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Sorghum Hybrid Performance
Trials in Eastern Colorado, 2012

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SORGHUM HYBRID PERFORMANCE TRIALS IN EASTERN COLORADO, 2012
K.J. Larson, J.J. Johnson, C.E. Jahn and B.T. Pettinger \1

The 2012 Colorado grain sorghum crop was estimated at 3.20 million bushels, 35 percent below the 2011 sorghum crop of 4.90 million bushels. For Colorado, the 2012 grain sorghum crop of 3.20 million bushels was the second lowest in the last 10 years, only 2002 had lower production. The decrease in sorghum production this year was due to a 15 bu/a yield reduction compared to last year, 20 bu/a for 2012 and 35 bu/a for 2011, even though harvested grain acreage was up 20,000 acres compared to last year. This yield decrease was due to an extremely dry growing season, resulting in a tie with 2002 for the lowest yield for the last 10 years of 20 bu/a. The harvested grain acreage in 2012 was 160,000 acres and 140,000 acres were harvested for grain in 2011. Sorghum silage statistics are not published during the current year; however, Colorado sorghum silage statistics are available for last year. In 2011, 182,000 tons of sorghum silage was produced. The average yield was 13 tons/a from 14,000 harvested acres. (National Agricultural Statistics Service, Colorado Field Office, 2012).

This publication is a progress report of the sorghum hybrid performance trials conducted by the Department of Soil and Crop Sciences at Colorado State University, Colorado Agricultural Experiment Station (AES), and Colorado State University Extension. The sorghum trials were conducted at four sites in eastern Colorado: dryland grain sorghum trials at Akron, Brandon, and Walsh; irrigated and dryland forage sorghum trials at Akron, Fort Collins, and Walsh. The dryland grain trial at Akron failed to produce a crop due to extreme drought conditions. From the trial planting date of June 2 through the end of September, there were 41 days when the high temperature was above 95°F and the total rainfall during that time was 3.51 inches at Akron.

Tests are partially funded by entry fees paid by commercial firms. Commercial seed representatives interested in entering sorghum hybrids in any of the trials should contact Jerry Johnson, phone (970) 491-1454, email Jerry.Johnson@colostate.edu; or Kevin Larson, phone (719) 324-5643, email Kevin.Larson@colostate.edu for further details. Names and addresses of firms submitting entries in 2012 are shown in Table 1. Each firm selected entries for testing and furnished seed for the trials. AES researchers selected closed-pedigree hybrids as standards of comparison.

Summary tables for weather data (CoAgMet and NOAA, 2012), soil analysis, fertilization (Soil, Plant and Water Testing Laboratory, Colorado State University), and available soil water graphs derived from gypsum block readings are provided for certain trial locations. Other information, where available, was included: site description, emergence date, irrigation, pest control, field history, and pertinent comments.

\1 Superintendent, Plainsman Research Center, Walsh;
Extension Crop Specialist, Dept. of Soil and Crop Sciences;
Assistant Professor, Dept. of Bioagricultural Sciences and Pest Management
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Table 1.--Entrants in the 2012 Colorado Sorghum Performance Trials.

Brand	Entered by
ADVANTA	Advanta US, 2001 E. 1 st St., P.O. Box 2420, Hereford, TX 79045
AERC	Agriculture Environmental Renewal Canada (AERC) Inc., 58 Lakspur Drive, Ottawa, Ontario, K2H 6L1
ASGROW	Monsanto Company, 800 N. Lindbergh Blvd., St. Louis, MO 63167
CHROMATIN	Chromatin Inc., 403 South Monroe, New Deal, TX 79350
DEKALB	Monsanto Company, 800 N. Lindbergh Blvd., St. Louis, MO 63167
EASTERN COLORADO SEEDS	Eastern Colorado Seeds, LLC, P.O. Box 546, Burlington, CO 80807
GAYLAND WARD SEED	Gayland Ward Seed Co. Inc., 4395 US Hwy 60, Hereford, TX 79045
MYCOGEN	Mycogen Seeds, 9330 Zionsville Rd., Indianapolis, IN 46268
RICHARDSON SEEDS	Richardson Seeds, Ltd., P.O. Box 60, 3095 CR 26, Vega, TX 79092
SORGHUM PARTNERS	Sorghum Partners, LLC, P.O. Box 189, 403 South Monroe, New Deal, TX 79350
TRIUMPH	Triumph Seed Co., Inc., P.O. Box 1050, Hwy 62 Bypass, Ralls, TX 79357

Growing Degree Days for sorghum were calculated from planting through first freeze using a maximum of 111°F and a minimum of 50°F for threshold temperatures (Peacock and Heinrich, 1984). They are calculated by averaging daily high and low temperatures and subtracting the base temperature of 50°F from the average. When daily temperatures are less than 50°F, 50°F is used, when temperatures are above 111°F a maximum temperature of 111°F is used:

$$\frac{(\text{Daily Minimum Temp.} + \text{Daily Maximum Temp.})}{2} - 50^{\circ}\text{F}$$

Experimental Methods and Evaluations

Trials were planted with a four-row cone planter and harvested with a modified, self-propelled John Deere 4420 combine equipped with a four-row row-crop head to enhance harvest of lodged tillers. Hand-harvested samples of the forage plots were taken for silage production.

Days to Emergence. Seedling emergence was determined as the number of days after planting until approximately half of the seedlings become visible down a planted row.

50% Bloom. Number of days after planting until half of the main heads had pollinating florets. Number of days to half bloom provides a good measure of relative maturity between hybrids.

50% Maturity. Number of days after planting until half of the kernels in half of the main heads reached physiological maturity, i.e., the black layer becomes visible at the base of the kernel.

Plant Height. Plant height was measured in inches from the soil to the tip of the main head.

Lodging. The percentage of tillers with broken basal stems or broken peduncles or were leaning more than a 45 degree angle were considered lodged. Since the combine was equipped with a row crop head, most of the leaning tillers were harvested.

