averages were 2.24 tons less than 2013. These yields differences may be attributed to the extremely dry weather experienced in 2014. Forage yields were adjusted to 65% moisture. The non-BMR Photoperiod forages were on average 5 tons acre^{-1} more productive than their BMR counterparts, similar to finding from previous years (table 1). Planting at Westside produced on average 0.4 tons acre^{-1} greater yield than those planted at Kearney; however, Westside did apply 3.19 inches more applied irrigation than what was applied at Kearney.

Similar to previous reports, lodging can be a major issue for forage sorghums. Lodging ranged from 0.0 to 80% (table 2). The non-BMR sorghums lodged the least of the different forage types, but even some of these forages had lodging issues. 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. Similar to last year, little stem breakage was observed in the plots, rather the plants tended to bend over from the base of the stem. Better irrigation control (not over-irrigating), better control of nitrogen applications, and throwing dirt up around the stems to support brace root development may be required to reduce the percentage of lodging in future research trials.

Digestibility as measured by ADF, NDF, IVTD, NDFD 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). Photoperiod sensitive forage sorghum including the bmr (3) types, though high yielding, were relatively poor nutritionally. 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 % IVTD and eliminating those hybrids with lodging scores of greater than 10% (table 4). Of these hybrids, yield ranged from a low of 17.6 tons acre^{-1} with Alta Seeds' AF 7202 to a high of 23.9 tons acre^{-1} with Alta Seeds' AF 7401.

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 19.5 tons acre^{-1} of yield. The highest yielding forage sorghum was SPX901 from Chromatin/Sorghum Partners, LLC at 24.2 tons acre^{-1} followed closely Premium Stock LS from Scott Seed at 24.0 tons acre^{-1}. In comparison to years past, many of the highest yielding hybrids this year had lodging issues, which may have impacted their overall nutrition quality.

Discussion

This was the forth year that a wide range of forage sorghums (42), 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 impacted some of the research in this years trials. Additional irrigations were needed to keep plants vigorous and healthy throughout the growing season. These water issues translated into less production in terms of yield. This past year. Work is continuing to evaluate management strategies to minimize lodging issues, optimize irrigation levels and management of fertilizer applications. Given the limited amount of irrigation used in these studies, low inputs and high yields, the potential does exist in sorghum forages to save both water and fertilizer, both costly inputs in the production of forages in the State. 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. 2014 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 7101	Alta Seeds	FS	M	Y	80.0 a	271.0 e-f	13.3 jk
AF 7102	Alta Seeds	FS	M	Y	0.0 j	207.7 m-o	18.9 a-i
AF 7201	Alta Seeds	FS	M	Y	73.3 ab	269.7 e-g	17.0 d-j
AF 7202	Alta Seeds	FS	ML	Y	0.0 j	196.1 n-p	17.6 d-j
AF 7401	Alta Seeds	FS	L	Y	0.0 j	182.5 p	23.9 a-c
AF 8301	Alta Seeds	FS	ML	N	0.0 j	210.2 l-n	19.1 a-i
AS 6402	Alta Seeds	FS	ML	Y	0.0 j	248.2 h-j	20.7 a-f
AS 6501	Alta Seeds	FS	ML	Y	67.5 a-d	275.4 d-f	19.0 a-i
AS 6502	Alta Seeds	FS	PS	Y	71.7 ab	261.1 f-h	14.1 h-k
AS 9301	Alta Seeds	FS	M	Y	34.2 f-g	228.2 kl	18.0 d-j
AS 9302	Alta Seeds	FS	M	Y	8.3 ij	234.6 i-k	19.1 a-h
EJXF2P136	Ceres	FS	L	N	12.5 h-j	303.5 a-c	21.8 a-e
EJXF2P134	Ceres	FS	ME	N	49.2 c-f	306.5 ab	20.6 a-f
EJXF2C102	Ceres	FS	L	N	80.0 a	303.8 a-c	14.5 g-k
EJX7C03	Ceres	FS	L	N	41.7 e-g	299.1 a-c	20.4 a-f
EJX7281	Ceres	FS	L	N	75.8 ab	270.4 e-g	16.7 e-j
841F	Pioneer	FS	M	N	0.0 j	207.7 m-o	18.5 b-j
849F	Pioneer	FS	ML	N	46.7 d-f	238.9 i-k	16.3 e-j
9500W	Richardson Seeds	FS	ML	N	0.0 j	181.1 p	19.7 a-g
Double 7 BMR	Richardson Seeds	FS	L	Y	0.0 j	208.1 m-o	19.7 a-g
Silo 700D	Richardson Seeds	FS	ML	N	0.0 j	214.0 l-n	16.2 f-j
Sweeter-n-Honey BMR Red	Richardson Seeds	FS	ME	Y	45.8 d-f	252.4 g-i	17.0 d-j
Great Scott BMR-R	Scott Seed	FS	L	Y	0.0 j	201.3 no	16.9 d-j
Great Scott BMR-W	Scott Seed	FS	L	N	0.0 j	196.2 n-p	19.6 a-g

