

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1998

	Page
Introduction:	
Firms Entered in Tests	2
Experimental Methods and Evaluations	3
Statistical Method	4
Acknowledgments	4
References	5
Dryland Grain Sorghum Hybrid Performance Tests	
Early Maturing at Walsh	6
Eads	9
Vilas	13
Walsh	17
Irrigated Grain Sorghum Hybrid Performance Tests	
Hartman	21
Walsh	25
Dryland Forage Sorghum Hybrid Performance Test at Walsh	29
Irrigated Forage Sorghum Hybrid Performance Tests	
Walsh	34
Rocky Ford	39
Row Spacing for Dryland Sorghum Production for Southeastern Colorado	42
Dryland Grain Sorghum Seeding Rate	45
Seedrow P and N on Dryland Grain Sorghum	49

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1998

K.J. Larson, F.C. Schweissing, and D.L. Thompson \1

Introduction

The 1998 Colorado grain sorghum crop was estimated at 8.6 million bushels, 34% higher than the 1997 production level. The increase in production was mainly due to an increase in yield and due to a lesser extent to an increase in acreage: 42% increase in yield, from 40 Bu/A in 1997 to 57 Bu/A in 1998 and a 11% increase in acreage from 180,000 planted acres in 1997 to 200,000 planted acres in 1998. The yield of 57 Bu/A is the highest yield on record, which reflects the above normal rainfall for the sorghum producing areas of Colorado. Sorghum silage production in 1997 was 234,000 tons, up 50% from 1996. The increase in silage production was attributed to more acres, 18,000 acres and 13 Tons/A for 1997, and 12,000 acres and 13 Tons/A for 1996 (Colorado Agricultural Statistic Service, 1998)

This publication is a progress report of the sorghum variety trials conducted by the Department of Soil and Crop Sciences at Colorado State University, Colorado Agricultural Experiment Station, and Cooperative Extension. The sorghum tests were located at five sites in Southeastern Colorado: dryland grain sorghum trials were conducted at Eads, Vilas and Walsh; irrigated grain sorghum trials at Hartman and Walsh; irrigated forage sorghum trials at Rocky Ford and Walsh; and a dryland forage sorghum trial at Walsh.

Tests are partially funded by entry fees paid by commercial firms. Commercial seed representatives who are interested in entering sorghum hybrids in any of the tests are invited to write Kevin Larson, Plainsman Research Center, Box 477, Walsh, Colorado 81090, or phone (719) 324-5643 for further details. Names and addresses of firms submitting entries in 1998 are shown in Table 1. The firms selected entries for testing and furnished seed for the tests. Selected open-pedigree hybrids were included by the Agricultural Experiment Station as a standard of comparison for each test. A closed-pedigree corn hybrid was included in the forage sorghum trials as a comparative standard and was sponsored by the Colorado State Agricultural Experiment Station.

Summary tables for weather (on-site portable weather stations and NOAA, 1998), soil analysis and fertilization (Soil Testing Laboratory, Colorado State University) and available soil water graphs derived from gypsum block readings are provided for each trial location. Other information, where available, was included: site description, emergence date, irrigation, pest control, field history, and pertinent comments.

\1 Superintendent, Plainsman Research Center, Walsh;
Superintendent, Arkansas Valley Research Center, Rocky Ford;
Research Farm Tech I, Plainsman Research Center, Walsh.

Table 1.--Entrants in the Colorado Sorghum Performance Tests, 1998.

Brand	Entered by
ASGROW	Asgrow Seed Co., 2533 S. Hertzler Road, Halstead, KS 67056
BUFFALO BRAND	Sharp Brothers Seed Co., P.O. Box 140, Healy, KS 67850
CARGILL	Cargill Hybrid Seeds, P.O. Box 5645, Minneapolis, MN 55440-5645
DEKALB	Dekalb Genetics Corporation, Route 2, P.O. Box 56, Lubbock, TX 79415
GOLDEN HARVEST	Golden Harvest Seeds, Inc., 100 J. C. Robinson Blvd., P.O. Box A, Waterloo, NE 68069-0301
KAYSTAR	Kaystar Seed, P.O. Box 947, Huron, SD 57350
MYCOGEN	Mycogen Seeds, 3600 N. Columbia, Plainview, TX 79072
NC+	NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504
NK Brand	Novartis Seeds, Inc., 11939A, Sugar Mill Rd., Longmont, CO 80501
PIONEER	Pioneer Hi-Bred International, Inc., 1616 South Kentucky St., C-150, Amarillo, TX 79102
TRIUMPH	Triumph Seed Co., Inc., P.O. Box 1050, Hwy. 62 Bypass, Ralls, TX 79357

Colorado Agricultural Experiment Station entered the following as checks: grain sorghum, TXms399 X TXR2436 (399 X 2436); forage sorghum, NB 305F; corn hybrids, DEKALB DK 636 and GOLDEN HARVEST H-2530 Bt.

Growing Degree Days for sorghum were calculated. They are based on the maximum (111 °F) and minimum (50 °F) threshold temperatures under which sorghum growth occurs (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, then 50 °F is used. Temperatures above 111 °F are converted to a maximum temperature of 111 °F:

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

Experimental Methods and Evaluations

Trials were seeded 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. Sorghum Forage was cut and chopped with a single row John Deere 8 silage cutter.

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 yield of grain in bushels per acre was corrected to 14 percent moisture content.

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

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

Stem Sugar. The sugar content, expressed as a percent, in the stem of forage sorghums at harvest. It 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. 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.

Statistical Method

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

Acknowledgments

We are sincerely grateful to the grower-cooperators for their assistance in the off-station trials: Harvey Kelley, Eads; Fred Williams, Hartman; and Terrill Swanson, Vilas. We are also grateful to the NOAA weather observers for collecting the weather data utilized for the off-station trials: Ben Fisher, Eads; William Davis, Holly.

References

Colorado Agricultural Statistics Service. November, 1998. Ag Update, vol. 18, no. 22. CASS, CDA, USDA. 4p.

Colorado Agricultural Statistics Service. 1998. Annual report , fiscal year 1997-98. CASS, CDA, USDA. 134p.

NOAA, May-October, 1998. Climatological Data, Colorado. vol. 103, no. 5-10. NOAA, NWS, NESDIS, NCDC.

Peacock, J.M. and G.M. Heinrich. 1984. Light and temperature response in sorghum. pp. 143-158. In: Agrometeorology of Sorghum and Millet in the Semi-Tropics: Proceedings of the International Symposium. November 15-20, 1982. India, ICRISAT, WMO.

Early Maturing Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1998

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids, when planted late in the season (July 1), under dryland conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,500 Seed/A. PLANTED: July 1. HARVESTED: November 21.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 75 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A. Post Emergence Herbicides: Peak 0.75 Oz/A, COC 1.0 Qt/A, 2,4-D 3 Oz/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-----		
July	11.35	872	19	5	30
August	3.59	734	12	0	31
September	0.45	669	15	0	90
October	2.35	234	1	0	108
Total	17.74	3090	47	5	108

\1 Growing season from July 1 (planting) to October 18 (first

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep Plow.

COMMENTS: Planted in marginal soil moisture. Weed control was good. Record precipitation for the growing season, with second highest July on record. No greenbug infestation. None of the hybrids lodged. Grain yields were good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.2	4	2.8	506	0.6	6.9
8"-24"				7				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	15	40	2	0

Available Soil Water
Dryland Grain Sorghum, Early Maturing, Walsh, 1998

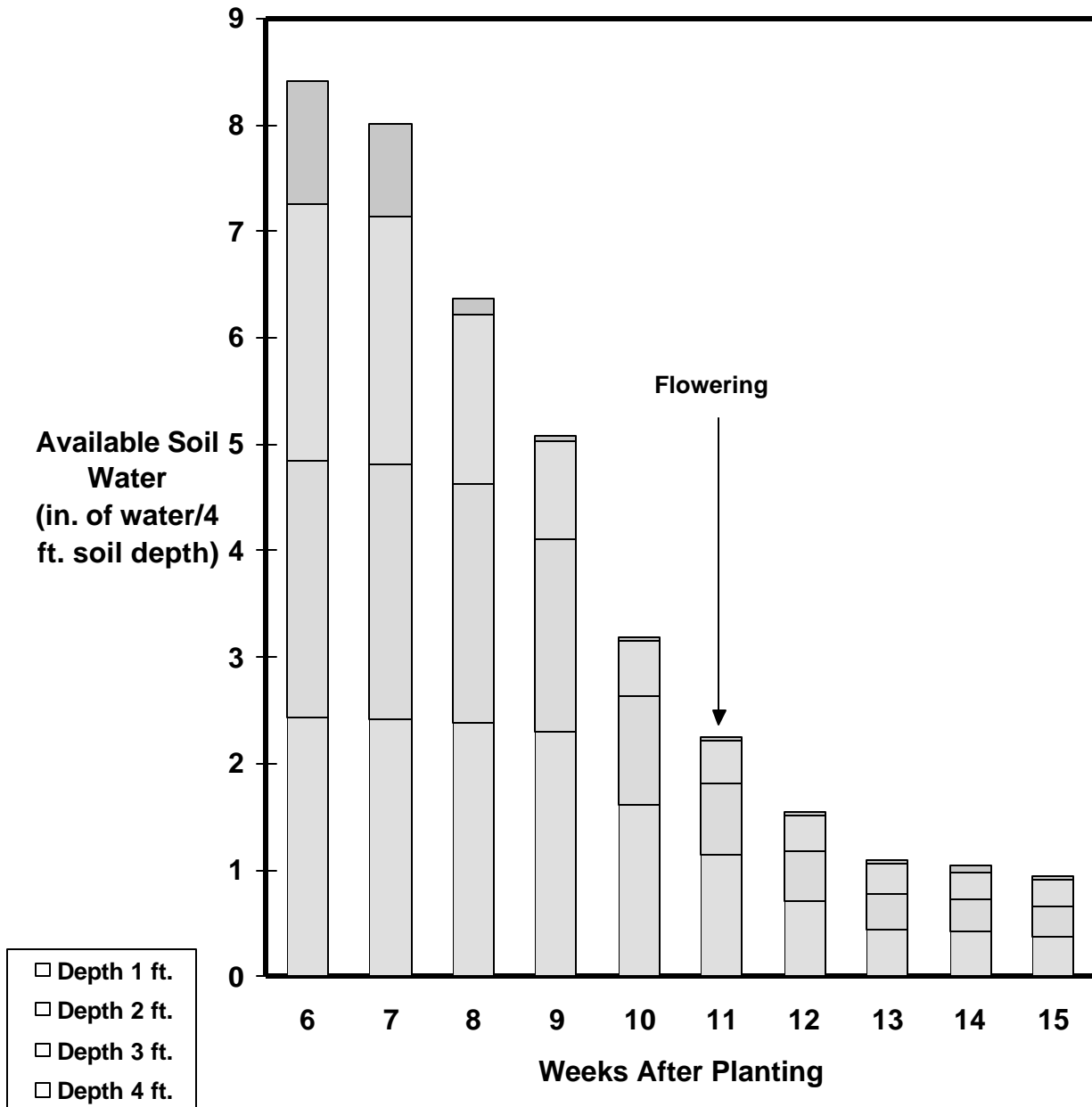


Fig. 1. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 17.74 in. Any increase in available soil water between weeks is from rain.

Table 2.--Dryland Grain Sorghum Early Maturing Hybrid Performance Test at Walsh, 1998. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
			DAP	GDD	DAP	Group						
ASGROW	A298	9	58	1511	102	E	42	22.8	0	56	56	124
MYCOGEN	3556	10	62	1606	107	E	39	26.3	0	55	48	107
CARGILL	576	10	62	1606	103	E	40	22.8	0	56	46	103
DEKALB	DK-28E	10	58	1511	101	E	40	24.0	0	55	45	100
ASGROW	A201	11	65	1675	108	E	37	26.3	0	54	44	98
KAYSTAR	KS-500	9	62	1606	102	E	44	24.4	0	56	42	93
PIONEER	87G57	9	60	1582	105	E	42	21.7	0	56	41	92
PIONEER	8875	10	64	1655	106	E	40	27.5	0	55	37	82
ASGROW	Seneca	10	69	1778	HD	ME	40	27.1	0	53	52	116
MYCOGEN	3595	9	66	1700	HD	ME	37	25.2	0	55	49	109
ASGROW	XP 3257	9	67	1725	HD	ME	44	25.6	0	55	44	98
DEKALB	DK-36	12	66	1700	HD	ME/E	41	24.8	0	53	38	85
(Check)	299 X 2436	9	74	1905	ED	M	41	25.6	0	45	36	80
Average		10	64	1658	108	E	41	24.9	0	54	45	
LSD	0.20										7.8	

\1 Planted: July 1; Harvested: November 21.