Harvest Density. Plant population in plants per acre was counted prior to harvest.

Test Weight. Test weight was determined using a hand-held bushel weight tester. A low test weight indicates that a hybrid did not fully mature prior to the first freeze or that it suffered environmental stress, such as a water deficiency.

Grain Yield. The grain yield in bushels per acre was adjusted to 14 percent moisture content.

Yield as a % of Test Average. Yield as a percentage of test average provides a comparison between yields within a trial and allows easy comparisons among years, irrespective of annual growing conditions.

Forage Yield. Forage yield in tons per acre was adjusted to 70% moisture content. A representative sample of fresh silage was oven-dried at 167°F (75°C) until there was no more weight loss, and then yields were adjusted to 70% moisture content.

Stem Sugar. The sugar content (Brix), expressed as a percent, in the stem of forage sorghums at harvest was measured with a hand refractometer.

Available Soil Water

Available soil water was measured by placing gypsum blocks at 6, 18, 30, and 42 inches below the soil surface. Electrical resistance readings were made weekly or biweekly. Resistance readings vary with the amount of soil water present. Using resistance readings, available soil water was determined by extrapolating from soil water depletion curves for each particular soil type.

Statistical Method

Trials were planted in a randomized complete block design with four replications. No less than three replications were harvested. Analysis of variance was applied to the results and the least significant difference (LSD) was computed at $\alpha = 0.05$ and 0.20 for all trials. Analysis of variance and regression were performed with CoStat Statistical Software a product of Cohort Software, Berkeley, California.

Acknowledgements

We are sincerely grateful to the National Sorghum Producers for providing funding through the Colorado Sorghum Producers to support these performance trials. We are also appreciative to the staffs at the Central Great Plains Research Station at Akron, Agricultural Research, Development and Education Center (ARDEC) at Fort Collins, and Plainsman Research Center at Walsh for their assistance in conducting these trials. We would like to extend a special thank you to Burl Scherler, grower-cooperator, for his assistance with the Brandon trial.

References

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Dryland Grain Sorghum Hybrid Performance Trial at Brandon, 2012

COOPERATOR: Burl Scherler, Sand Creek, Inc., Brandon, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3000 sorghum heat units in loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 43,600 seed/a. PLANTED: June 1. HARVESTED: October 29.

PEST CONTROL: Preemergence Herbicides: Glyphosate 32 oz/a, Atrazine 0.9 lb/a, Metal 24 oz/a. Post Emergence Herbicides: 2,4-D amine (with drops). CULTIVATION: None. INSECTICIDES: None.

FIELD HISTORY: Previous Crop: Wheat. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1 Chivington, Kiowa County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	0.99	796	20	13	30
July	0.97	926	28	19	61
August	1.21	744	22	4	92
September	0.56	525	10	0	122
October	0.00	26	0	0	124
Total	3.73	3017	80	36	124

\1 Growing season from June 2 (planting) to October 2 (first freeze, 29 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture. Weed control was excellent. The growing season was very dry. No greenbug infestation. Yields and test weights were good, especially considering the lack of precipitation. Because of the dry weather, particularly late in the season, later maturing hybrids did not fully mature and subsequently had low test weights and poor yields.

SOIL: Loam for 0-8" and loam 8"-24" depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.4	1.4	18	6.5	993	0.3	3.6
8"-24"				14				
Comment	Alka	VLo	Mod	Hi	Lo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	60	20	0	0

Yield Goal: 45 bu/a.

Actual Yield: 34 bu/a.