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.**
Premium Stock LS	Scott Seed	FS	PS	N	17.5 h-j	287.2 c-e	24.0 ab
X50623	Scott Seed	FS	ML	Y	70.0 a-c	224.5 k-m	11.0 k
1990	Sorghum Partners	FS	PS	N	21.7 g-j	292.6 b-d	21.8 a-e
NK300	Sorghum Partners	FS	M	N	0.0 j	190.2 op	19.1 a-h
SD1741 BMR	Sorghum Partners	FS	PS	Y	56.7 b-e	285.8 c-e	18.4 c-j
SDH2942 BMR	Sorghum Partners	FS	PS	Y	56.7 b-e	280.6 de	16.5 e-j
Sordan Headless	Sorghum Partners	FS	PS	N	27.5 f-i	315.7 a	20.9 a-f
SPX-28313	Sorghum Partners	FS	PS	N	16.7 h-j	315.8 a	19.0 a-i
SPX3902	Sorghum Partners	FS	L	Y	0.0 j	223.3 k-m	22.3 a-d
SPX3903	Sorghum Partners	FS	L	Y	0.0 j	190.5 op	19.4 a-h
SPX3952	Sorghum Partners	FS	M	N	0.0 j	250.0 h-j	18.6 b-j
SPX901	Sorghum Partners	FS	PS	N	20.8 g-j	305.9 ab	24.2 a
SPX902	Sorghum Partners	FS	PS	N	40.8 e-g	313.2 a	19.6 a-j
SPX903	Sorghum Partners	FS	PS	N	48.3 c-f	299.9 a-c	21.6 a-f
SPX904	Sorghum Partners	FS	PS	N	34.2 f-h	316.4 a	21.5 a-f
SS405	Sorghum Partners	FS	L	N	29.2 f-i	302.2 a-c	19.7 a-g
Trudan Headless	Sorghum Partners	FS	PS	N	15.0 h-j	303.7 a-c	19.7 a-g
X942 BMR	Sorghum Partners	FS	?	Y	62.5 a-e	233.3 jk	13.6 i-k
Means					**28.8**	**254.9**	**18.8**
CV					**66.37**	**6.18**	**25.26**
Location							
Kearney					**37.6 a**	**240.5 b**	**18.6 a**
Westside					**20.0 b**	**269.2 a**	**19.0 a**

[1]Hybrid 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.
[2]Means followed by the same letter do not significantly differ using LSD (P=0.01)