Yields corrected to 14.0% moisture.

DAP: Days After Planting or maturation of seed at first freeze, October 18 (30 F).

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Dryland Grain Sorghum Hybrid Performance Test at Eads, 1998

COOPERATORS: Harvey Kelley Farm, Eads, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under a dryland, continuous sorghum system with 2700 sorghum heat units in a Loamy Sand soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,600 Seed/A. PLANTED: June 2; Replanted: June 18. HARVESTED: November 25.

EMERGENCE DATE: 12 days after planting. SOIL TEMP: 68 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 0.6 Lb AI/A. Post Emergence Herbicides: None. CULTIVATION: Once. INSECTICIDE: None.

FIELD HISTORY: Last Crop: Sorghum. FIELD PREPARATION: Sweep Plow.

COMMENTS: The study had to be replanted in late June because the original planting emerged but was destroyed by wind-blown soil. Planting moisture was good. Broadleaf weed control was good. Grass control was poor. Above normal precipitation for the growing season, with July and August wetter than normal and September drier than normal. No greenbug infestation. None of the hybrids lodged. Grain yields were fair.

SOIL: Loamy Sand for 0-8" and Sandy Clay Loam 8"-24" depths from soil analysis.

Summary: Growing Season Precipitation and Temperature \1 Eads, Kiowa County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
June	0.26	322	8	2	12
July	4.05	819	17	3	43
August	4.55	706	9	0	74
September	0.12	607	10	0	104
October	0.17	179	0	0	121
Total	9.15	2633	44	5	121

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	0.3	0.8	2	1.1	307	0.5	11.5
8"-24"				3				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	42	40	2	0

Available Soil Water Dryland Grain Sorghum, Eads, 1998

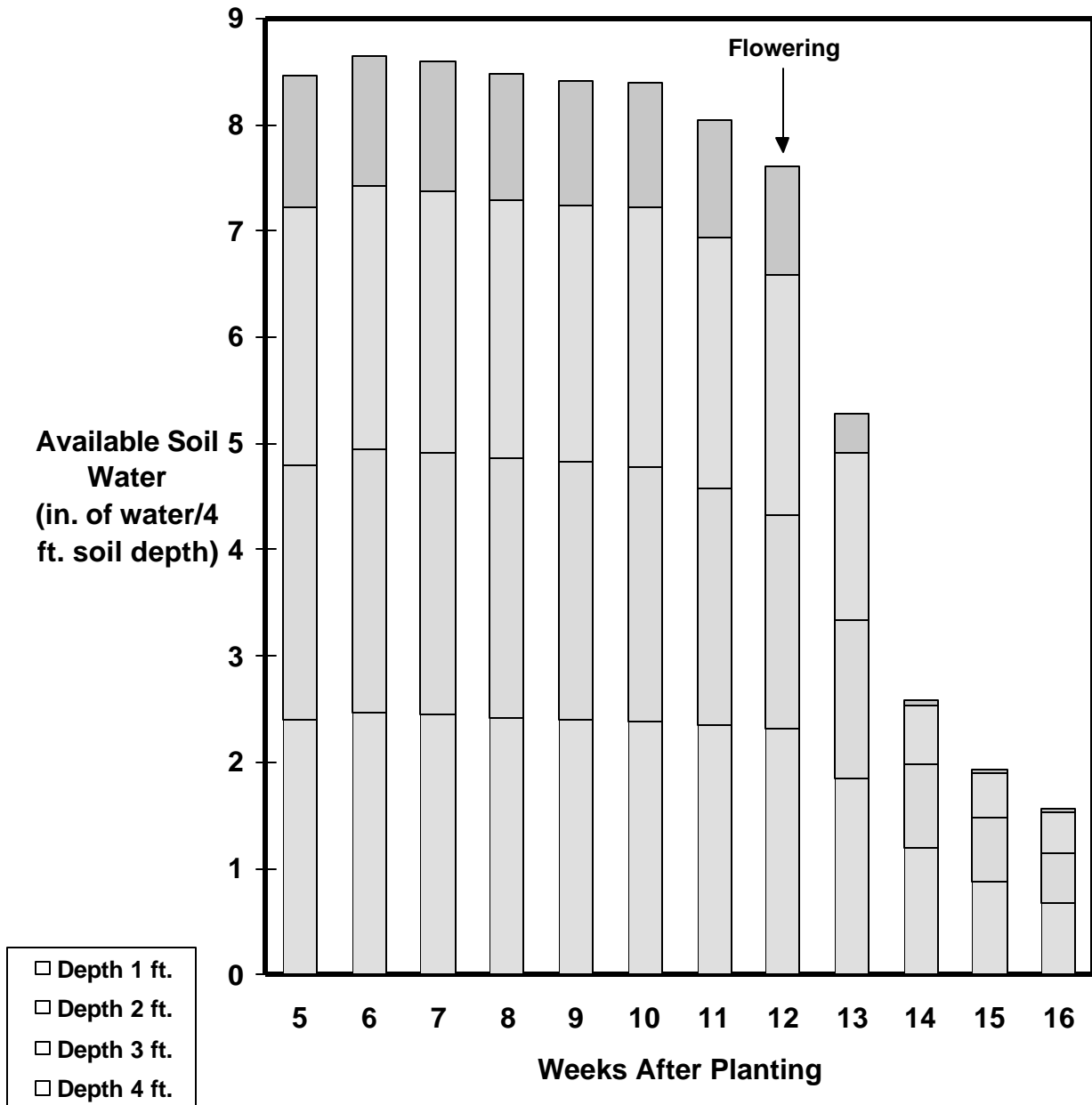


Fig. 2. Available soil water in dryland grain sorghum at Eads. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall from planting to first freeze was 8.13 in. Any increase in available soil water between weeks is from rain.

Table 4.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Eads, 1996-98.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
DEKALB	DK-38y	37	55	21	38	38	97	87	54	71	79
DEKALB	DK-43A	--	66	31	49	--	---	102	81	92	--
DEKALB	DK-44	39	58	37	48	45	98	91	96	94	95
GOLDEN HARVEST	H-296W	32	57	--	45	--	83	89	---	86	--
MYCOGEN	T-E Hardy	39	62	--	51	--	103	97	---	100	--
MYCOGEN	9580-X	34	68	--	51	--	88	107	---	98	--
NK BRAND	KS 35-Y5	--	73	39	56	--	---	115	103	109	--
NK BRAND	KS 310	53	64	47	56	55	138	100	122	111	120
PIONEER	8500	52	82	--	67	57	137	128	---	133	57
PIONEER	8522Y	35	--	38	37	--	93	---	101	97	--
PIONEER	85Y34	--	66	42	54	--	---	102	109	106	--
PIONEER	87G57	--	56	33	45	--	---	87	87	87	--
(Check)	399 X 2436	34	53	25	39	37	90	83	65	74	79
Average		37	63	37	50	46					

Yields corrected to 14.0 % moisture.

Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1998

COOPERATORS: Terrill Swanson Farm, Vilas, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

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

PLOT: Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 43,600 Seed/A. **PLANTED:** May 29; Replanted: June 17. **HARVESTED:** November 11.

EMERGENCE DATE: 10 days after planting. **SOIL TEMP:** 66 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides: Atrazine 0.75 Lb AI/A, COC 1.0 Qt/A. **CULTIVATION:** Once. **INSECTICIDE:** None.

FIELD HISTORY: Last Crop: Wheat. **FIELD PREPARATION:** Sweep Plow.

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		56		2
June	0.85	668	18	6	32
July	11.35	872	19	5	63
August	3.59	734	12	0	94
September	0.45	669	15	0	124
October	2.35	234	1	0	142
Total	18.59	3233	67	11	142

COMMENTS: Planted in good soil moisture. Broadleaf and grass control was very good. Record precipitation for the growing season, with the second wettest July on record. No greenbug infestation. None of the hybrids lodged. Because of the abundant rains, grain yields were excellent.

SOIL: Loamy Sand for 0-8" and Sandy Clay Loam 8"-24" depths from soil analysis.

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.2	0.4	2	8.7	255	0.6	6.9
8"-24"				4				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	48	0	2	0

Available Soil Water
Dryland Grain Sorghum, Vilas, 1998

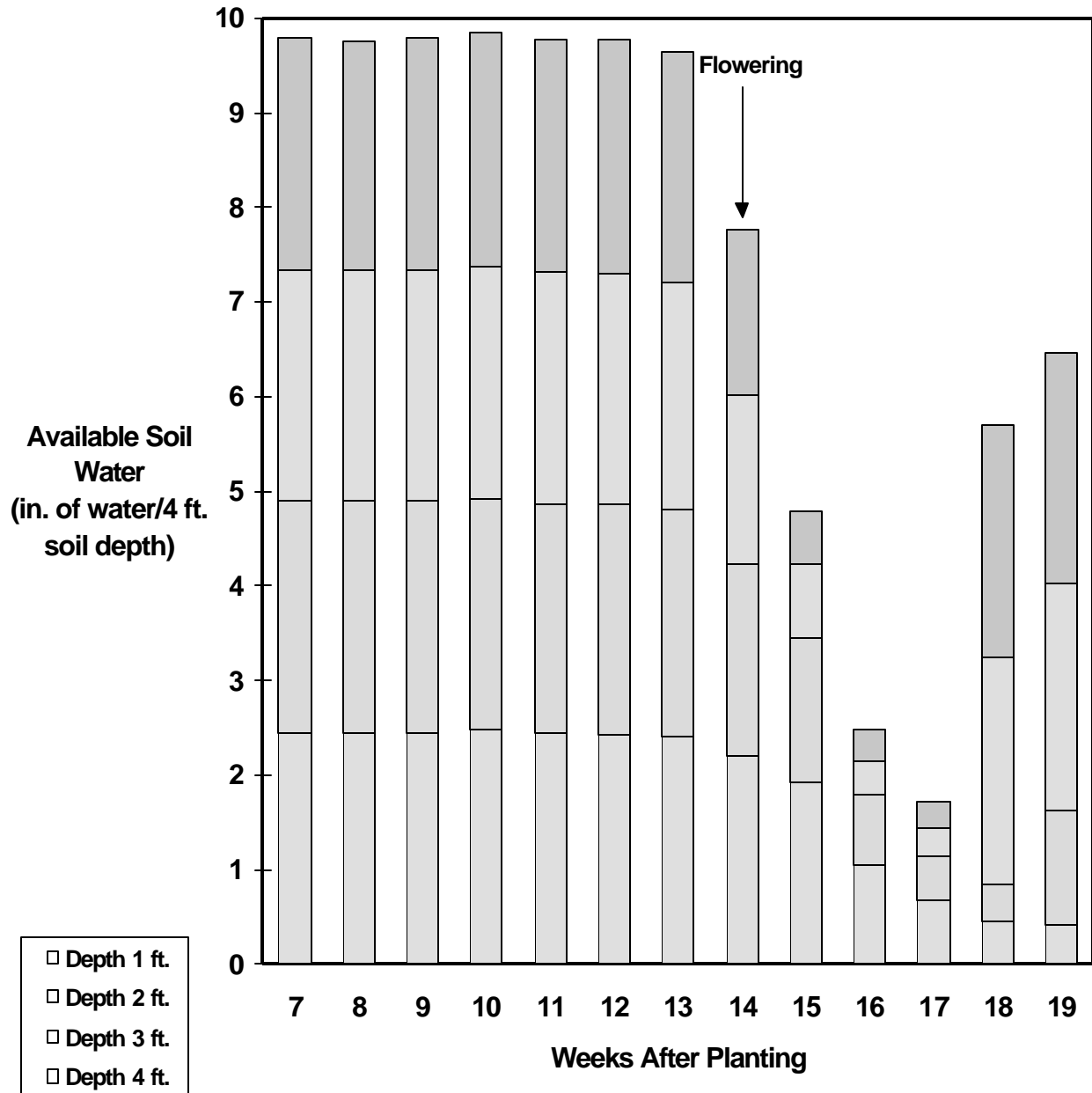


Fig. 3. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Vilas from planting to first freeze was 18.59 in. Any increase in available soil water between weeks is from rain.