Available Soil Water Dryland Grain Sorghum, Brandon, 2012

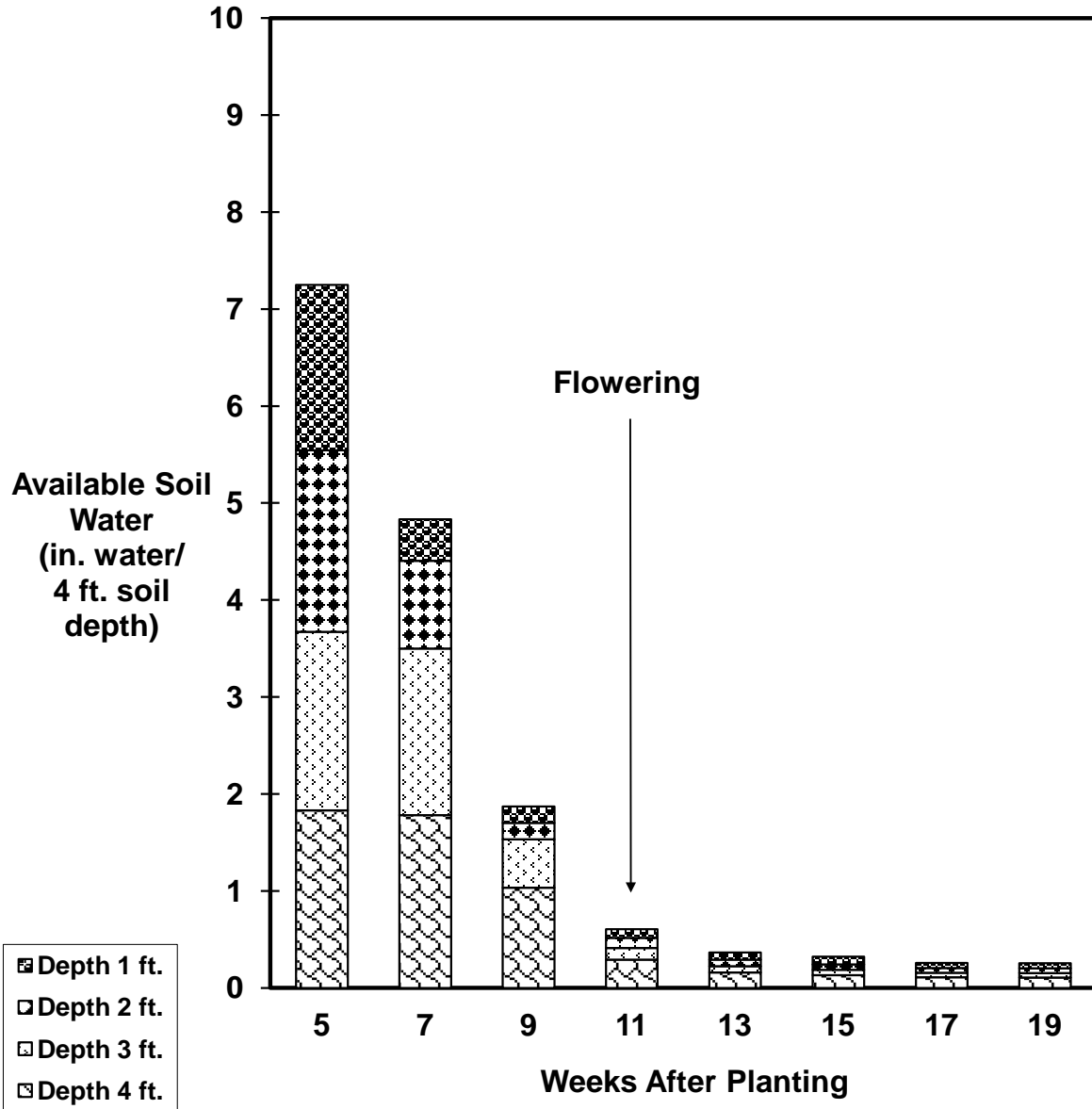


Fig. 1. Available soil water in dryland grain sorghum at Brandon. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Brandon from planting to first freeze was 3.73 in. Any increase in available soil water between weeks is from rain.

Table 2. 2012 Dryland Grain Sorghum Hybrid Performance Trial at Brandon.

Source	Hybrid	Grain Yield ^a	Yield	Test Weight	Lodging	Harvest Plant Population	Plant Height	50% Bloom	GDD ^b	50% Mature ^c	Maturity Group ^d
			Percent of Trial Average							days after planting	
		bu/ac	percent	lb/bu	percent	plants/ac	in	days after planting		days after planting	
Triumph	TR424	50.8	149	59	2	26,300	34	67	1886	113	E
Sorghum Partners	KS310	46.7	137	59	2	22,900	33	71	1993	115	E
Dekalb	DKS29-28	45.3	133	59	4	19,400	33	66	1852	111	E
Mycogen	1G557	44.8	131	58	1	22,300	32	68	1917	113	E
Dekalb	DKS28-05	40.4	118	58	4	21,300	33	73	2052	118	E
Asgrow	Pulsar	39.5	116	57	8	22,700	32	73	2052	119	E
Advanta	96275	36.4	107	58	2	17,200	30	66	1852	111	E
Sorghum Partners	251	32.8	96	57	1	21,500	29	63	1785	107	E
Syngenta	H-307	32.8	96	58	2	20,500	34	68	1917	113	E
Dekalb	DK39Y	31.2	91	56	1	15,900	34	72	2026	118	E
Triumph	TR438	45.0	132	57	1	17,400	37	80	2197	121	ME
Dekalb	DKS44-20	38.2	112	56	6	19,200	36	81	2215	123	ME
Mycogen	627	34.7	102	55	1	17,600	36	81	2215	123	ME
Mycogen	1G600	30.3	89	54	1	18,200	36	80	2197	122	ME
Sorghum Partners	NK5418	27.3	80	55	0	19,800	36	82	2235	122	ME
Triumph	TR452	26.2	77	54	1	19,000	36	82	2235	123	ME
Dekalb	DKS37-07	24.1	71	54	1	25,900	36	81	2215	123	ME
Mycogen	M3838	22.2	65	53	1	18,200	34	83	2260	HD	M
Triumph	TR448	18.0	53	50	1	17,200	37	87	2347	SD	M
Advanta	97524	14.7	43	53	0	16,300	36	83	2260	HD	M
Average		34.1		56	2	19,940	34	75	2085		

^eLSD (P<0.05)

9.9 2.5

^eLSD (P<0.20)

6.4 1.6

^aYields corrected to 14% moisture and hybrids ranked by yield within maturity group.

^bGDD: Growing degree-days to 50% bloom date.

^cDays after planting or maturation of seed at first freeze. HD=hard dough, SD=soft dough.

^dMaturity Group: E=early; ME=medium-early; M=medium.

^eIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Table 3. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Brandon, 2010-2012.

Brand	Hybrid	Maturity Group	Grain Yield					Yield as % of Test Average				
			2010	2011	2012	2-Year Avg	3-Year Avg	2010	2011	2012	2-Year Avg	3-Year Avg
			-----bu/a-----					-----%-----				
ASGROW	Pulsar	E	70	22	40	31	44	104	115	116	115	110
DEKALB	DKS37-07	ME	61	--	24	--	--	91	--	71	--	--
DEKALB	DKS29-28	E	69	--	45	--	--	103	--	133	--	--
DEKALB	DKS28-05	E	80	37	40	39	52	105	197	118	143	131
MYCOGEN	1G557	E	78	26	45	36	50	116	139	131	131	124
MYCOGEN	M3838	ME/M	48	13	22	18	28	71	67	65	65	69
SORGHUM PARTNERS	KS310	E	79	32	47	40	53	118	172	137	146	132
SORGHUM PARTNERS	251	E	55	11	33	22	33	81	57	96	81	83
SORGHUM PARTNERS	NK5418	ME/M	60	21	27	24	36	90	111	80	89	90
SORGHUM PARTNERS	K35-Y5	E/ME	72	25	--	--	--	108	132	--	--	--
SORGHUM PARTNERS	SP3303	E	60	10	--	--	--	89	52	--	--	--
TRUIMPH	TR424	E	76	32	51	42	53	114	172	149	154	133
TRUIMPH	TR452	ME	66	--	26	--	--	98	--	77	--	--
Average			66	19	34	27	40					

Maturity Group: E, early; ME, medium early; M, medium.