Table 3. 2014 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 7101	Alta Seeds	FS	M	Y	5.9 e-l	39.1 g-l	60.3 d-k	4.9 o-q	5.5 f-k	2.2 d-j
AF 7102	Alta Seeds	FS	M	Y	7.6 a-f	35.2 l	52.6 m	5.1 k-q	16.3 a-c	2.6 ab
AF 7201	Alta Seeds	FS	M	Y	7.2 a-g	39.6 e-l	59.7 f-l	5.2 j-q	6.4 e-k	2.3 a-f
AF 7202	Alta Seeds	FS	ML	Y	7.8 a-d	35.8 j-l	53.4 k-m	5.1 l-q	15.7 a-c	2.5 a-c
AF 7401	Alta Seeds	FS	L	Y	8.9 a	38.1 h-l	59.9 e-k	4.6 q	6.3 e-k	2.6 a
AF 8301	Alta Seeds	FS	ML	N	6.2 c-j	38.8 g-l	57.4 i-m	5.9 c-i	15.6 a-c	2.2 d-i
AS 6402	Alta Seeds	FS	ML	Y	8.3 ab	38.4 h-l	60.0 e-k	5.0 m-q	6.4 e-k	2.4 a-e
AS 6501	Alta Seeds	FS	ML	Y	7.0 a-g	44.3 a-e	67.1 a-d	5.8 f-k	3.1 h-k	1.9 h-n
AS 6502	Alta Seeds	FS	PS	Y	5.5 g-n	44.4 a-e	66.6 a-f	5.7 g-m	2.8 g-k	2.0 f-m
AS 9301	Alta Seeds	FS	M	Y	6.9 b-h	37.0 i-l	55.6 j-m	5.6 h-o	11.9 c-e	2.3 a-g
AS 9302	Alta Seeds	FS	M	Y	7.9 a-c	36.6 j-l	54.1 k-m	5.4 i-p	17.2 a-c	2.4 a-e
EJXF2P136	Ceres	FS	L	N	4.3 k-o	45.4 a-c	66.9 a-e	6.6 b-d	2.2 h-k	1.6 op
EJXF2P134	Ceres	FS	ME	N	6.5 b-i	43.4 b-g	64.8 a-h	6.3 c-h	2.1 i-k	1.8 k-o
EJXF2C102	Ceres	FS	L	N	3.5 o	36.9 i-l	55.3 j-m	5.1 k-q	5.3 f-k	2.0 f-m
EJX7C03	Ceres	FS	L	N	5.1 h-o	45.3 a-c	66.9 a-e	6.6 bc	2.2 h-k	1.6 n-p
EJX7281	Ceres	FS	L	N	5.8 e-m	41.5 c-i	63.1 b-i	5.3 i-q	2.3 g-k	2.0 g-l
841F	Pioneer	FS	M	N	7.9 a-d	42.6 c-h	64.0 b-i	6.3 c-h	8.0 e-h	1.8 j-o
849F	Pioneer	FS	ML	N	6.6 b-h	35.8 j-l	52.8 lm	5.8 e-k	18.1 ab	2.1 e-l
9500W	Richardson Seeds	FS	ML	N	6.5 b-i	37.6 i-l	57.2 i-m	5.1 l-q	16.6 a-c	2.0 g-m
Double 7 BMR	Richardson Seeds	FS	L	Y	8.1 a-c	39.0 g-l	63.3 b-i	4.8 pq	3.7 f-k	2.2 b-h
Silo 700D	Richardson Seeds	FS	ML	N	5.8 f-m	38.6 h-l	57.5 i-m	5.7 g-n	14.3 b-d	1.9 i-o
Sweeter-n-Honey BMR Red	Richardson Seeds	FS	ME	Y	5.9 e-m	40.2 d-i	61.6 c-j	5.0 n-q	6.5 e-k	2.3 a-g
Great Scott BMR-R	Scott Seed	FS	L	Y	7.0 b-h	39.8 e-l	61.4 c-j	5.2 j-q	8.0 e-g	2.1 d-k
Great Scott BMR-W	Scott Seed	FS	L	N	7.8 a-d	36.3 j-l	55.8 j-m	4.9 o-q	7.4 e-i	2.4 a-e

Table 3. continued.