Table 5.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1998. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
<hr/>													
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
ASGROW	A201	9	70	1738	120	E	42	22.5	0	59	104	94	
ASGROW	A298	10	66	1665	118	E	46	22.8	0	59	93	84	
CARGILL	627	9	79	1941	126	ME	47	24.2	0	56	123	112	
TRIUMPH	TR 447	10	81	1994	130	ME	46	24.8	0	56	121	110	
CARGILL	647	9	81	1994	129	ME	53	24.0	0	58	120	109	
DEKALB	DK-43A	11	82	2020	130	ME	48	19.0	0	58	119	108	
DEKALB	DK-44	10	81	1994	132	ME	51	24.0	0	57	113	103	
MYCOGEN	3636	9	80	1967	128	ME	46	23.2	0	58	109	99	
ASGROW	Seneca	9	81	1994	132	ME	46	29.0	0	59	109	99	
TRIUMPH	TR 459	10	81	1994	132	ME	46	23.0	0	58	99	90	
DEKALB	DK-38y	11	80	1967	128	ME	44	17.7	0	57	96	87	
ASGROW	XP 3257	10	77	1894	124	ME	47	21.7	0	57	89	81	
CARGILL	X12027	10	82	2020	133	M	49	21.9	0	57	122	111	
CARGILL	X12200	9	82	2020	135	M	50	21.3	0	55	116	105	
CARGILL	770Y	10	82	2020	136	M	51	24.2	0	55	115	105	
(Check)	399 x 2436	9	84	2070	138	M	45	26.7	0	55	111	100	
<hr/>													
Average		10	79	1956	129	ME	47	23.1	0	57	110		
LSD	0.20										8.2		

\1 Planted: May 29; Replanted: June 17; Harvested: November 11.

Yields corrected to 14.0% moisture.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 6.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 1996-98.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	627	79	42	123	83	81	96	100	111	106	102
CARGILL	647	81	40	120	80	80	98	95	108	102	100
CARGILL	730	80	46	--	63	--	97	109	---	103	--
CARGILL	737	86	55	--	71	--	103	131	---	117	--
CARGILL	770Y	90	45	115	80	83	109	108	104	106	107
DEKALB	DK-38y	79	38	96	67	71	96	90	87	89	91
DEKALB	DK-36	74	33	--	54	--	89	78	---	84	--
DEKALB	DK-43A	--	34	119	77		---	80	109	95	
DEKALB	DK-44	76	34	113	74	74	92	80	102	91	91
MYCOGEN	T-E Hardy	75	38	--	57	--	91	91	---	91	--
MYCOGEN	9580-X	86	38	--	62	--	104	91	---	98	--
TRIUMPH	TR 459	92	45	99	72	79	112	108	90	99	103
(Check)	399 X 2436	89	36	111	74	79	109	87	100	94	99
Average		82	40	110	75	77					

Yields corrected to 14.0 % moisture.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1998

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,500 Seed/A. PLANTED: May 28. HARVESTED: November 16.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 66 F.

PEST CONTROL: Preemergence
Herbicides: LandMaster 54 Oz/A. Post
Emergence Herbicides: Peak 0.75 Oz/A,
COC 1.0 Qt/A, 2,4-D 3.0 Oz/A.
CULTIVATION: Once. INSECTICIDES:
None.

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep Plow.

COMMENTS: Planted in good soil moisture. Weed control was very good. Record precipitation for the growing season, with second highest July on record. No greenbug infestation. None of the hybrids lodged. Because of the record breaking rainfall, grain yields were excellent.

SOIL: Silty Clay Loam for 0-8" and Silty Clay 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	79	3	0	3
June	0.85	668	18	6	33
July	11.35	872	19	5	64
August	3.59	734	12	0	95
September	0.45	669	15	0	125
October	2.35	234	1	0	143
Total	18.59	3256	68	11	143

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.2	4	2.8	506	0.6	6.9
8"-24"				7				

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	15	40	2	0

Available Soil Water
Dryland Grain Sorghum, Walsh, 1998

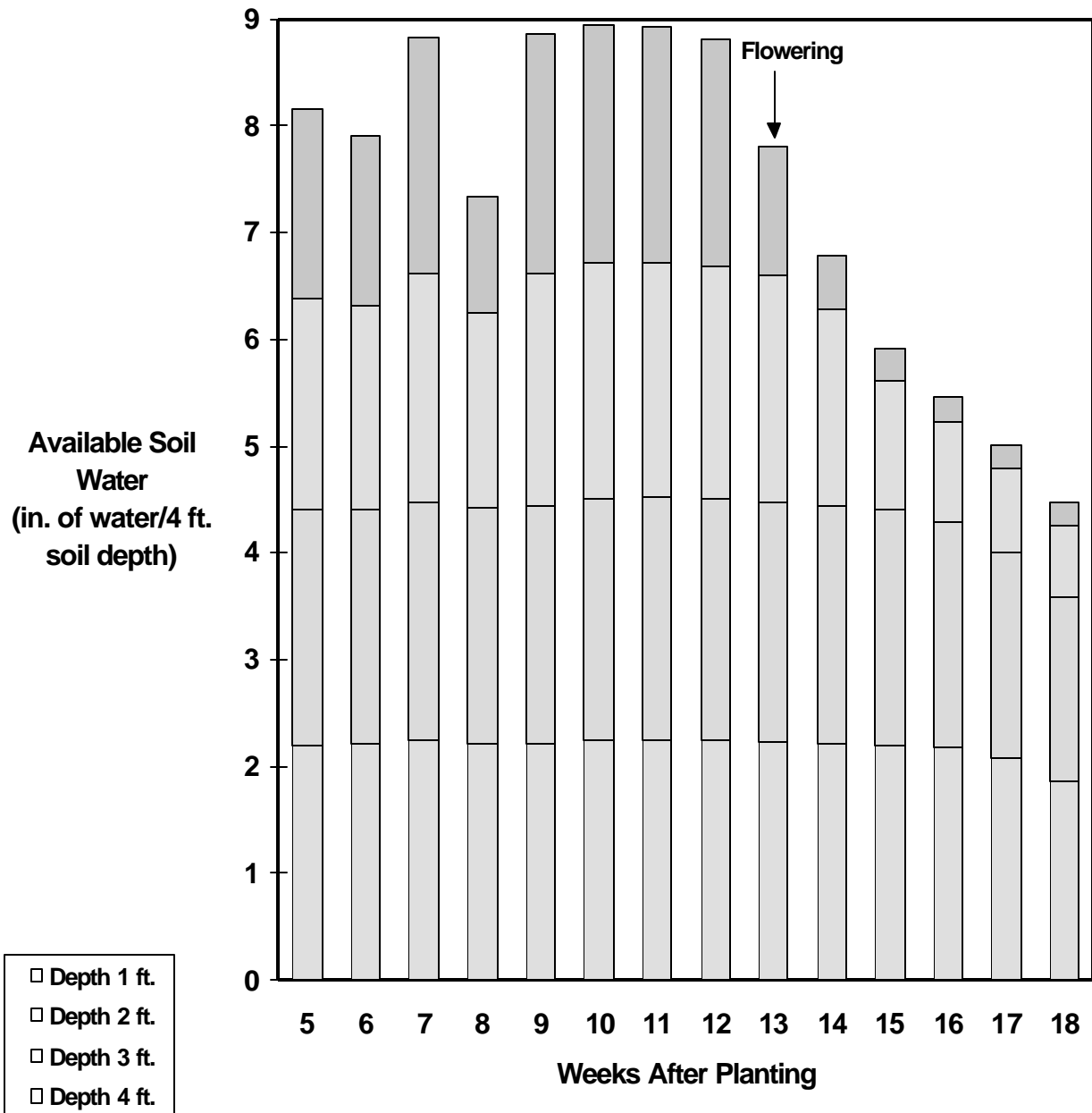


Fig. 4. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 18.59 in. Any increase in available soil water between weeks is from rain.

Table 7.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1998. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
ASGROW	A201	8	72	1782	113	E	43	23.3	0	58	84	94	
PIONEER	87G57	7	69	1727	110	E	45	25.9	0	57	80	88	
ASGROW	A298	7	67	1688	109	E	45	22.8	0	57	72	80	
DEKALB	DK-43A	8	82	2017	124	ME	49	21.3	0	60	113	126	
NC+	5B74E	7	80	1964	123	ME	45	26.3	0	60	101	112	
NK BRAND	KS 560Y	8	80	1964	124	ME/M	43	21.3	0	60	101	112	
PIONEER	85Y34	8	75	1854	114	ME	50	26.7	0	56	99	110	
PIONEER	8500	7	78	1917	120	ME/M	49	24.0	0	60	99	109	
DEKALB	DK-38y	9	80	1964	122	ME	44	19.4	0	57	96	107	
PIONEER	8505	7	74	1833	118	ME/M	49	23.8	0	59	95	106	
DEKALB	DK-44	8	80	1964	124	ME	46	25.4	0	61	88	98	
CARGILL	647	8	79	1939	124	ME	52	28.1	0	59	87	96	
TRIUMPH	TR 447	7	81	1990	125	ME	45	25.2	0	58	86	95	
CARGILL	627	7	79	1939	121	ME	48	26.3	0	56	84	93	
ASGROW	Seneca	7	82	2017	125	ME	46	25.8	0	59	80	89	
ASGROW	XP 3257	7	73	1808	116	ME	47	19.8	0	58	75	84	
CARGILL	X12200	9	83	2043	128	M	52	22.7	0	58	107	119	
CARGILL	770Y	7	84	2069	130	M	47	23.6	0	57	99	110	
NK BRAND	KS 585	7	85	2093	127	M	46	24.0	0	60	97	108	
CARGILL	X12027	7	85	2093	129	M	47	25.0	0	58	97	107	
NC+	6B50	7	84	2069	133	M	49	25.8	0	56	85	95	
GOLDEN HARVEST	EX 471	7	87	2146	132	M	42	25.2	0	57	84	93	
GOLDEN HARVEST	H-430Y	7	84	2069	128	M	51	20.9	0	60	82	91	
NC+	Y363	8	84	2069	131	M	49	19.2	0	59	79	88	
(Check)	399 X 2436	7	88	2175	135	M	46	23.3	0	57	74	82	
Average		7	80	1968	123	ME	47	23.8	0	58	90		
LSD 0.20												13.3	

\1 Planted: May 28; Harvested: November 16.

Yields corrected to 14.0% moisture.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 8.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 1996-98.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	627	104	86	84	85	91	110	104	93	99	102
CARGILL	647	95	79	87	83	87	101	95	96	96	97
CARGILL	730	91	82	--	87	--	96	99	---	98	--
CARGILL	737	97	94	--	96	72	103	113	---	108	72
CARGILL	770Y	89	92	99	96	93	94	110	110	110	105
DEKALB	DK-38y	90	96	96	96	94	95	116	107	112	106
DEKALB	DK-36	98	71	--	85	--	104	85	85	95	--
DEKALB	DK-43A	--	83	113	98	--	---	100	126	113	--
DEKALB	DK-44	99	88	88	88	92	105	106	98	102	103
GOLDEN HARVEST	H-430Y	--	91	82	87	--	---	110	91	101	--
NC+	6B50	106	96	85	91	96	115	116	95	106	109
NC+	5B74E	--	96	101	99	--	---	116	112	114	--
NK BRAND	KS 310	88	70	--	79	--	93	84	84	89	--
NK BRAND	KS 560Y	93	--	101	97	--	99	---	112	106	--
NK BRAND	KS 585	102	103	97	100	101	110	123	108	116	114
OHLDE	G530	93	87	--	90	--	99	105	---	102	--
PIONEER	8500	103	89	99	94	97	110	108	109	109	109
PIONEER	8505	107	77	95	86	93	113	92	106	99	104
PIONEER	85Y34	--	53	99	76	--	---	64	110	87	--
PIONEER	87G57	--	63	80	72	--	---	75	88	82	--
TRIUMPH	TR 459	100	82	--	91	--	106	98	---	102	--
(Check)	399 X 2436	96	86	74	80	85	104	103	82	93	96
Average		91	83	90	87	88					

Yields corrected to 14.0 % moisture.

Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1998

COOPERATORS: Fred Williams Farm, Hartman, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3000 sorghum heat units in a Silty Clay soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 104,500 Seed/A. PLANTED: May 26; Replanted: June 16. HARVESTED: November 24.

EMERGENCE DATE: 9 days after planting.
SOIL TEMP: 64 F.

PEST CONTROL: Preemergence
Herbicides: Atrazine 1.0 Lb AI/A. Post
Emergence Herbicides: None.
CULTIVATION: Once. INSECTICIDE:
None.

FIELD HISTORY: Last Crop: Sorghum.
FIELD PREPARATION: Disc.