Grain Yields were adjusted to 14.0% seed moisture content.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3700 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. **SEEDING DENSITY:** 43,600 seed/a. **PLANTED:** May 29. **HARVESTED:** October 25.

PEST CONTROL: Preemergence Herbicides: Atrazine 1lb/a, Dual II Magnum 21 oz/a, Glyphosate, 28 oz/a; 2,4-D, 0.5 lb/a, Banvel 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Banvel 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. **CULTIVATION:** Once. **INSECTICIDES:** None.

FIELD HISTORY: Previous Crop: Wheat. **FIELD PREPARATION:** No-till.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Sandbur control was poor; broadleaf weed control was good. The growing season precipitation was average, but variable (June was wet and July was dry). Grain yields were fair, but variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8" and silt loam 8"-24" depths from soil analysis.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.36	537	8	0	125
October	0.86	167	0	0	143
Total	11.68	3266	71	22	143

\1 Growing season from May 29 (planting) to October 18 (first freeze, 29 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.4	2.1	16	7.0	973	0.6	3.3
8"-24"				34				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 45 bu/a.

Actual Yield: 25 bu/a.

**Available Soil Water
Dryland Grain Sorghum, Walsh, 2012**

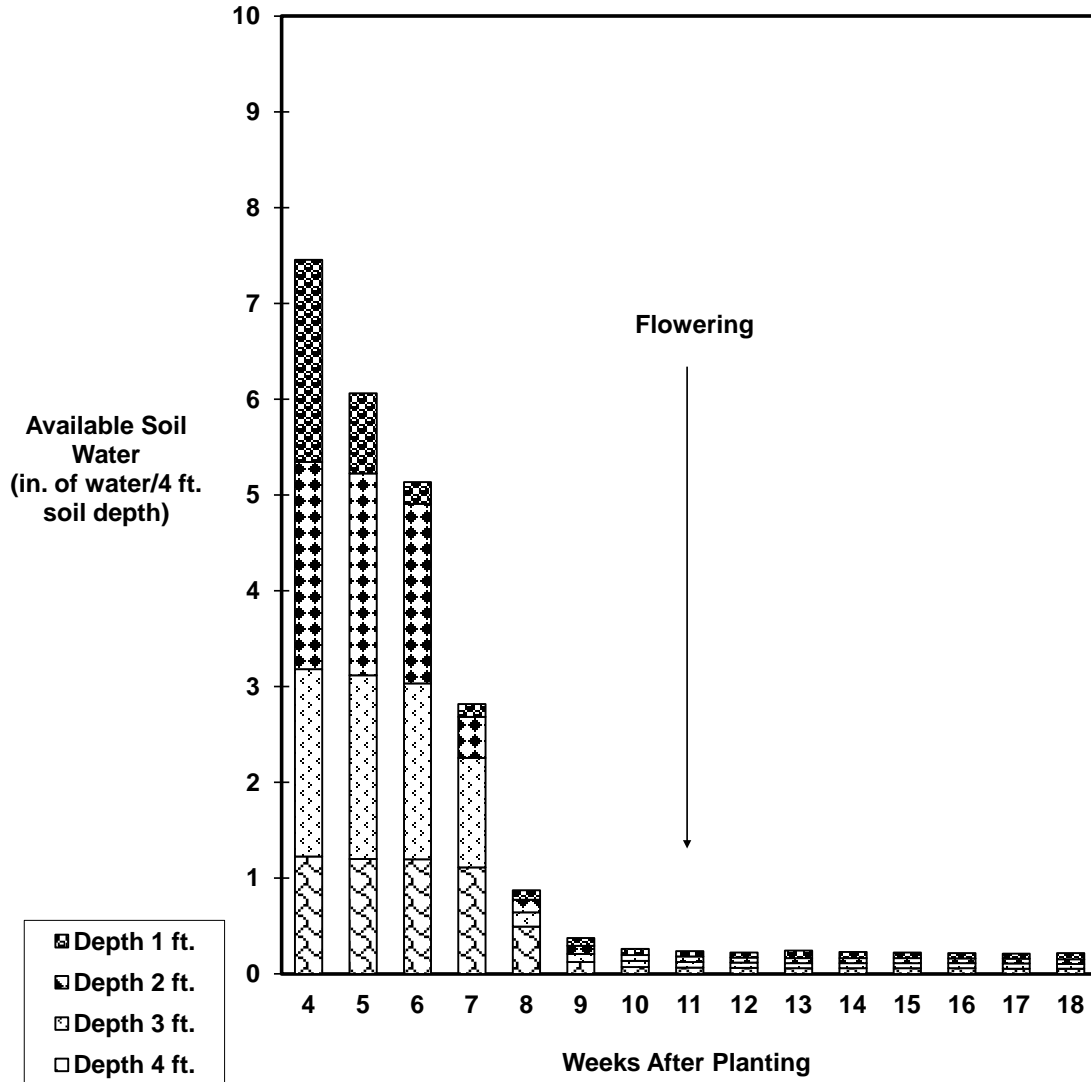


Fig. 2. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.76 in. Any increase in available soil water between weeks is from rain.

Table 4. 2012 Dryland Grain Sorghum Hybrid Performance Trial at Walsh.