Hybrid Information[1]					Nutrient Composition & Calculations[2]					
Hybrid	**Company**	**Type**	**Maturity**	**BMR**	**% Crude Protein**	**% ADF**	**% NDF**	**% Lignin**	**% Starch**	**% Fat**
Premium Stock LS	Scott Seed	FS	PS	N	6.0 d-j	44.4 a-e	65.7 a-g	6.6 b-e	4.7 f-k	1.7 m-p
X50623	Scott Seed	FS	ML	Y	6.6 b-h	40.4 d-j	61.8 c-j	5.1 l-q	6.7 e-k	2.1 d-k
1990	Sorghum Partners	FS	PS	N	4.5 j-o	46.5 ab	69.2 ab	6.6 b-e	1.9 i-k	1.6 n-p
NK300	Sorghum Partners	FS	M	N	7.2 a-g	35.4 kl	52.4 m	5.7 h-n	20.9 a	2.2 c-g
SD1741 BMR	Sorghum Partners	FS	PS	Y	5.1 h-o	39.1 g-l	58.9 g-m	5.2 j-q	7.7 e-i	2.3 a-g
SDH2942 BMR	Sorghum Partners	FS	PS	Y	6.4 c-j	47.1 ab	71.3 a	5.3 i-p	1.5 jk	1.8 k-o
Sordan Headless	Sorghum Partners	FS	PS	N	4.6 i-o	48.9 a	71.2 a	7.2 ab	1.4 k	1.4 p
SPX-28313	Sorghum Partners	FS	PS	N	4.5 j-o	44.7 a-d	66.6 a-f	6.4 c-g	4.1 f-k	1.8 k-o
SPX3902	Sorghum Partners	FS	L	Y	7.7 a-e	35.6 kl	54.9 j-m	4.8 pq	9.1 d-f	2.4 a-d
SPX3903	Sorghum Partners	FS	L	Y	7.5 a-f	39.4 f-l	61.4 c-j	5.1 l-q	4.9 f-k	2.3 a-g
SPX3952	Sorghum Partners	FS	M	N	7.1 a-g	37.5 i-l	58.0 h-m	4.8 pq	7.3 e-j	2.4 a-e
SPX901	Sorghum Partners	FS	PS	N	5.1 h-o	45.3 a-c	67.3 a-d	6.5 c-f	5.3 f-k	1.8 m-o
SPX902	Sorghum Partners	FS	PS	N	5.5 g-n	45.4 a-c	68.4 a-c	6.3 c-g	2.5 g-k	1.8 l-o
SPX903	Sorghum Partners	FS	PS	N	4.1 l-o	46.9 ab	69.3 ab	6.5 c-f	2.5 g-k	1.6 n-p
SPX904	Sorghum Partners	FS	PS	N	3.7 no	48.3 a	71.6 a	7.6 a	1.9 i-k	1.4 p
SS405	Sorghum Partners	FS	L	N	3.5 o	44.1 a-f	65.2 a-g	6.3 c-h	4.3 f-k	1.7 m-o
Trudan Headless	Sorghum Partners	FS	PS	N	4.0 m-o	44.9 a-d	66.8 a-e	6.6 b-d	3.2 g-k	1.8 m-o
X942 BMR	Sorghum Partners	FS	?	Y	6.8 b-h	45.6 a-c	67.9 a-c	5.9 d-j	2.8 g-k	1.8 k-o
Means **CV**					**6.18** **26.93**	**41.17** **10.18**	**62.02** **9.88**	**5.70** **11.12**	**7.06** **71.66**	**2.03** **14.34**
Location										
Kearney					**7.85 a**	**38.17 b**	**58.92 b**	**5.37 b**	**7.98 a**	**2.09 a**
Westside					**4.51 b**	**44.17 a**	**65.12 a**	**6.02 a**	**6.14 b**	**1.96 b**

Table 3. continued.