Summary: Growing Season Precipitation and Temperature \1 Hartman, Prowers County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.24	132	4	0	5
June	1.30	639	19	6	35
July	5.83	911	20	7	66
August	2.32	774	18	0	97
September	0.85	647	15	4	127
October	1.55	212	0	0	145
Total	12.09	3315	76	17	145

COMMENTS: Planted in good soil moisture. Broadleaf weeds and shattercane infested part of the site, so only three replications were used to record yield. Above normal precipitation for the growing season with August well above average. No greenbug infestation. None of the hybrids lodged. Grain yields were very good.

SOIL: Silty Clay for 0-8" and Sandy Clay 8"-24" depths from soil analysis.

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.1	0.6	2.4	20	6.9	423	3.1	11
8"-24"				16				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	36	20	0	0

Available Soil Water
Irrigated Grain Sorghum, Hartman, 1998

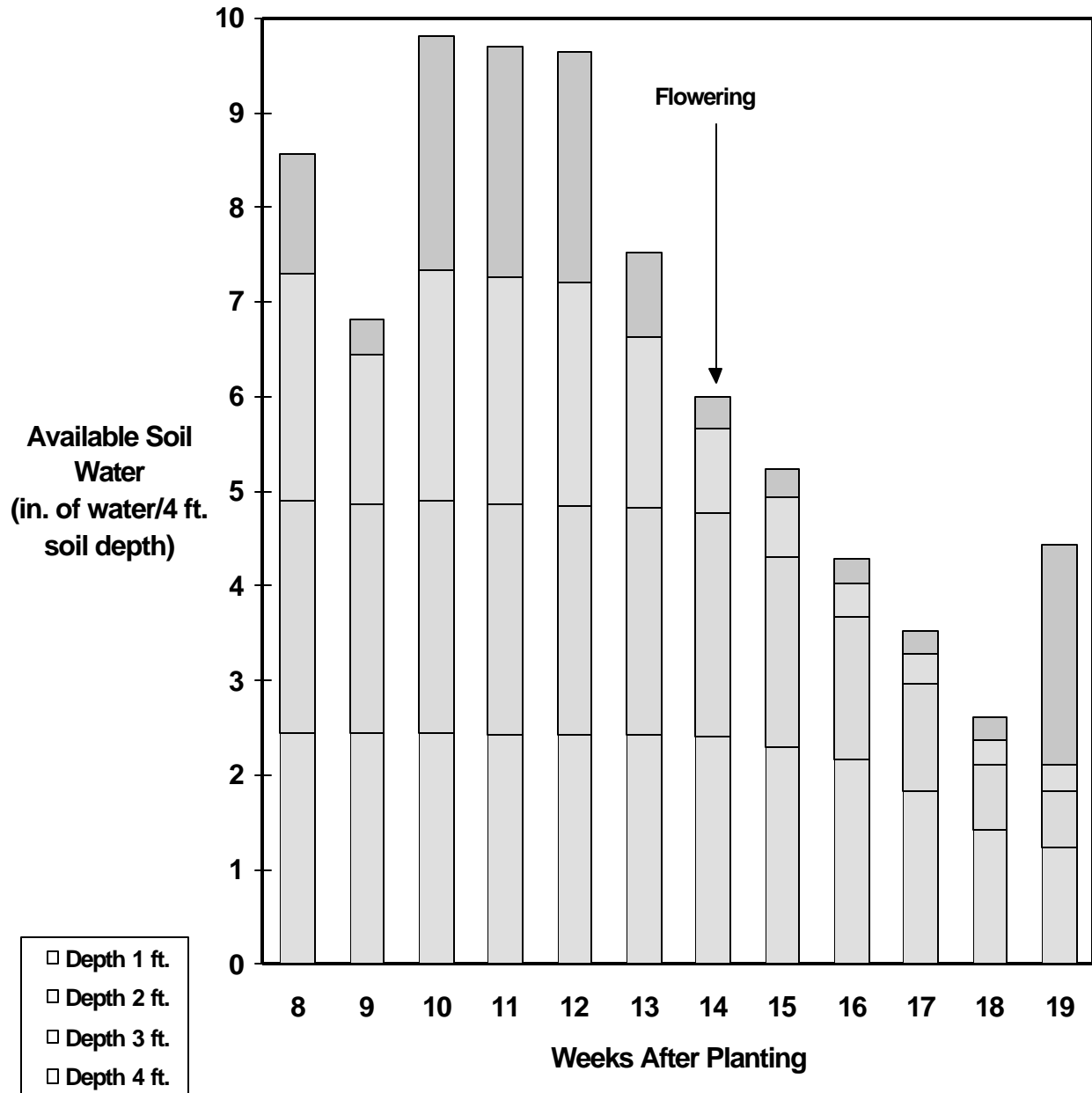


Fig. 5. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 12.09 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 9.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1998. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
			DAP	GDD	DAP	Group						
							In.	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
ASGROW	A298	8	68	1725	109	E	49	36.4	0	56	114	90
ASGROW	A201	10	72	1811	117	E	45	30.2	0	55	105	83
ASGROW	XP 3257	8	73	1831	120	ME	56	44.1	0	56	135	106
ASGROW	Seneca	8	77	1937	123	ME	50	36.8	0	58	133	105
MYCOGEN	1506	8	80	2003	126	M/ML	64	39.1	0	56	145	114
DEKALB	DK-47	10	81	2027	127	M	55	30.6	0	56	140	110
TRIUMPH	TR 462	8	83	2079	128	M	54	33.3	0	55	127	100
TRIUMPH	TR 481	7	82	2052	128	M	62	34.1	0	56	125	99
(Check)	399 X 2436	7	82	2052	128	M	53	38.0	0	56	114	90
MYCOGEN	X9656	9	84	2105	130	ML	53	39.9	0	55	139	109
DEKALB	DK-56	10	86	2155	131	ML	56	26.3	0	55	123	97
Average		8	79	1980	124	M	54	35.3	0	56	127	
LSD 0.20											8.6	

\1 Planted: May 26; Replanted: June 16; Harvested: November 24.

Yields corrected to 14.0% moisture.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 10.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Hartman, 1996-98.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
DEKALB	DK-47	158	139	140	140	146	116	97	109	103	107
DEKALB	DK-55	130	148	--	139	--	96	103	---	100	--
DEKALB	DK-56	147	163	123	143	144	108	114	96	105	106
MYCOGEN	1506	136	154	145	150	145	100	108	113	111	107
MYCOGEN	3747	130	136	--	133	--	96	95	--	96	--
NK BRAND	KS 585	147	140	--	144	--	108	98	--	103	--
TRIUMPH	TR 481	--	136	125	131	--	---	95	98	97	--
(Check)	399 X 2436	141	136	114	125	130	104	95	89	92	96
Average		136	142	127	135	135					

Yields corrected to 14.0 % moisture.

Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1998

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 78,400 Seed/A. **PLANTED:** May 25. **HARVESTED:** November 23.

EMERGENCE DATE: 7 days after planting. **SOIL TEMP:** 64 F.

IRRIGATION: Two furrow irrigations: June 30 and July 23, total applied 10.5 acre-in./A.

PEST CONTROL: Preemergence
Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. **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	134	4	0	6
June	0.85	668	18	6	36
July	11.35	872	19	5	67
August	3.59	734	12	0	98
September	0.45	669	15	0	128
October	2.35	234	1	0	146
Total	18.59	3311	69	11	146

FIELD HISTORY: Last Crop: Wheat. **FIELD PREPARATION:** Sweep Plow.

COMMENTS: Planted in good soil moisture. Weed control was very good. Record precipitation for the growing season, with July being the second highest month on record. No greenbug infestation. None of the hybrids lodged. Grain yields were excellent.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.6	7	1.8	543	0.6	6.2
8"-24"				7				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	94	40	2	0

Available Soil Water
Irrigated Grain Sorghum, Walsh, 1998

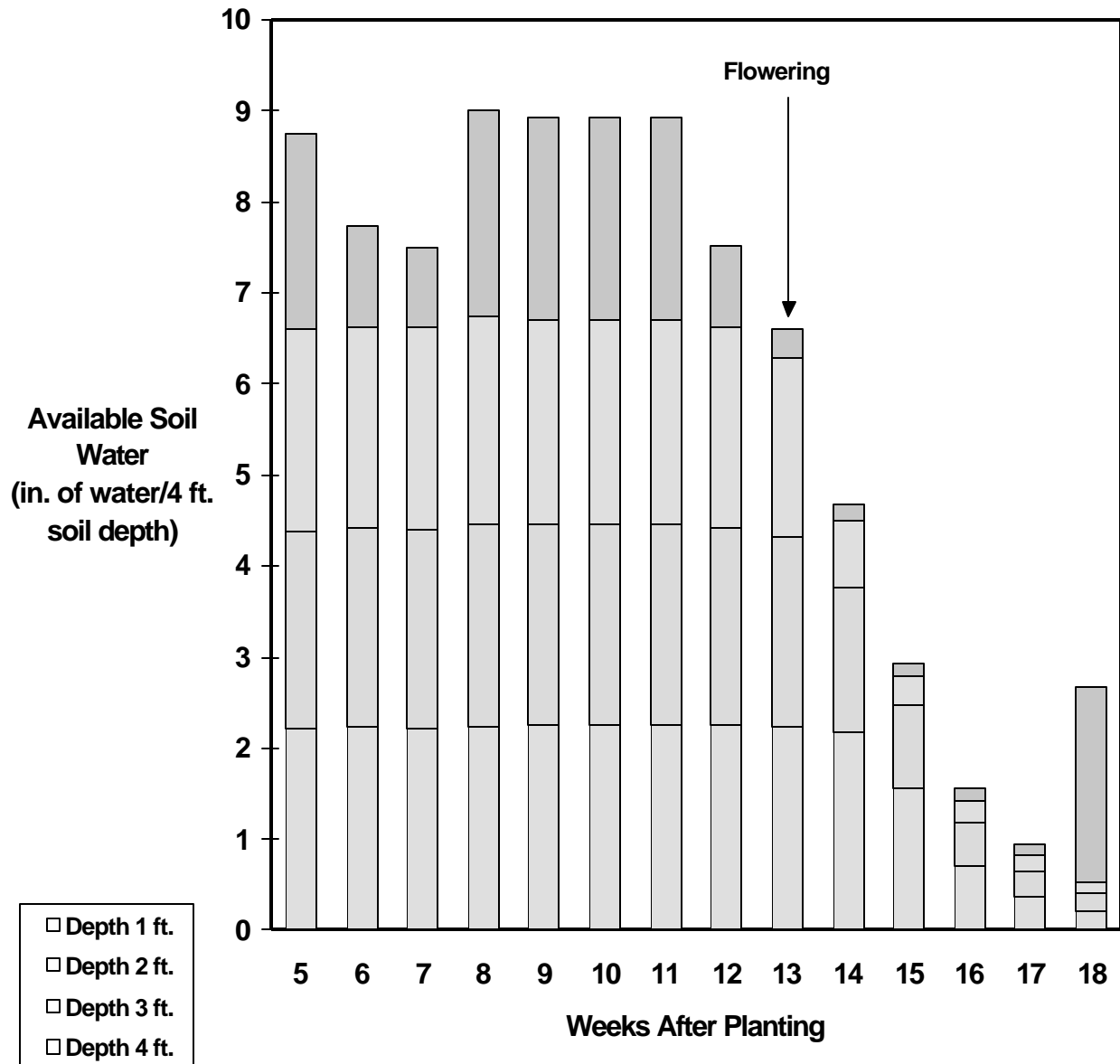


Fig. 6. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 18.59 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 11.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1998. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
ASGROW	A298	7	68	1696	113	E	50	32.8	0	57	102	85	
ASGROW	A201	8	75	1838	118	E	45	27.4	0	59	99	83	
ASGROW	Seneca	7	82	1995	125	ME	47	29.7	0	61	129	107	
TRIUMPH	TR 447	7	82	1995	128	ME	45	25.1	0	58	116	97	
ASGROW	XP 3257	6	77	1889	121	ME	52	31.3	0	60	109	90	
PIONEER	84G62	7	85	2073	132	M	52	26.9	0	60	140	116	
MYCOGEN	1506	6	84	2046	127	M/ML	64	30.9	0	59	123	102	
DEKALB	DK-47	8	84	2046	129	M	52	23.9	0	61	115	96	
(Check)	399 X 2436	7	86	2099	131	M	53	31.9	0	60	111	92	
MYCOGEN	X9656	7	88	2149	132	ML	52	31.7	0	58	133	111	
DEKALB	DK-56	8	89	2176	133	ML	58	29.7	0	59	133	111	
NK BRAND	KS 73-J6	7	87	2125	130	ML	55	30.1	0	58	127	105	
CARGILL	833	6	88	2149	133	ML	54	34.0	0	59	124	103	
PIONEER	83G66	7	87	2125	131	ML	56	31.3	0	60	122	102	
Average		7	83	2029	127	M	53	29.8	0	59	120		
LSD	0.20										4.2		

\1 Planted May 25; Harvested: November 23.