Source	Hybrid	Grain Yield ^a bu/ac	Yield	Test Weight lb/bu	Harvest Plant Population plants/ac	Plant Height in	Emergence days after planting	50%	GDD ^b	50%	Maturity Group ^d
			Percent of Trial Average percent					Bloom days after planting		Mature ^c days after planting	
Triumph	TR424	37.2	149	61	25,900	33	12	65	1812	102	E
Dekalb	DK39Y	31.2	125	62	19,800	34	13	67	1879	106	E
Advanta	96275	29.8	120	57	21,500	33	12	61	1677	99	E
Dekalb	DKS29-28	29.7	119	61	25,900	32	13	63	1745	102	E
Asgrow	Pulsar	25.7	103	61	24,200	30	12	68	1910	109	E
Dekalb	DKS28-05	25.3	102	59	25,800	25	12	68	1910	106	E
Sorghum Partners	KS310	24.4	98	59	27,100	30	12	69	1929	107	E
Mycogen	1G557	19.5	78	59	24,400	31	12	63	1745	101	E
Sorghum Partners	251	18.4	74	58	26,700	29	12	58	1584	96	E
Dekalb	DKS44-20	35.6	143	61	25,600	36	12	75	2098	119	ME
Dekalb	DKS37-07	29.2	117	56	26,300	32	12	77	2155	121	ME
Triumph	TR438	28.8	116	60	27,700	35	13	70	1955	108	ME
Triumph	TR452	25.3	102	60	25,000	36	12	76	2132	114	ME
Sorghum Partners	NK5418	21.8	88	57	22,100	35	13	77	2155	121	ME
Mycogen	627	15.0	60	58	23,600	32	13	76	2132	114	ME
Mycogen	1G600	13.2	53	57	22,300	33	12	76	2132	115	ME
Triumph	TR448	23.2	93	55	25,200	33	13	80	2233	125	M
Mycogen	M3838	20.1	81	56	27,500	36	13	78	2184	122	M
Advanta	97524	19.8	80	56	23,000	34	13	80	2233	124	M
Average		24.9		59	24,716	33	12	71	1979	111	
^e LSD (P<0.05)		20.6									
^e LSD (P<0.20)		13.3									

^aYields corrected to 14% moisture and hybrids ranked by yield within maturity group.

^bGDD: Growing degree-days to 50% bloom date.

^cDays after planting or maturation of seed at first freeze.

^dMaturity Group: E=early; ME=medium-early; M=medium.

^eIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Table 5. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Walsh, 2010-2012.

Brand	Hybrid	Maturity Group ^a	Grain Yield					Yield as % of Test Average				
			2010	2011	2012	2-Year Avg	3-Year Avg	2010	2011	2012	2-Year Avg	3-Year Avg
			-----bu/a-----					-----%-----				
ASGROW	Pulsar	E	88	--	26	--	--	98	--	103	--	--
DEKALB	DKS44-20	ME	--	56	36	46	--	--	130	143	135	--
DEKALB	DKS37-07	ME	91	48	29	39	56	102	111	117	113	108
DEKALB	DKS29-28	E	80	--	30	--	--	89	--	119	--	--
DEKALB	DKS28-05	E	80	--	25	--	--	97	--	102	--	--
MYCOGEN	M3838	ME/M	88	31	20	26	46	99	72	81	75	89
MYCOGEN	1G557	E	--	49	20	35	--	--	113	78	101	--
SORGHUM PARTNERS	KS310	E	79	43	24	34	49	89	99	98	99	94
SORGHUM PARTNERS	251	E	57	32	18	25	36	63	75	74	74	69
SORGHUM PARTNERS	NK5418	ME/M	112	63	22	43	66	126	144	88	125	126
SORGHUM PARTNERS	K35-Y5	E/ME	95	47	--	--	--	107	108	--	--	--
SORGHUM PARTNERS	SP3303	E	64	34	--	--	--	72	78	--	--	--
TRUIMPH	TR424	E	83	48	37	43	56	93	111	149	125	108
TRUIMPH	TR438	ME	100	50	29	40	60	112	115	116	116	115
TRUIMPH	TR448	M	93	--	23	--	--	104	--	93	--	--
TRUIMPH	TR452	ME	108	--	25	--	--	121	--	102	--	--
(Check)	399 X 2737	M	101	15	--	--	--	113	35	--	--	--
Average			89	43	25	34	52					

^aMaturity Group: E, early; ME, medium early, M, medium.

Grain Yields were adjusted to 14.0% seed moisture content.

The site was pre-irrigated with furrow irrigation in 2011.

Dryland Forage Sorghum Performance Trial at Akron, 2012

COOPERATOR: Central Great Plains Research Station.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2750 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 69,700 seed/a. PLANTED: May 31. HARVESTED: September 25.

WEED CONTROL: Aim, Paraquat, Glyphosate, and Starane.

CULTIVATION: None.

SOIL: Weld silty loam.

FERTILIZER: Nitrogen 40 lb/a.

Summary: Growing Season Precipitation and Temperature \1 Akron, Washington County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.24	2.32	736	17	7	30
July	2.26	0.91	852	25	4	61
August	0.15	4.03	732	17	1	92
September	0.53	2.08	432	7	0	117
Total	3.18	9.34	2752	66	12	117

\1 Growing season from May 31 (planting) to September 25 (harvest).

\2 Total in-season water from irrigation and precipitation was 12.52 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Soybean. FIELD PREPARATION: No-till.

COMMENTS: Planted in dry soil moisture and irrigated up with overhead risers for stand establishment. Because of the extremely dry and hot season, the site received rescue irrigations from late July through mid September. However, chronic hot and windy conditions greatly reduced the effectiveness of these overhead irrigations. Much below normal precipitation for the growing season with June, August, and September months being extremely dry. Weeds (particularly Russian thistle, puncture vine, and kochia) were a major problem. Multiple herbicides were applied, but the hot and dry weather compromised their effectiveness. Forage yields were poor and variable because of the dry and hot season.

Table 6. 2012 Dryland Forage and Sweet Sorghum Variety Performance Trial at Akron.