Hybrid Information[1]					Nutrient Composition & Calculations[2]					
Hybrid	**Company**	**Type**	**Maturity**	**BMR**	**% TDN**	**48 hr NDFD**	**48hr IVTD**	**% Ca**	**% P**	**% Mg**
AF 7101	Alta Seeds	FS	M	Y	55.2 a-i	58.4 b-f	74.9 a-e	0.410 b-h	0.158 k-p	0.233 d-k
AF 7102	Alta Seeds	FS	M	Y	57.1 a-d	54.7 e-h	76.1 a-c	0.382 d-k	0.212 a-c	0.213 f-k
AF 7201	Alta Seeds	FS	M	Y	53.9 b-l	57.0 c-g	74.2 a-f	0.400 c-i	0.207 a-d	0.237 d-k
AF 7202	Alta Seeds	FS	ML	Y	56.6 a-f	55.3 e-h	76.2 a-c	0.433 a-d	0.217 ab	0.253 b-i
AF 7401	Alta Seeds	FS	L	Y	55.2 a-i	62.2 ab	77.4 ab	0.422 b-f	0.222 a	0.252 b-i
AF 8301	Alta Seeds	FS	ML	N	56.2 a-f	47.4 l-n	69.9 e-k	0.358 d-l	0.177 d-l	0.252 b-i
AS 6402	Alta Seeds	FS	ML	Y	54.7 a-k	61.0 a-c	76.5 ab	0.413 b-g	0.195 a-h	0.252 b-i
AS 6501	Alta Seeds	FS	ML	Y	50.4 k-n	55.1 e-h	69.7 f-k	0.423 b-f	0.200 a-f	0.260 b-f
AS 6502	Alta Seeds	FS	PS	Y	51.8 g-m	54.9 e-h	69.7 f-k	0.395 c-j	0.168 g-n	0.213 f-l
AS 9301	Alta Seeds	FS	M	Y	56.9 a-e	51.0 h-l	72.7 a-g	0.348 f-l	0.190 b-k	0.207 g-l
AS 9302	Alta Seeds	FS	M	Y	58.6 a	52.8 g-k	74.5 a-f	0.347 f-l	0.197 a-h	0.195 j-l
EJXF2P136	Ceres	FS	L	N	49.8 l-n	45.3 m-p	63.1 m-o	0.387 f-j	0.142 n-r	0.255 b-h
EJXF2P134	Ceres	FS	ME	N	50.9 i-n	47.7 l-n	66.0 i-o	0.430 b-e	0.182 c-l	0.273 a-e
EJXF2C102	Ceres	FS	L	N	57.9 ab	53.4 g-i	74.2 a-f	0.302 kl	0.108 s	0.190 kl
EJX7C03	Ceres	FS	L	N	50.0 l-n	44.2 n-p	62.4 n-p	0.420 b-f	0.153 k-r	0.272 a-e
EJX7281	Ceres	FS	L	N	53.6 c-l	52.9 g-j	70.2 e-j	0.382 d-k	0.145 m-r	0.243 c-j
841F	Pioneer	FS	M	N	51.2 h-n	48.4 j-n	66.7 h-n	0.352 e-l	0.218 ab	0.248 b-i
849F	Pioneer	FS	ML	N	57.9 a-c	45.8 m-p	71.3 c-h	0.383 d-j	0.167 h-m	0.257 b-g
9500W	Richardson Seeds	FS	ML	N	55.3 a-h	52.8 g-k	73.3 a-g	0.337 g-l	0.190 b-j	0.243 c-j
Double 7 BMR	Richardson Seeds	FS	L	Y	55.2 a-i	63.4 a	76.7 ab	0.410 b-h	0.173 e-m	0.298 ab
Silo 700D	Richardson Seeds	FS	ML	N	57.1 a-d	49.7 i-m	71.0 d-i	0.278 l	0.168 g-n	0.203 i-l
Sweeter-n-Honey BMR Red	Richardson Seeds	FS	ME	Y	55.5 a-g	61.0 a-c	75.9 a-d	0.320 i-k	0.170 f-n	0.232 d-k
Great Scott BMR-R	Scott Seed	FS	L	Y	55.1 a-j	56.1 d-g	72.6 b-g	0.343 f-l	0.195 a-h	0.223 e-l
Great Scott BMR-W	Scott Seed	FS	L	N	57.2 a-d	60.3 a-d	77.8 a	0.343 f-l	0.207 a-d	0.205 h-k

Table 3. continued.