Yields corrected to 14.0% moisture.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 12.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Walsh, 1996-98.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	730	89	98	--	94	--	98	108	---	103	--
CARGILL	737	93	100	--	97	--	103	110	---	107	--
CARGILL	770Y	97	80	--	89	--	106	89	---	98	--
CARGILL	837	94	100	--	97	--	104	111	---	108	--
DEKALB	DK-47	101	94	115	105	103	111	104	96	100	104
DEKALB	DK-51	90	93	--	92	--	99	103	---	101	--
DEKALB	DK-56	87	86	133	110	102	95	96	111	104	101
MYCOGEN	1506	96	102	123	113	107	105	113	102	108	107
MYCOGEN	3747	89	88	--	89	--	98	98	---	98	--
NK BRAND	KS 585	102	100	--	101	--	112	111	---	112	--
NK BRAND	KS 711Y	99	82	--	91	--	109	91	---	100	--
NK BRAND	KS 73-J6	--	98	127	113	--	---	109	105	107	--
PIONEER	8310	96	88	--	92	--	106	98	---	102	--
(Check)	399 X 2436	95	79	111	95	95	104	87	92	90	94
Average		91	90	120	105	100					

Yields corrected to 14.0 % moisture.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1998

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 52,300 Seed/A. PLANTED: May 28. HARVESTED: September 18.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 66 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A. Post Emergence Herbicides: Peak 0.75 Oz/A, COC 1.0 Qt/A, 2,4-D 3 Oz/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	79	3	0	3
June	0.85	668	18	6	33
July	11.35	872	19	5	64
August	3.59	734	12	0	95
September	0.33	414	9	0	113
Total	16.12	2767	61	11	113

\1 Growing season from May 28 (planting) to September 18

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep Plow.

COMMENTS: Planted in good soil moisture. Weed control was very good. Record precipitation for the growing season, with second highest July on record. No greenbug infestation. Forage yields were excellent.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.2	4	2.8	506	0.6	6.9
8"-24"				7				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	15	40	0	0

Available Soil Water
Dryland Forage Sorghum, Walsh, 1998

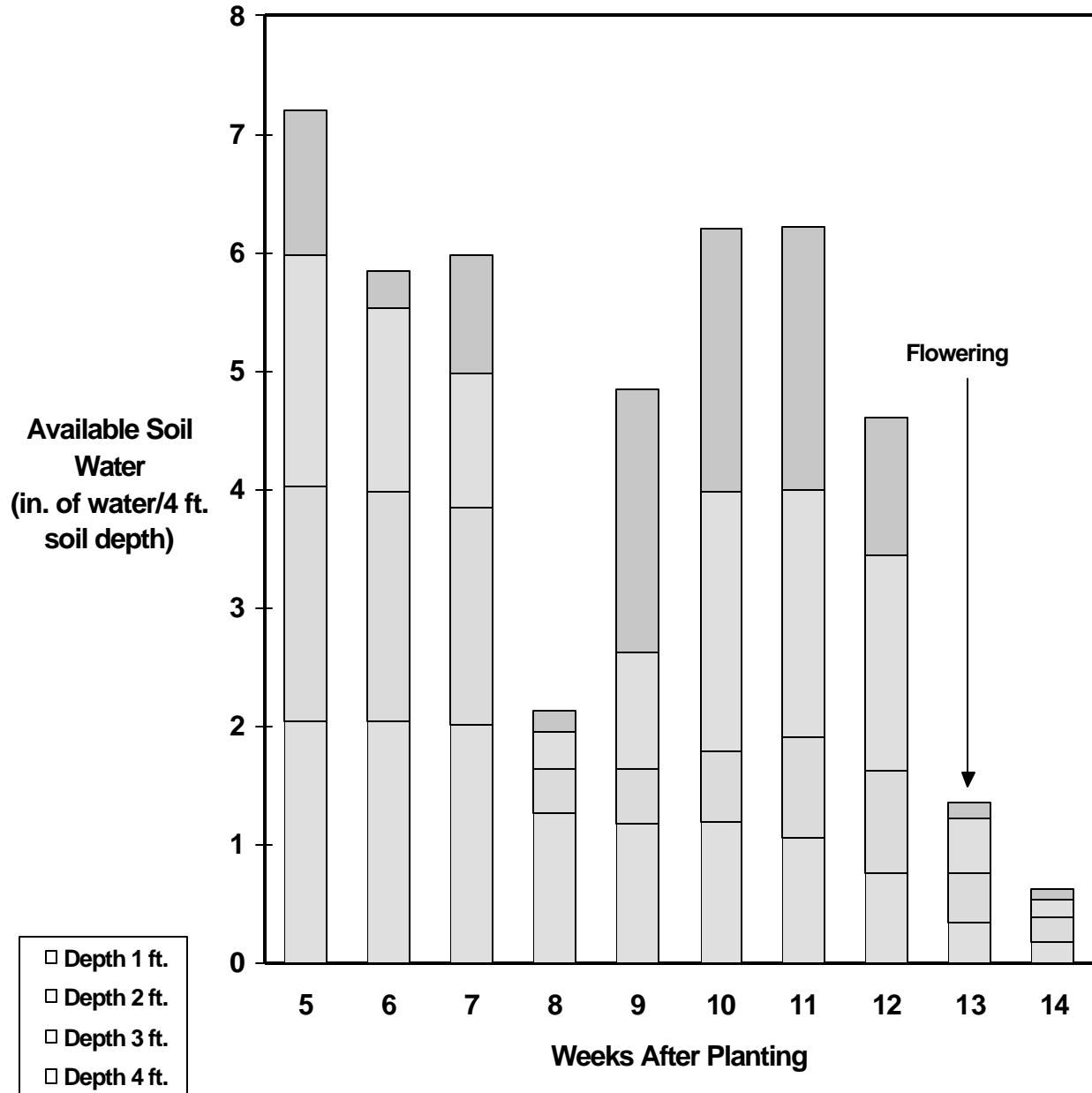


Fig. 7. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 16.12 in. Any increase in available soil water between weeks is from rain.

Brand	Hybrid	Forage Type \2	Days			Harvest Density	Stage \3			Forage Yield	Yield % of Test Average
			Days to Emerge	to 50% Bloom	Harvest		Plant at Harvest	Stem Sugar	Plants Lodged		
					Plants/A (1000 X)	In.	%	%	Tons/A	%	
ASGROW	Titan R	FS	6	98	28.5	102	MM	15	0	21.4	121
DEKALB	FS-5	FS	7	98	30.4	102	MM	16	0	20.0	113
BUFFALO BRAND	Canex II	FS	8	90	26.0	113	SD	17	0	18.8	106
(Check)	NB 305F	FS	8	96	29.0	104	MM	18	0	18.1	102
BUFFALO BRAND	BMR 208	FS	6	92	29.0	105	LM	11	12	17.1	97
BUFFALO BRAND	Canex	FS	8	89	28.9	104	SD	19	0	17.1	96
ASGROW	XP BMR 1	FS	7	97	31.8	109	MM	12	3	17.1	96
CARGILL	BMRX1	FS	7	95	27.9	108	MM	13	15	16.3	92
CARGILL	X43024	FS	7	105	27.1	75	EM	18	0	14.6	82
CARGILL	X24442	FS	7	106	30.2	97	EM	17	0	14.4	81
CARGILL	X18347	SS	7	85	27.9	121	SD	12	3	20.2	114
CARGILL	X25477	SS	6	85	29.6	118	SD	14	0	19.5	110
DEKALB	SX-8	SS	7	87	30.4	133	SD	14	5	18.9	107
BUFFALO BRAND	Grazex II	SS	6	83	30.0	130	HD	17	0	18.8	106
DEKALB	ST-6E	SS	7	88	29.8	127	SD	15	5	18.7	106
BUFFALO BRAND	Grazex II W	SS	6	81	29.0	124	HD	13	2	18.1	102
BUFFALO BRAND	BMR 737	SS	7	86	24.4	102	SD	15	0	18.1	102
BUFFALO BRAND	Buffalo Brand	SS	6	86	30.2	131	SD	13	2	16.9	96
GOLDEN HARVEST	H-2530 Bt	Com	5	79	23.6	90	SD	10	0	12.4	70
Average		FS	7	91	28.6	110	SD	15	2	17.7	
LSD 0.20										2.11	

\1 Planted: May 25; Harvested: September 18.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\3 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

Yields corrected to 70% moisture based on oven-dried sample.

Table 14.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 1996-98.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Canex	14.2	10.3	17.1	13.7	13.9	92	100	96	98	96
BUFFALO BRAND	Canex II	14.3	10.3	18.8	14.6	14.5	92	100	105	103	99
BUFFALO BRAND	Buffalo Brand	17.1	10.7	16.9	13.8	14.9	111	104	95	100	103
BUFFALO BRAND	Grazex II	16.2	10.0	18.8	14.4	15.0	105	97	106	102	103
BUFFALO BRAND	Grazex II W	16.4	9.4	18.1	13.8	14.6	106	91	101	96	99
CARGILL	MorCane II	16.9	9.1	--	13.0	--	109	88	---	99	--
DEKALB	FS-5	17.3	11.8	20.0	15.9	16.4	112	115	112	114	113
(Check)	NB 305F	14.4	11.4	18.1	14.8	14.6	93	111	102	107	102
(Check)	Corn	17.0	8.3	12.4	10.4	12.6	110	81	70	76	87
Average		15.5	10.1	17.7	13.9	14.4					

Yields corrected to 70% moisture based on oven-dried sample.

Table 15.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1998.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	In -----%-----									
					CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
BUFFALO BRAND	Canex	FS	80	86	14.6	9.7	34.0	50.0	63.8	116.0	0.41	0.41	3.05	0.27
DEKALB	FS-5	FS	90	97	14.2	9.3	39.4	52.9	57.7	102.4	0.39	0.56	2.60	0.30
CARGILL	BMRX1	FS	86	96	13.4	8.5	38.5	56.4	58.7	97.3	0.41	0.29	2.91	0.26
BUFFALO BRAND	BMR 208	FS	84	91	13.4	9.0	34.8	53.9	62.8	106.7	0.39	0.28	2.86	0.24
BUFFALO BRAND	Canex II	FS	81	87	13.1	8.5	40.5	53.4	56.4	99.8	0.39	0.55	2.65	0.30
(Check)	NB 305F	FS	88	81	12.2	8.1	37.1	55.5	60.3	100.5	0.38	0.35	2.54	0.26
CARGILL	X24442	FS	98	62	11.5	7.7	37.2	53.8	60.1	103.5	0.36	0.42	2.53	0.26
ASGROW	Titan R	FS	91	88	11.3	7.5	38.5	56.0	58.7	98.0	0.36	0.36	0.52	0.25
ASGROW	XP BMR1	FS	90	95	10.5	6.9	40.5	55.5	56.4	96.2	0.37	0.37	2.46	0.26
CARGILL	X43024	FS	98	62	9.5	6.6	36.9	54.4	60.5	102.9	0.34	0.33	2.48	0.24
BUFFALO BRAND	Grazex II W	SS	72	80	15.3	9.9	37.9	53.5	58.4	103.3	0.39	0.58	2.69	0.28
DEKALB	SX-8	SS	79	98	13.3	8.7	38.5	54.0	58.7	101.5	0.38	0.51	2.67	0.26
CARGILL	X18347	SS	77	84	12.9	8.5	39.1	52.8	58.0	102.7	0.37	0.56	2.50	0.28
BUFFALO BRAND	Buffalo Brand	SS	78	99	12.2	8.0	37.8	54.0	59.5	102.5	0.35	0.51	2.56	0.25
DEKALB	ST-6E	SS	79	96	12.0	7.9	36.8	52.6	60.6	106.6	0.36	0.45	2.59	0.25
CARGILL	X25477	SS	77	88	11.6	7.7	36.6	54.6	60.9	103.0	0.35	0.39	2.56	0.24
BUFFALO BRAND	BMR 737	SS	79	77	11.5	7.8	39.2	55.6	57.8	97.7	0.37	0.34	2.61	0.25
BUFFALO BRAND	Grazex II	SS	75	92	10.5	7.1	38.6	53.5	58.5	102.2	0.34	0.43	2.39	0.26
GOLDEN HARVEST	H-2530 Bt	Corn	74	87	9.8	6.7	36.5	50.8	60.9	110.7	0.31	0.49	2.21	0.23
Average		FS	83	87	12.3	8.1	37.8	53.9	59.4	102.8	0.37	0.43	2.49	0.26

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, Digestible Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; RFV, Relative Feed Value; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1998

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: May 25. HARVESTED: September 21.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 63 F.