Source	Variety	Forage Yield ^a tons/ac	Brix (Stem Sugar) percent	Plant Height in	Flowering percent at harvest	Type	Maturity Group ^b
Chromatin	FS0000HS	5.3	10.9	17.1	0.0	Forage	P
Gayland Ward Seed	Super Sugar	4.8	13.8	27.2	62.5	Sweet	E
AERC	CSSPM-7	4.4	10.4	30.4	62.5	Pearl Millet	E
Eastern CO Seeds	HP1010BMR	4.2	11.5	15.5	0.0	Forage	L
Eastern CO Seeds	HPECS12EXP	3.9	11.6	12.3	0.0	Forage	ME
Eastern CO Seeds	HP99BMR	3.9	12.0	18.8	0.0	Forage	ME
Gayland Ward Seed	Sweet for Ever	3.6	12.5	14.5	25.0	Sweet	P
Richardson Seeds	X38400	3.5	11.5	17.0	62.5	Sorghum x Sudan	ME
Chromatin	FS00504	3.4	11.9	15.5	0.0	Forage	L
Eastern CO Seeds	HP85BMR	3.2	11.1	22.0	37.5	Forage	E
Richardson Seeds	Silo 700D	3.1	12.1	9.9	0.0	Hybrid Forage	ML
Chromatin	FS00991	3.1	11.5	12.4	0.0	Forage	L
Eastern CO Seeds	HP95BMR	3.0	12.0	15.4	12.5	Forage	ME
AERC	CSSH-45	2.7	12.9	19.2	0.0	Sweet	E
Eastern CO Seeds	HP120BMR	2.2	13.3	8.6	0.0	Forage	L
Richardson Seeds	X36400	1.8	11.1	9.4	0.0	Hybrid Forage	L
Chromatin	FS0000HT	1.7	11.8	7.6	0.0	Forage	P
Average		3.40	11.9	16.0	15.4		
^c LSD (P<0.05)		2.41					
^c LSD (P<0.20)		1.66					

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Irrigated Forage Sorghum Performance Trial at Akron, 2012

COOPERATOR: Central Great Plains Research Station.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2750 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 113,250 seed/a. PLANTED: May 31. HARVESTED: September 25.

WEED CONTROL: Aim, Paraquat, Glyphosate, and Starane.

CULTIVATION: None.

SOIL: Weld silt loam.
FERTILIZER: Nitrogen 40 lb/a.

Summary: Growing Season Precipitation and Temperature \1 Akron, Washington County.						
Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.24	2.32	736	17	7	30
July	2.26	4.96	852	25	4	61
August	0.15	4.96	732	17	1	92
September	0.53	2.50	432	7	0	117
Total	3.18	14.74	2752	66	12	117

\1 Growing season from May 31 (planting) to September 25 (harvest).
 \2 Total in-season water from irrigation and precipitation was 17.92 in/a.
 \3 GDD: Growing Degree Days for sorghum.
 \4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Soybean. FIELD PREPARATION: No-till.

COMMENTS: Planted in dry soil moisture and irrigated up with overhead risers for stand establishment. In-season overhead irrigations were applied from late June to mid September. However, chronic hot and windy conditions greatly reduced the effectiveness of these overhead irrigations. Much below normal precipitation for the growing season with June, August, and September months being extremely dry. Weeds (particularly Russian thistle, puncture vine, and kochia) were a major problem. Multiple herbicides were applied, but the hot and dry weather compromised their effectiveness. Forage yields were poor and viable. Chronic hot and windy conditions made overhead irrigation difficult and created substantial spatial variability across the field.

Table 7. 2012 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Akron.

Source	Variety	Forage Yield ^a	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group ^b
		tons/ac	percent	in	percent at harvest		
Chromatin	FS0000HT	10.17	12.7	41.9	0.0	Forage	P
Eastern CO Seeds	HP95BMR	9.81	14.0	50.3	100.0	Forage	ME
Richardson Seeds	Silo 700D	9.65	15.0	25.0	62.5	Hybrid Forage	ML
Eastern CO Seeds	HP99BMR	9.59	13.7	43.0	25.0	Forage	ME
AERC	CSSPM-7	9.03	12.0	49.0	100.0	Pearl Millet	E
Eastern CO Seeds	HP1010BMR	8.73	12.9	44.7	25.0	Forage	L
Richardson Seeds	X38400	8.69	13.3	30.2	50.0	Sorghum x Sudan	ME
Chromatin	FS00504	7.83	11.6	44.9	12.5	Forage	L
Eastern CO Seeds	HP120BMR	7.61	13.7	23.8	37.5	Forage	L
Chromatin	FS00991	7.45	11.6	19.2	12.5	Forage	L
AERC	CSSH-45	7.34	14.8	40.4	50.0	Sweet	E
Eastern CO Seeds	HPECS12EXP	7.02	14.1	21.4	50.0	Forage	ME
Chromatin	FS0000HS	6.59	12.5	24.5	0.0	Forage	P
Gayland Ward Seed	Super Sugar	6.58	13.4	46.9	100.0	Sweet	E
Eastern CO Seeds	HP85BMR	4.67	12.8	35.4	37.5	Forage	E
Gayland Ward Seed	Sweet for Ever	4.10	12.2	20.2	37.5	Sweet	P
Richardson Seeds	X36400	4.07	12.1	15.4	12.5	Hybrid Forage	L
Average		7.58	13.1	33.9	41.9		
^c LSD (P<0.05)		4.62					
^c LSD (P<0.20)		2.85					

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Dryland Forage Sorghum Performance Trial at Fort Collins, 2012

COOPERATOR: Agricultural Research, Development and Education Center (ARDEC).

PURPOSE: To identify high yielding hybrids under dryland conditions with 2450 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. **SEEDING DENSITY:** 69,700 seed/a.
PLANTED: June 1.
HARVESTED: September 5 and 15.

WEED CONTROL: Starane.

CULTIVATION: None.

SOIL: Fort Collins loam.

FERTILIZER: Nitrogen 40 lb/a.

Summary: Growing Season Precipitation and Temperature \1
 Fort Collins, Larimer County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.62	3.00	647	14	3	29
July	1.75	0.00	754	18	0	60
August	0.70	0.00	673	12	0	91
September	0.80	0.00	393	0	0	106
Total	3.87	3.00	2467	44	3	106

\1 Growing season from June 1 (planting) to September 15 (harvest).

\2 Total in-season water from irrigation and precipitation was 6.87 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Wheat. **FIELD PREPARATION:** Tilled.