Hybrid Information[1]					**Nutrient Composition & Calculations**[2]					
Hybrid	**Company**	**Type**	**Maturity**	**BMR**	**% TDN**	**48 hr NDFD**	**48hr IVTD**	**% Ca**	**% P**	**% Mg**
Premium Stock LS	Scott Seed	FS	PS	N	49.9 l-n	45.9 m-o	64.2 l-o	0.400 c-i	0.183 c-k	0.265 b-e
X50623	Scott Seed	FS	ML	Y	52.6 e-m	55.2 e-h	72.4 b-g	0.418 b-f	0.182 c-l	0.250 b-i
1990	Sorghum Partners	FS	PS	N	50.5 k-n	45.7 m-p	62.2 n-p	0.343 f-l	0.135 o-s	0.242 d-j
NK300	Sorghum Partners	FS	M	N	57.7 a-c	48.0 k-n	72.7 b-g	0.362 d-k	0.198 a-g	0.250 b-i
SD1741 BMR	Sorghum Partners	FS	PS	Y	56.2 a-f	53.9 f-i	72.8 a-g	0.317 j-l	0.143 m-r	0.175 l
SDH2942 BMR	Sorghum Partners	FS	PS	Y	45.3 o	55.7 d-h	68.3 g-l	0.485 ab	0.215 ab	0.293 a-c
Sordan Headless	Sorghum Partners	FS	PS	N	47.5 no	41.0 p	57.9 p	0.380 d-k	0.162 j-p	0.250 b-i
SPX-28313	Sorghum Partners	FS	PS	N	52.7 e-m	46.7 m-n	64.3 l-o	0.365 d-k	0.132 p-s	0.252 b-i
SPX3902	Sorghum Partners	FS	L	Y	56.9 a-e	57.4 c-g	76.4 a-c	0.357 d-l	0.202 a-e	0.223 e-l
SPX3903	Sorghum Partners	FS	L	Y	53.1 d-m	58.8 a-e	74.5 a-f	0.468 a-c	0.193 a-i	0.272 a-e
SPX3952	Sorghum Partners	FS	M	N	55.7 a-g	58.8 a-f	76.1 a-d	0.382 d-k	0.163 j-o	0.230 d-k
SPX901	Sorghum Partners	FS	PS	N	50.8 k-n	46.5 l-n	63.6 l-o	0.380 d-k	0.155 k-q	0.262 b-f
SPX902	Sorghum Partners	FS	PS	N	50.7 k-n	48.1 j-n	64.4 l-o	0.407 b-h	0.152 l-r	0.275 a-d
SPX903	Sorghum Partners	FS	PS	N	49.9 l-n	44.4 n-p	61.4 op	0.402 c-h	0.125 q-s	0.262 b-f
SPX904	Sorghum Partners	FS	PS	N	49.0 m-o	41.2 op	57.4 p	0.355 d-l	0.110 s	0.268 b-e
SS405	Sorghum Partners	FS	L	N	52.5 f-k	46.9 l-n	64.9 k-o	0.332 h-l	0.123 rs	0.230 d-k
Trudan Headless	Sorghum Partners	FS	PS	N	50.8 j-n	48.2 j-n	65.3 j-o	0.360 d-k	0.143 m-r	0.235 d-k
X942 BMR	Sorghum Partners	FS	?	Y	46.9 no	53.3 h-g	68.2 g-m	0.513 a	0.198 a-g	0.322 a
Mean					**53.38**	**52.06**	**70.00**	**0.382**	**0.173**	**0.244**
CV					**7.04**	**8.11**	**6.39**	**18.46**	**15.17**	**18.34**
Location										
Kearney					**55.40 a**	**54.33 a**	**73.00 a**	**0.401 a**	**0.176 a**	**0.276 a**
Westside					**51.36 b**	**49.78 b**	**66.99 b**	**0.362 b**	**0.171 a**	**0.213 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 7101	Alta Seeds	FS	M	Y	1.39 f-j	0.095 f-o	2504.1 a-f	90.61 d-l	102.33 a-e
AF 7102	Alta Seeds	FS	M	Y	1.52 c-i	0.123 a-f	2692.0 ab	113.15 ab	115.76 ab
AF 7201	Alta Seeds	FS	M	Y	1.74 b-g	0.118 a-g	2400.7 a-h	92.26 c-k	97.43 a-f
AF 7202	Alta Seeds	FS	ML	Y	1.47 c-j	0.127 a-e	2644.7 a-c	109.85 a-c	113.14 ab
AF 7401	Alta Seeds	FS	L	Y	1.79 a-e	0.147 a	2571.0 a-d	94.70 b-i	113.70 ab
AF 8301	Alta Seeds	FS	ML	N	1.38 f-j	0.100 d-m	2475.6 a-g	101.81 a-f	92.20 b-g
AS 6402	Alta Seeds	FS	ML	Y	1.71 b-g	0.137 a-c	2547.6 a-e	92.19 c-l	108.08 a-c
AS 6501	Alta Seeds	FS	ML	Y	1.76 a-f	0.117 a-h	2061.1 f-l	76.25 i-p	79.29 e-j
AS 6502	Alta Seeds	FS	PS	Y	1.47 d-j	0.102 d-l	2170.9 d-k	77.02 h-p	82.39 d-j
AS 9301	Alta Seeds	FS	M	Y	1.28 h-j	0.103 d-l	2598.5 a-d	101.70 a-g	99.92 a-e
AS 9302	Alta Seeds	FS	M	Y	1.26 ij	0.120 a-f	2786.8 a	109.58 a-c	114.61 ab
EJXF2P136	Ceres	FS	L	N	1.67 c-h	0.078 j-p	1823.4 j-l	75.64 j-p	61.99 i-m
EJXF2P134	Ceres	FS	ME	N	1.86 a-d	0.108 c-j	1987.9 h-l	79.53 h-p	69.02 h-m
EJXF2C102	Ceres	FS	L	N	1.21 ij	0.060 p	2695.8 ab	101.73 a-g	106.01 a-d
EJX7C03	Ceres	FS	L	N	1.69 c-g	0.088 g-p	1808.0 j-l	75.96 i-p	60.23 j-m
EJX7281	Ceres	FS	L	N	1.66 c-h	0.095 f-o	2247.7 b-j	84.00 f-p	84.24 c-j
841F	Pioneer	FS	M	N	1.99 ab	0.125 a-f	2034.0 g-l	82.82 g-p	72.96 f-l
849F	Pioneer	FS	ML	N	1.11 j	0.100 d-m	2620.5 a-d	112.10 ab	99.07 a-e
9500W	Richardson Seeds	FS	ML	N	1.52 c-i	0.102 d-l	2427.0 a-h	104.32 a-e	96.30 a-g
Double 7 BMR	Richardson Seeds	FS	L	Y	1.81 a-e	0.130 a-d	2605.3 a-d	86.70 e-o	109.23 a-c
Silo 700D	Richardson Seeds	FS	ML	N	1.46 d-j	0.080 i-p	2578.2 a-d	104.40 a-e	100.89 a-e
Sweeter-n-Honey BMR Red	Richardson Seeds	FS	ME	Y	1.74 a-g	0.098 e-m	2599.8 a-d	88.29 d-m	108.52 a-c
Great Scott BMR-R	Scott Seed	FS	L	Y	1.71 b-g	0.107 c-k	2461.4 a-g	92.11 c-l	100.07 a-e
Great Scott BMR-W	Scott Seed	FS	L	N	1.70 c-g	0.118 a-g	2764.0 a	102.43 a-f	119.86 a