IRRIGATION: Two furrow irrigations: June 30 and July 23, total applied 10.5 acre-in./A.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. 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	134	4	0	6
June	0.85	668	18	6	36
July	11.35	872	19	5	67
August	3.59	734	12	0	98
September	0.33	481	11	0	119
Total	16.12	2889	64	11	119

\1. Growing season from May 25 (planting) to September 21

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep Plow.

COMMENTS: Planted in good soil moisture. Weed control was very good. Record precipitation for the growing season, with second highest July on record. No greenbug infestation. Forage yields were good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.6	7	1.8	543	0.6	6.2
8"-24"				7				

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	94	40	0	0

Available Soil Water
Irrigated Forage Sorghum, Walsh, 1998

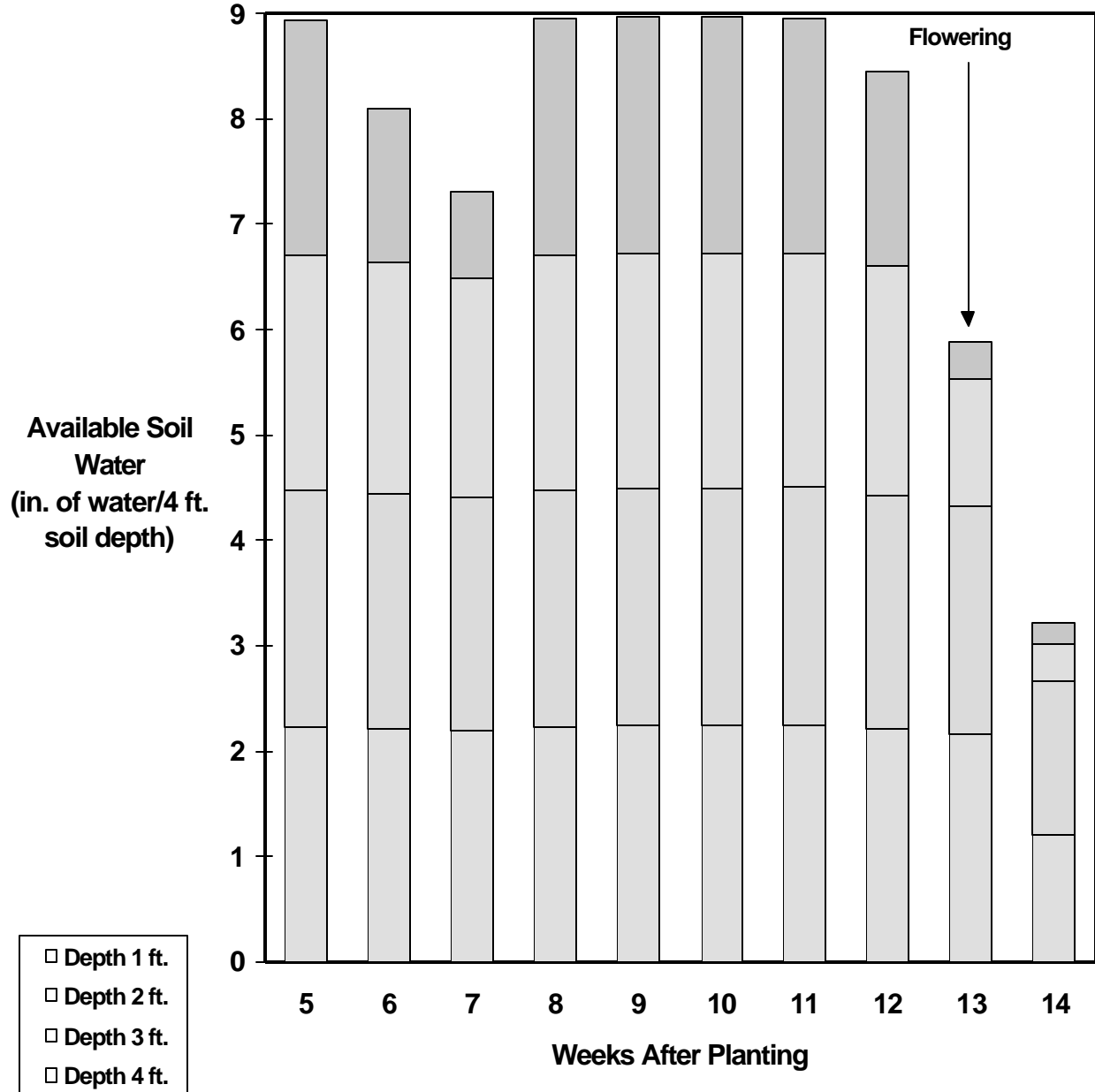


Fig. 8. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 16.12 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Brand	Hybrid	Forage Type \2	Days			Harvest Density	Stage \3			Forage Yield	Yield % of Test Average
			Days to Emerge	to 50% Bloom	Harvest		Plant at Harvest	Stem Sugar	Plants Lodged		
						Plants/A (1000 X)	In.	%	%	Tons/A	%
DEKALB	FS-25E	FS	7	106	33.3	116	EM	11	0	25.0	119
MYCOGEN	Greenchopper	FS	6	Veg \4	32.1	116	Veg \4	11	0	24.6	117
ASGROW	XP BMR 1	FS	7	91	29.0	120	LM	6	25	22.5	107
DEKALB	FS-22	FS	7	88	26.7	85	SD	4	0	22.2	106
MYCOGEN	T-E Silomaker	FS	6	98	32.5	103	MM	9	5	22.2	105
CARGILL	X43024	FS	7	100	28.3	76	EM	13	0	21.8	104
CARGILL	BMRX1	FS	7	89	35.6	118	SD	6	20	21.8	104
DEKALB	FS-5	FS	7	93	25.9	110	LM	12	0	21.7	103
BUFFALO BRAND	BMR 208	FS	7	90	37.2	110	LM	7	0	21.2	101
ASGROW	Titan R	FS	6	98	38.7	105	MM	5	5	20.8	99
CARGILL	X24442	FS	7	101	32.9	103	EM	11	0	20.1	96
BUFFALO BRAND	Canex II	FS	8	89	26.3	118	SD	14	0	19.7	94
(Check)	NB 305F	FS	8	92	30.6	112	LM	12	0	18.7	89
BUFFALO BRAND	Canex	FS	8	87	25.2	112	SD	13	0	17.5	83
BUFFALO BRAND	Buffalo Brand	SS	7	84	31.0	129	SD	12	2	21.8	104
BUFFALO BRAND	Grazex II W	SS	6	81	34.5	126	HD	8	2	21.6	103
CARGILL	X25477	SS	7	81	37.2	118	HD	10	0	21.4	102
BUFFALO BRAND	Grazex II	SS	7	83	32.1	129	HD	11	0	20.7	99
CARGILL	X18347	SS	7	84	32.1	125	SD	9	0	20.2	96
BUFFALO BRAND	BMR 737	SS	8	84	24.7	119	SD	5	0	19.9	95
GOLDEN HARVEST	H-2530 Bt	Corn	5	78	27.5	99	SD	10	0	15.1	72
Average		FS	7	90	31.1	112	SD	9	3	21.0	
LSD	0.20									1.79	

\1 Planted May 25; Harvested: September 21.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\3 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough.

\4 MYCOGEN Greenchopper remained vegetative.

Yields corrected to 70% moisture based on oven-dried sample.

Table 17.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1996-98.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Canex	15.6	12.8	17.5	15.2	15.3	84	82	83	83	83
BUFFALO BRAND	Canex II	16.6	11.2	19.7	15.5	15.8	90	71	94	83	85
BUFFALO BRAND	Buffalo Brand	18.1	17.8	21.8	19.8	19.2	98	113	104	109	105
BUFFALO BRAND	Grazex II	18.3	18.5	20.7	19.6	19.2	99	118	99	109	105
BUFFALO BRAND	Grazex II W	17.5	19.0	21.6	20.3	19.4	95	121	103	112	106
CARGILL	FS 466	22.7	16.8	--	19.8	--	123	107	---	115	--
CARGILL	Sweet Souix V	23.5	19.4	--	21.5	--	127	124	---	126	--
CARGILL	MorCane II	17.5	14.1	--	15.8	--	95	90	---	93	--
CARGILL	X25477	19.6	19.3	21.4	20.4	20.1	106	123	102	113	110
DEKALB	FS-5	18.1	13.9	21.7	17.8	17.9	98	89	103	96	97
MYCOGEN	T-E Silomaker	19.5	15.9	22.2	19.1	19.2	105	101	105	103	104
MYCOGEN	Greenchopper	19.6	15.0	24.6	19.8	19.7	106	96	117	107	106
(Check)	NB 305F	19.4	14.3	18.7	16.5	17.5	105	91	89	90	95
(Check)	Corn	17.2	13.5	15.1	14.3	15.3	93	86	72	79	84
Average		18.5	15.7	21.0	18.4	18.4					

Yields corrected to 70% moisture based on oven-dried sample.

Table 18.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1998.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
ASGROW	XP BMR 1	FS	83	91	15.8	10.2	35.5	54.3	62.1	105.0	0.45	0.32	3.17	0.26
CARGILL	BMRX1	FS	82	89	15.1	9.7	37.1	55.2	60.2	101.1	0.43	0.39	3.11	0.28
MYCOGEN	T-E Silomaker	FS	90	89	14.7	9.7	36.7	53.9	60.8	104.2	0.41	0.40	2.89	0.27
BUFFALO BRAND	Canex II	FS	80	87	14.3	9.4	36.7	51.8	60.7	108.3	0.41	0.48	2.96	0.29
DEKALB	FS-5	FS	86	95	14.3	9.5	37.8	55.5	58.4	99.6	0.39	0.47	2.69	0.26
ASGROW	Titan R	FS	90	100	14.2	9.3	37.2	53.9	60.1	103.4	0.40	0.47	2.77	0.27
DEKALB	FS-22	FS	80	67	14.0	9.2	37.7	54.1	59.5	102.3	0.42	0.40	3.02	0.28
CARGILL	X43024	FS	92	63	13.9	9.1	36.9	56.5	60.5	99.0	0.41	0.30	2.88	0.25
DEKALB	FS-25E	FS	99	102	13.1	8.6	37.6	56.6	59.6	98.0	0.37	0.41	2.63	0.25
BUFFALO BRAND	Canex	FS	78	88	12.9	8.4	38.4	53.5	58.7	102.4	0.35	0.45	2.60	0.26
(Check)	NB 305F	FS	83	86	12.5	8.3	38.9	55.8	58.3	97.7	0.39	0.40	2.69	0.26
BUFFALO BRAND	BMR 208	FS	82	86	12.0	8.2	35.5	49.4	62.1	115.3	0.39	0.38	2.82	0.28
CARGILL	X24442	FS	93	87	11.4	7.6	38.7	54.7	58.5	100.0	0.36	0.43	2.52	0.27
MYCOGEN	Greenchopper	FS	Veg \2	111	10.3	6.8	42.2	58.7	54.4	88.8	0.31	0.58	2.00	0.25
CARGILL	X18347	SS	75	92	13.0	8.4	39.9	54.8	57.1	98.3	0.38	0.53	2.63	0.28
BUFFALO BRAND	Buffalo Brand	SS	74	85	12.7	8.3	39.2	53.6	57.9	101.3	0.35	0.63	2.49	0.27
BUFFALO BRAND	Grazex II W	SS	71	87	12.0	8.0	39.7	56.6	57.3	95.3	0.35	0.49	2.54	0.25
BUFFALO BRAND	BMR 737	SS	75	82	11.9	8.0	37.3	56.5	60.0	98.6	0.38	0.27	2.84	0.24
BUFFALO BRAND	Grazex II	SS	74	79	11.6	7.7	39.3	54.6	57.8	99.4	0.35	0.51	2.51	0.25
CARGILL	X25477	SS	71	76	11.0	7.3	40.5	53.4	56.4	100.0	0.33	0.64	2.38	0.27
GOLDEN HARVEST	H-2530 Bt	Corn	73	95	13.0	8.7	37.4	47.3	58.8	117.6	0.35	0.75	2.52	0.28
Average		FS	82	87	13.0	8.6	38.1	54.3	59.0	101.7	0.38	0.46	2.70	0.27

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\2 MYCOGEN Greenchopper remained vegetative.