COMMENTS: Planted in dry soil moisture and irrigated up with linear-mover sprinkler for stand establishment. Much below normal precipitation for the growing season with June, August and September months being extremely dry. Weed control was very good. There were patchy infestations of aphid and an unidentified fungus, but no significant damage from these pests was observed. Forage yields were very good despite the dry season.

Table 8. 2012 Dryland Forage and Sweet Sorghum Variety Performance Trial at Fort Collins.

Source	Variety	Forage Yield ^a	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group ^b
		tons/ac	percent	in	percent at harvest		
Chromatin	FS0000HS	18.03	15.0	19.0	12.5	Forage	P
Chromatin	FS00504	13.83	13.8	25.7	12.5	Forage	L
Richardson Seeds	X36400	13.18	14.5	18.3	33.3	Hybrid Forage	L
Eastern CO Seeds	HP99BMR	12.71	15.1	20.3	0.0	Forage	ME
Chromatin	FS0000HT	12.55	15.9	20.5	12.5	Forage	P
Chromatin	FS00991	12.15	14.5	13.2	0.0	Forage	L
Gayland Ward Seed	Super Sugar*	11.55	17.2	46.2	100.0	Sweet	E
Eastern CO Seeds	HP1010BMR	11.45	13.6	18.2	0.0	Forage	L
Eastern CO Seeds	HP95BMR	11.23	14.3	19.5	0.0	Forage	ME
AERC	CSSH-45*	9.97	16.9	31.2	28.6	Sweet	E
Richardson Seeds	X38400*	9.61	14.0	18.9	33.3	Sorghum x Sudan	ME
Gayland Ward Seed	Sweet For Ever*	9.58	16.0	20.2	33.3	Sweet	P
Richardson Seeds	Silo 700D*	9.24	15.8	14.6	20.0	Hybrid Forage	L
Eastern CO Seeds	HPECS12EXP	9.01	15.3	11.9	12.5	Forage	ME
Eastern CO Seeds	HP120BMR	8.44	15.9	11.5	0.0	Forage	L
AERC	CSSPM-7*	8.26	14.1	33.2	56.3	Pearl Millet	E
Eastern CO Seeds	HP85BMR	7.52	13.8	17.8	0.0	Forage	E
Average		11.08	15.0	21.2	20.9		

^cLSD (P<0.05)

4.77

^cLSD (P<0.20)

3.24

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Varieties with an asterisk symbol were harvested on 9/5/2012. All other varieties were harvested on 9/15/2012.

Irrigated Forage Sorghum Performance Trial at Fort Collins, 2012

COOPERATOR: Agricultural Research, Development and Education Center (ARDEC).

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2450 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 113,250 seed/a. PLANTED: June 1. HARVESTED: September 5 and 15.

WEED CONTROL: Starane.

CULTIVATION: None.

SOIL: Fort Collins loam.

FERTILIZER: Nitrogen 40 lb/a.

Summary: Growing Season Precipitation and Temperature \1
Fort Collins, Larimer County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.62	4.20	647	14	3	29
July	1.75	4.34	754	18	0	60
August	0.70	4.34	673	12	0	91
September	0.80	1.12	393	0	0	106
Total	3.87	14.00	2467	44	3	106

\1 Growing season from June 1 (planting) to September 15 (harvest).

\2 Total in-season water from irrigation and precipitation was 17.87 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Wheat. FIELD PREPARATION: No-till.

COMMENTS: Planted in dry soil moisture and irrigated up with a linear-move sprinkler for stand establishment and subsequent irrigations.. Sprinkler irrigation was applied weekly from planting through early September. Much below normal precipitation for the growing season with June, August and September months being extremely dry. Weed control was very good. There were patchy infestations of aphid and fungus, but no significant damage from these pests was observed. Forage yields were very good despite the dry season.

Table 9. 2012 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Fort Collins.

Source	Variety	Forage Yield ^a	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group ^b
		tons/ac	percent	in	percent at harvest		
AERC	CSSH-45*	31.04	14.2	91.1	100.0	Sweet	E
Richardson Seeds	X38400*	30.18	8.3	82.9	100.0	Sorghum x Sudan	ME
Gayland Ward Seed	Sweet for Ever*	29.85	7.3	72.8	100.0	Sweet	P
Chromatin	FS00504	29.79	13.0	98.4	100.0	Forage	L
Chromatin	FS0000HS	28.50	10.8	92.3	100.0	Forage	P
Gayland Ward Seed	Super Sugar*	27.55	12.0	86.7	100.0	Sweet	E
Richardson Seeds	Silo 700D*	26.47	13.1	55.1	100.0	Hybrid Forage	ML
Chromatin	FS00991	24.19	9.1	74.6	14.3	Forage	L
Chromatin	FS0000HT	23.96	12.0	99.6	100.0	Forage	P
Eastern CO Seeds	HP95BMR	23.24	12.1	85.6	100.0	Forage	ME
Eastern CO Seeds	HP85BMR	22.83	11.9	83.0	100.0	Forage	E
Eastern CO Seeds	HP99BMR	21.33	12.9	92.1	100.0	Forage	ME
AERC	CSSPM-7*	20.39	13.2	84.2	100.0	Pearl Millet	E
Richardson Seeds	X36400	19.92	12.5	70.6	20.0	Hybrid Forage	L
Eastern CO Seeds	HP1010BMR	18.20	13.3	71.0	100.0	Forage	L
Eastern CO Seeds	HPECS12EXP	18.03	9.9	48.7	100.0	Forage	ME
Eastern CO Seeds	HP120BMR	17.75	9.5	47.4	100.0	Forage	L
Average		24.31	11.5	78.6	90.3		
^c LSD (P<0.05)		6.65					
^c LSD (P<0.20)		4.60					

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Varieties with an asterisk were harvested on 9/5/2012. All other varieties were harvested on 9/15/2012.

Dryland Forage Sorghum Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3250 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 69,700 seed/a. PLANTED: May 29. HARVESTED: September 28.