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**
Premium Stock LS	Scott Seed	FS	PS	N	1.95 ab	0.108 c-j	1858.7 j-l	77.84 h-p	64.17 i-m
X50623	Scott Seed	FS	ML	Y	1.69 c-g	0.120 a-f	2211.3 c-k	87.60 e-n	86.32 c-i
1990	Sorghum Partners	FS	PS	N	1.47 d-j	0.065 op	1855.1 j-l	71.42 m-p	60.28 j-m
NK300	Sorghum Partners	FS	M	N	1.44 e-j	0.110 b-i	2649.1 a-c	115.76 a	105.52 a-d
SD1741 BMR	Sorghum Partners	FS	PS	Y	1.24 ij	0.088 g-p	2532.6 a-e	92.91 c-j	96.74 a-f
SDH2942 BMR	Sorghum Partners	FS	PS	Y	2.14 a	0.123 a-f	1522.1 m	68.92 n-p	63.77 i-m
Sordan Headless	Sorghum Partners	FS	PS	N	1.83 a-e	0.078 k-p	1518.8 m	66.79 p	46.47 m
SPX-28313	Sorghum Partners	FS	PS	N	1.35 g-j	0.073 l-p	2095.9 e-l	76.87 i-p	67.87 h-m
SPX3902	Sorghum Partners	FS	L	Y	1.69 c-g	0.125 a-f	2658.4 a-c	106.57 a-d	115.21 ab
SPX3903	Sorghum Partners	FS	L	Y	1.86 a-c	0.140 ab	2361.1 a-i	89.46 d-m	100.03 a-e
SPX3952	Sorghum Partners	FS	M	N	1.53 c-i	0.125 a-f	2569.5 a-d	95.92 b-h	107.59 a-d
SPX901	Sorghum Partners	FS	PS	N	1.49 c-j	0.087 h-p	1919.9 i-l	75.84 i-p	65.33 i-m
SPX902	Sorghum Partners	FS	PS	N	1.70 b-g	0.097 e-n	1930.3 i-l	73.30 l-p	65.36 i-m
SPX903	Sorghum Partners	FS	PS	N	1.46 d-j	0.073 l-p	1774.5 k-m	70.60 m-p	56.48 k-m
SPX904	Sorghum Partners	FS	PS	N	1.29 h-j	0.067 n-p	1681.6 lm	67.79 op	49.98 lm
SS405	Sorghum Partners	FS	L	N	1.52 c-i	0.070 m-p	2063.5 f-l	79.44 h-p	71.11 g-m

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**
Trudan Headless	Sorghum Partners	FS	PS	N	1.47 c-j	0.077 l-p	2000.1 h-l	76.06 i-p	63.48 i-m
X942 BMR	Sorghum Partners	FS	?	Y	1.95 ab	0.122 a-f	1701.6 lm	73.74 k-p	65.82 i-m
Mean					**1.59**	**0.103**	**2262.2**	**88.47**	**87.11**
CV					**21.63**	**26.72**	**17.39**	**18.66**	**25.23**
Location									
Kearney					**1.41 b**	**0.12 a**	**2494.9 a**	**96.7 a**	**99.13 a**
Westside					**1.78 a**	**0.09 b**	**2029.4 b**	**80.3 b**	**75.09 b**

[1]Hybrid 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.
[2]Means followed by the same letter do not significantly differ using LSD (P=0.01)

Table 4. Top 25% of hybrids in the 2014 Kearney and Westside trials based on %IVTD, lodging, and yield[1].