\3 MYCOGEN Greenchopper height was measured at harvest.

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, Digestible Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; RFV, Relative Feed Value; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 1998

COOPERATORS: Frank C. Schweissing, Superintendent, Arkansas Valley Research Center, Rocky Ford, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions.

PLOT: Two rows with 30" row spacing, 31' long. **SEEDING DENSITY:** 99,565 Seed/A. **PLANTED:** May 29. **HARVESTED:** September 16.

EMERGENCE DATE: 11 days after planting. **SOIL TEMP:** 67 °F.

IRRIGATION: Three furrow irrigations: June 1, July 2, July 21, total applied 15 acre-in/A.

PEST CONTROL: Preemergence
Herbicides: Bifenox 2 lbs. AI/A + propachlor 2 lbs. AI/A. Post Emergence Herbicides: None. Insecticide: None.

Summary: Growing Season Precipitation and Temperature \1
Arkansas Valley Research Center, Rocky Ford, Otero County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.00	30	3	0	2
June	0.36	586	17	4	32
July	3.66	744	25	6	63
August	3.24	657	18	1	94
September	0.24	329	11	0	110
Total	7.50	2346	74	11	110

\1 Growing season from May 29 (planting) to September 16

CULTURAL PRACTICES: Previous crop: corn. Field Preparation: plow, disc, roller-pack, float. Cultivation: 1 time.

SOIL: Silty Clay Loam, 1 - 1.5 % O.M., pH-ca. 7.8. **FERTILIZER:** 50 lbs. P₂O₅ and 150 lbs. N/A.

COMMENTS: Planted in dry soil and irrigated up. No serious weather problems. Greater than average precipitation in July and August. Greenbugs were not a problem.

Brand	Hybrid	Forage Type \2	Days		Stage \4				Yield %	
			to 50% Bloom	Stand \3	Plant Height	at Harvest	Stem Sugar	Dry Matter	Forage Yield	of Test Average
				Plants/A (1000 X)	In.		%	%	Tons/A	%
DEKALB	SX-8	SS	86	82.2	129	MM	13	29	40.3	128
BUFFALO BRAND	Buffalo Brand	SS	81	89.8	125	ED	11	33	38.0	120
MYCOGEN	T-E Silomaker	FS	86	81.9	95	LM	5	26	36.3	115
DEKALB	ST-6E	SS	89	78.1	123	EM	10	30	35.7	113
BUFFALO BRAND	Grazex II W	SS	82	85.5	119	ED	6	38	35.0	111
DEKALB	FS-5	FS	86	76.0	109	MM	13	27	34.4	109
DEKALB	FS-25E	FS	94	65.9	109	EM	11	25	34.0	108
MYCOGEN	Greenchopper	FS	Veg	85.8	121	PM	11	24	33.2	105
BUFFALO BRAND	Grazex II	SS	81	87.9	114	HD	5	28	32.9	104
ASGROW	Titan R	FS	86	80.6	99	MM	7	27	32.0	101
ASGROW	XP BMR1	FS	85	61.5	101	MM	5	27	30.4	96
BUFFALO BRAND	Canex	FS	82	102.1	104	SD	13	28	29.9	95
(Check)	NB 305F	FS	85	97.2	108	SD	12	25	28.7	91
BUFFALO BRAND	G737BMR	SS	80	62.9	109	HD	6	30	28.6	90
DEKALB	FS-22	FS	82	98.0	84	HD	2	28	27.3	86
BUFFALO BRAND	Canex II	FS	83	102.1	108	ED	11	26	24.7	78
BUFFALO BRAND	F208BMR	FS	82	94.5	105	SD	10	26	24.0	76
MYCOGEN	2725	Corn	69	42.7	87	HD	11	30	23.9	76
Average		FS	83	81.9	108	ED	9	28	31.6	
LSD 0.20									3.34	

\1 Planted May 29, 1998; Harvested: September 16, 1998.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\3 Plant Population per acre on June 23, 1998.

\4 Seed Maturation: PM, pre-milk; EM, early milk; MM, mid-milk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough.

Yields corrected to 70% moisture based on oven-dried sample.

Table 20.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Rocky Ford, 1996-98.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1996	1997	1998	2-Year Avg	3-Year Avg	1996	1997	1998	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Buffalo Brand	32.7	29.5	38.0	33.8	33.4	125	119	120	120	121
BUFFALO BRAND	Canex	24.8	22.6	29.9	26.3	25.8	95	91	95	93	94
BUFFALO BRAND	Canex II	20.8	20.9	24.7	22.8	22.1	80	85	78	82	81
BUFFALO BRAND	Grazex II	27.2	25.7	32.9	29.3	28.6	105	104	104	104	104
BUFFALO BRAND	Grazex II W	25.9	26.2	35.0	30.6	29.0	100	107	111	109	106
DEKALB	FS-25E	29.3	27.0	34.0	30.5	30.1	113	109	108	109	110
MYCOGEN	Greenchopper	29.5	28.2	33.2	30.7	30.3	114	114	105	110	111
MYCOGEN	T-E Silomaker	25.3	25.6	36.3	30.9	29.1	97	103	115	109	105
(Check)	NB 305F	21.8	22.3	28.7	25.5	24.2	84	90	91	91	88
(Check)	Corn	21.7	18.4	23.9	21.2	21.3	83	74	76	75	78
Average		26.0	24.8	31.6	28.2	27.5					

Yields corrected to 70% moisture based on oven-dried sample.

Row Spacing for Dryland Grain Sorghum Production for Southeastern Colorado Kevin Larson and Calvin Thompson

Row spacing for dryland grain sorghum varies greatly throughout the sorghum producing counties of Southeastern Colorado. When there is a wheat failure, the traditional wheat-fallow growers sow grain sorghum on same row spacing as their wheat drill, typically on 12 in. row spacing. Whereas, the traditional dryland continuous sorghum growers in Kiowa County plant grain sorghum in 48 in. row spacing. In Baca County the dryland continuous sorghum is usually planted on 40 in. row spacing, while the irrigated is on 30 in. row spacing. In this study, the first year of our multiple year study, we tested five row spacing widths to determine the optimum spacing for dryland grain sorghum production.

Materials and Methods

The five row spacing widths we tested were, 1, 2, 3, 4, 5 ft. We used a six row cone planter with 12 in. row spacing. We plugged the seed spouts as needed to provide the needed row spacings. The grain sorghum hybrid we used was CARGILL 627 and the seeding rate for all row spacings was 40,000 Seeds/A. Weed control was via a broad spectrum pre-emergence herbicide (LandMaster 54 Oz/A) and a post emergence broadleaf weed herbicide mixture (Peak 0.75 Oz/A, COC 1 Qt/A, 2,4-D 3 Oz/A). The treatments were not cultivated. The plots were 12 ft. by 450 ft, with two replications. The plots were harvested with a self-propelled combine equipped a straight head and wide plastic sorghum fingers. Only treatment rows adjacent to identically treated rows were recorded for harvest.

Results and Discussion

The wide row spacing (48 in.) used in Kiowa County was adopted during the severe drought of the 1930's and 1950's. To reach the soil moisture, they had to list very deep, "as deep as a man's leg". This wide row spacing continues today as insurance against dry weather.

We found that the highest yield was with the narrowest row spacing, 1 ft. (Fig. 9). One of the reasons narrow row spacings produced higher yield than the wide row spacings was weed suppression. The narrowest row spacings (1 and 2 ft.) provided canopy closure and grass weed suppression; the wider row spacings did not. However, wider row spacing would allow weed cultivation between the rows, but with narrow row spacing weed suppression occurred with canopy closure, making supplemental weed control less critical.

This past year was a record wet year (18.59 in. of rain during the growing season). With abundant rainfall, we found that increasing row spacing from 1 ft. to 5 ft. reduced grain yield by 4 Bu/A for each foot increase in row width. It can be argued that dry weather would reverse our findings. Under late-season drought conditions, the soil moisture saved between the wide rows could be utilized for making grain and producing a crop; whereas, narrow row spacing might use all the soil moisture for vegetative growth and leave nothing for grain filling. Moreover, under early-season drought conditions, only wide row spacing

can be listed deep enough to reach soil moisture and assure seed germination and growth.

In order for growers to implement a change in row spacing, it is obvious that this study needs to be conducted over multiple years and various weather conditions, particularly dry weather conditions. From the study this year, with well above average rainfall during the growing season, narrow row spacing was preferable to wide row spacing.

Row Spacing on Dryland Grain Sorghum Walsh, 1998

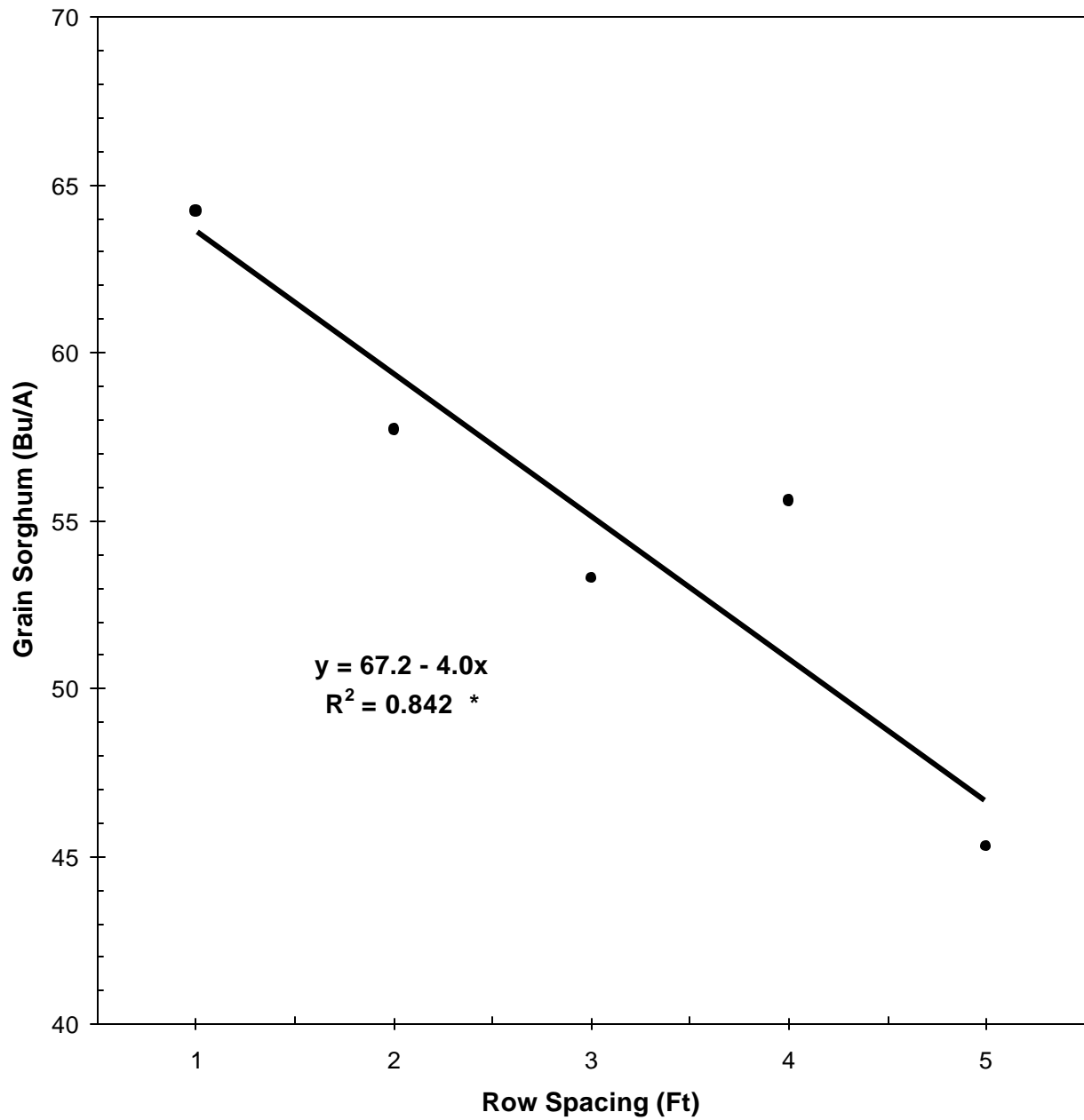


Fig. 9. Row spacing on dryland grain sorghum at Walsh. The five row spacings tested are: 1ft., 2 ft., 3 ft., 4 ft. and 5 ft. CARGILL 627 was sown at 40,000 Seeds/A.