PEST CONTROL: Preemergence Herbicides: Atrazine 1 lb/a, Glyphosate 28 oz/a, 2,4-D 0.5 lb/a, Dicamba 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Dicamba 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: Once. INSECTICIDES: None.

FIELD HISTORY: Previous Crop: Canola. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.16	517	8	0	123
Total	11.48	3246	71	22	123

\1 Growing season from May 29 (planting) to September 28 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Sandbur control was poor; broadleaf weed control was good, except for a late infestation of puncture vine. The growing season precipitation was average, but variable (June was wet and July was dry). Forage yields were poor and variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8" and silt loam 8"-24" depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.4	2.1	16	7.0	973	0.6	3.3
8"-24"				34				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 8 tons/a.

Actual Yield: 2.33 tons/a.

Table 10. 2012 Dryland Forage and Sweet Sorghum Variety Performance Trial at Walsh.

Source	Variety	Forage Yield ^a tons/ac	Brix (Stem Sugar) percent	Plant Height in	Flowering percent at harvest	Type	Maturity Group ^b
Eastern CO Seeds	HPECS12EXP	3.76	13.9	6.8	0.0	Forage	ME
Eastern CO Seeds	HP99BMR	3.36	14.1	8.6	25.0	Forage	ME
Eastern CO Seeds	HP85BMR	2.91	14.9	8.3	0.0	Forage	E
Gayland Ward Seed	Super Sugar	2.79	18.0	15.4	75.0	Sweet	E
Richardson Seeds	X38400	2.68	13.8	18.0	50.0	Sorghum x Sudan	ME
AERC	CSSPM-7	2.59	12.1	11.9	87.5	Pearl Millet	E
Eastern CO Seeds	HP1010BMR	2.46	12.8	14.3	12.5	Forage	L
Eastern CO Seeds	HP95BMR	2.38	13.2	24.5	0.0	Forage	ME
Chromatin	FS0000HS	2.28	13.3	9.4	0.0	Forage	P
Chromatin	FS00991	2.24	13.8	11.9	0.0	Forage	L
Richardson Seeds	X36400	2.21	14.1	15.5	0.0	Hybrid Forage	L
Richardson Seeds	Silo 700D	2.06	13.6	8.8	12.5	Hybrid Forage	ML
Gayland Ward Seed	Sweet for Ever	2.01	13.3	11.6	12.5	Sweet	P
Chromatin	FS00504	1.99	12.9	17.0	12.5	Forage	L
Eastern CO Seeds	HP120BMR	1.70	14.0	11.7	0.0	Forage	L
AERC	CSSH-45	1.14	15.1	24.1	75.0	Sweet	E
Chromatin	FS0000HT	0.98	13.2	18.1	0.0	Forage	P
Average		2.33	13.9	13.9	21.3		
^c LSD (P<0.05)		1.94					
^c LSD (P<0.20)		1.30					

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3250 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 113,250 seed/a. PLANTED: May 29; replanted: June 27. HARVESTED: September 28.

IRRIGATION: One furrow irrigation: July 27, total applied 8 a-in./a.

PEST CONTROL: Preemergence Herbicides: Atrazine 1 lb/a, Glyphosate 28 oz/a, 2,4-D 0.5 lb/a, Dicamba 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Dicamba 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: Once. INSECTICIDES: None.

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.16	517	8	0	123
Total	11.48	3246	71	22	123

\1 Growing season from May 29 (planting) to September 28 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Canola. FIELD PREPARATION: No-till.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Replanted on June 27 because of herbicide drift damage. Sandbur control was poor; broadleaf weed control was good, except for a late infestation of puncture vine. The growing season precipitation was average, but variable (June was wet and July was dry). Forage yields were poor and variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8" and silt loam 8"-24" depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.8	2.2	37	5.0	915	0.8	3.8
8"-24"				39				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 18 tons/a.

Actual Yield: 6.44 tons/a @ 70% MC.

Table 11. 2012 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Walsh.

Source	Variety	Forage Yield ^a	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group ^b
		tons/ac	percent	in	percent at harvest		
Chromatin	FS0000HT	9.20	10.4	36.3	37.5	Forage	P
Chromatin	FS00504	9.15	11.2	39.5	75.0	Forage	L
AERC	CSSPM-7	8.55	12.5	44.2	100.0	Pearl Millet	E
AERC	CSSH-45	8.11	11.7	42.2	75.0	Sweet	E
Chromatin	FS0000HS	6.86	10.4	17.6	0.0	Forage	P
Gayland Ward Seed	Sweet for Ever	6.70	10.6	25.3	50.0	Sweet	P
Richardson Seeds	X38400	6.65	10.1	28.5	75.0	Sorghum x Sudan	ME
Eastern CO Seeds	HP99BMR	6.60	9.9	26.8	37.5	Forage	ME
Richardson Seeds	Silo 700D	6.59	12.2	24.4	37.5	Hybrid Forage	ML
Eastern CO Seeds	HP85BMR	6.15	10.2	32.9	75.0	Forage	E
Eastern CO Seeds	HP120BMR	6.06	10.6	15.8	0.0	Forage	L
Eastern CO Seeds	HP95BMR	6.03	10.3	32.1	50.0	Forage	ME
Gayland Ward Seed	Super Sugar	5.95	14.3	38.9	100.0	Sweet	E
Chromatin	FS00991	4.66	11.0	16.1	0.0	Forage	L
Richardson Seeds	X36400	4.35	11.7	17.1	0.0	Hybrid Forage	L
Eastern CO Seeds	HP1010BMR	4.19	12.1	17.0	12.5	Forage	L
Eastern CO Seeds	HPECS12EXP	3.76	12.3	12.5	0.0	Forage	ME
Average		6.44	11.3	27.5	42.6		

^cLSD (P<0.05)

3.35

^cLSD (P<0.20)

2.08

^aYields are adjusted to 70% moisture content based on oven-dried samples.

^bMaturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.