Hybrid	Company	Type	Maturity	BMR	% Lodging	T ac^{-1} 65% Moist.	% Crude Prot.	48 hr IVTD	Milk lbs ton^{-1}	Rel. Fedd Value
Great Scott BMR-W	Scott Seed	FS	L	N	0.0	19.6	7.8	77.8	2764.0	102.4
AF 7401	Alta Seeds	FS	L	Y	0.0	23.9	8.9	77.4	2571.0	94.7
Double 7 BMR	Richardson Seeds	FS	L	Y	0.0	19.7	8.1	76.7	2605.3	86.7
AS 6402	Alta Seeds	FS	ML	Y	0.0	20.7	8.3	76.5	2547.6	92.2
SPX3902	Sorghum Partners	FS	L	Y	0.0	22.3	7.7	76.4	2658.4	106.6
AF 7202	Alta Seeds	FS	ML	Y	0.0	17.6	7.8	76.2	2644.7	109.9
AF 7102	Alta Seeds	FS	M	Y	0.0	18.9	7.6	76.1	2692.0	113.2
SPX3952	Sorghum Partners	FS	M	N	0.0	18.6	7.1	76.1	2569.5	95.9
AS 9302	Alta Seeds	FS	M	Y	8.3	19.1	7.9	74.5	2786.8	109.6
SPX3903	Sorghum Partners	FS	L	Y	0.0	19.4	7.5	74.5	2361.1	89.5
9500W	Richardson Seeds	FS	ML	N	0.0	19.7	6.5	73.3	2427.0	104.3

[1]The top 25% list was derived by taking those hybrids with the highest %IVTD and eliminating those hybrids that lodged by more than 25%.

Table 5. Top yielding hybrids that yielded over 19.5 tons acre^{-1} averaged over Kearney and Westside trials in 2014.

Hybrid[1]	Company	Type	Maturity	BMR	% Lodging	Ton acre^{-1} 65% Moist.	48 hr IVTD	Milk lbs ton^{-1}
SPX901	Sorghum Partners	FS	PS	N	20.8	24.2	63.6	1919.9
Premium Stock LS	Scott Seed	FS	PS	N	17.5	24.0	64.2	1858.7
AF 7401	Alta Seeds	FS	L	Y	0.0	23.9	77.4	2571.0
SPX3902	Sorghum Partners	FS	L	Y	0.0	22.3	76.4	2658.4
EJXF2P136	Ceres	FS	L	N	12.5	21.8	63.1	1823.4
1990	Sorghum Partners	FS	PS	N	21.7	21.8	62.2	1855.1
SPX903	Sorghum Partners	FS	PS	Y	48.3	21.6	61.4	1774.5
SPX904	Sorghum Partners	FS	PS	N	34.2	21.5	57.4	1681.6
Sordan Headless	Sorghum Partners	FS	PS	N	27.5	20.9	57.9	1518.8
AS 6402	Alta Seeds	FS	ML	Y	0.0	20.7	76.5	2547.6
EJXF2P134	Ceres	FS	ME	N	49.2	20.6	66.0	1987.9
EJX7C03	Ceres	FS	L	N	41.7	20.4	62.4	1808.0
Double 7 BMR	Richardson Seeds	FS	L	Y	0.0	19.7	76.7	2605.3
9500W	Richardson Seeds	FS	ML	N	0.	19.7	73.3	2427.0
Trudan Headless	Sorghum Partners	FS	PS	N	15.0	19.7	65.3	2000.1
SS405	Sorghum Partners	FS	L	N	29.2	19.7	64.9	2063.5
Great Scott BMR-W	Scott Seed	FS	L	N	0.0	19.6	77.8	2764.0
SPX902	Sorghum Partners	FS	PS	N	40.8	19.6	64.4	1930.3

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