Dryland Grain Sorghum Seeding Rate Kevin Larson and Dennis Thompson

The seeding rate for dryland grain sorghum in Colorado varies almost as widely as does row spacing. The old standard, using the old hybrids, was about one to two pounds per acre with no consideration taken for seed size. With modern hybrids the seeding rate has increased to about two to three pounds per acre, but there are some dryland growers who sow up to five pounds per acre, particularly when planted in wide rows. With such a broad spectrum of seeding rates used for dryland sorghum production, we decided to test a wide range of seeding rates to determine the optimum dryland grain sorghum rate with 30 in. row spacing. Since seed size varies from hybrid to hybrid, bag to bag, we reported our seeding rates not only in the traditional pounds per acre, but, more importantly, in seeds per acre and corresponding plants per acre.

Materials and Methods

The eight seeding rates we tested were 1, 2, 3, 4, 5, 6, 7 and 8 Lb/A, which corresponds to 12,700 to 101,600 Seeds/A at 12,700 Seed/A increments. We planted with a four-row cone planter on 30 in. row spacing. The grain sorghum hybrid was CARGILL 627. The only fertilizer that we added was seedrow applied 5 Gal/A of 10-34-0. We were less than 10 Lb/A short of the soil test N recommendation. Weed control was achieved with pre and post emergence herbicides (pre, LandMaster 54 Oz/A; post, Peak 0.75 Oz/A, COC 1Qt/A, 2,4-D 3 Oz/A) and cultivation. The study was harvested with a self-propelled combine equipped with a digital scale.

Results and Discussion

The highest yielding seeding rate was 6 Lb/A which corresponds to 76,200 Seeds/A and 34,300 Plants/A (Fig. 10). The optimum seeding rate ranged from 4.5 to 8 Lb/A which corresponds to 57,000 to 101,600 Seeds/A or 28,500 to 42,000 Plants/A (CI 95%). The high seeding rate range optimum is partly attributable to record high precipitation during the growing season, 18.59 in. Under drier weather conditions these high seeding rate may use most of the available soil moisture for vegetative growth while reserving little for grain filling.

A puzzling phenomenon occurs when we investigate the plant density to seeding rate ratio. As the seeding rate increases fewer of the seeds develop into plants. At the 1 Lb/A (12,700 Seeds/A) rate about 80% of the seeds make plants (10,100 Plants/A), while at the 8 Lb/A (101,600 Seeds/A) rate only about 40% of the seeds make plants (42,000 Plants/A) (Fig. 11). The plant density to seeding rate ratio follows a decay curve with fewer seeds developing into plants. We reviewed last year's limited irrigation seeding rate study and a similar decay curve developed (Larson, Schweissing, Thompson, 1998). The reason behind this decay curve is unclear. As the seeding rate increases more and more seeds are grouped together. Seed crowding, perhaps, creates competition for some limiting factor such as water for germination (but this year was very wet) or, perhaps, sorghum seeds exude some type of alleopathic chemical arresting germination of nearby seeds. Furthermore, we believe that seed crowding is partly responsible for the higher seeding rates frequently sown by wide row sorghum producers. As the row width

increases, seed concentration also increases and to compensate for the seed crowding affects more seed must be sown to maintain high plant densities and high yields.

This year, abundant rains during the growing season resulted in a high seeding rate optimum range (73,000 to 101,600 Seeds/A) for dryland grain sorghum production. To be accepted by sorghum growers, this seeding rate study must be conducted over multiple years and weather conditions, especially dry years as these tend to define good cultural practices. Seed crowding also needs to be further studied to explain this phenomenon and perhaps be utilized for our benefit.

Literature Cited

Larson, K.J., F.C. Schweissing, D. L. Thompson. 1998. Sorghum hybrid performance tests in Colorado, 1997. Technical Report TR98-3. AES, Dept. of Soil and Crop Sciences, CSU. 53p.

Dryland Grain Sorghum Seeding Rate Walsh, 1998

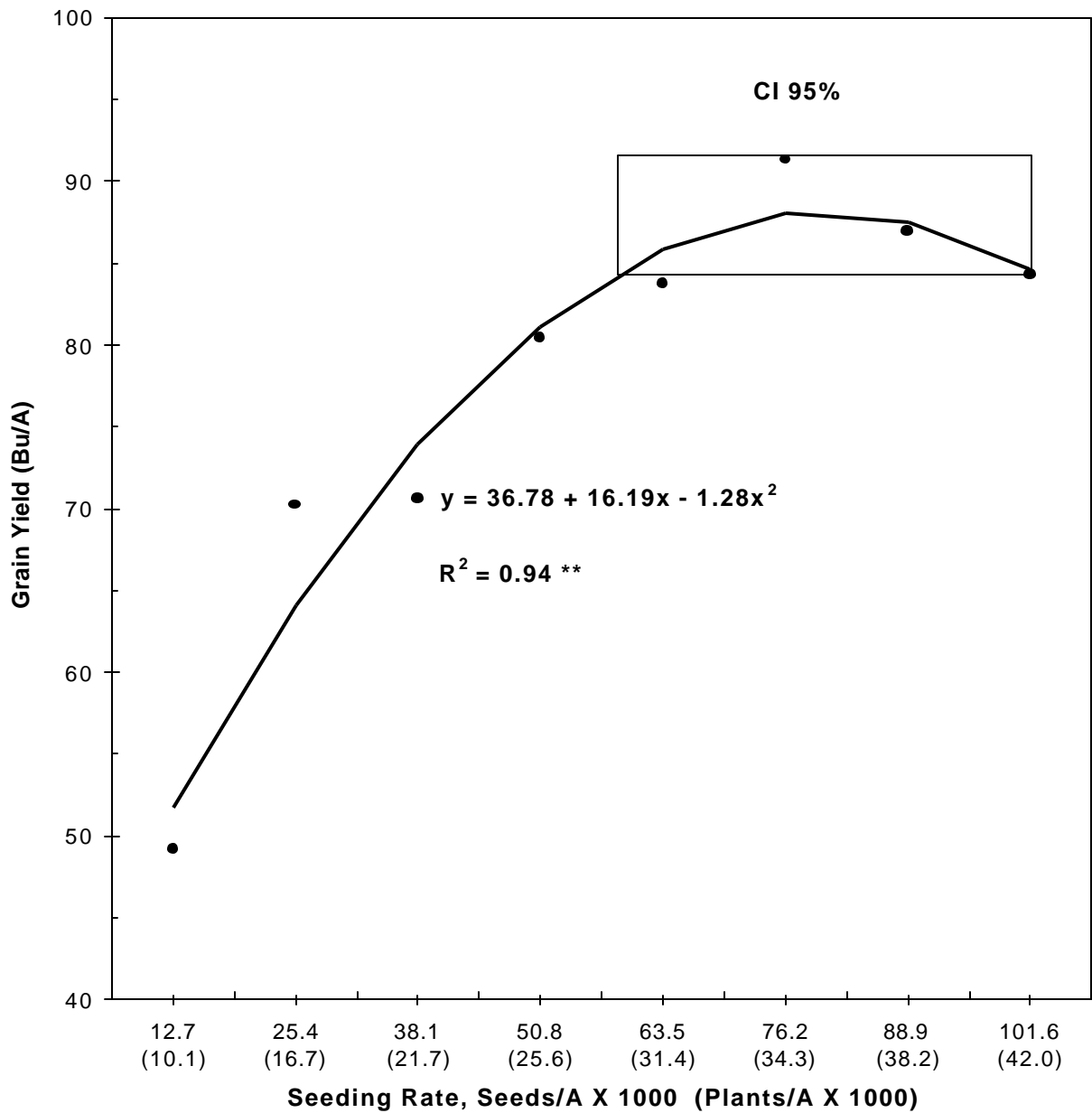


Fig. 10. Dryland grain sorghum seeding rate at Walsh. The eight seeding rates tested are 12,700 Seeds/A to 101,600 Seeds/A at 12,700 Seeds/A increments (1 Lb to 8 Lb/A at 1 Lb/A increments) using CARGILL 627.

**Plant Density to Seeding Rate Ratio
Dryland Grain Sorghum, Walsh, 1998**

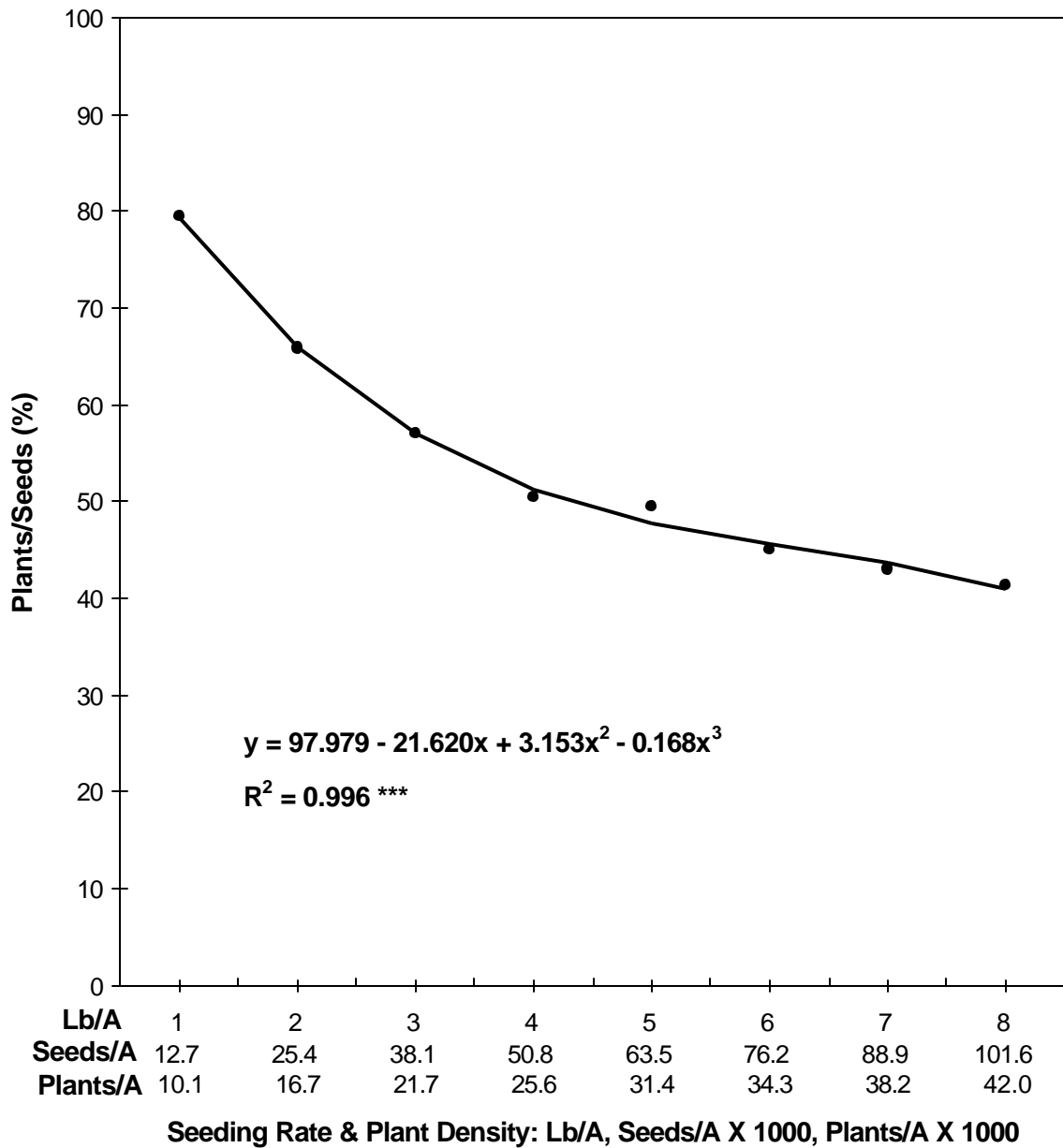


Fig. 11. Plant density to seeding rate ratio in dryland grain sorghum at Walsh. The eight seeding rates tested are 1, 2, 3, 4, 5, 6, 7 and 8 lb./A, corresponding to 12,700 to 101,600 seeds/A at 12,700 seeds/A increments.

Seedrow P and N on Dryland Grain Sorghum

Kevin Larson, Dennis Thompson and Calvin Thompson

Banding P fertilizer with the seed at planting (seedrow placement) has proven to be a very effective P fertilizing method for dryland grain sorghum in the high lime, high alkaline soils of Southeastern Colorado. For these alkaline soils, the P fertilizer of choice for seedrow placement is liquid 10-34-0. The most common seedrow P rate for dryland grain sorghum is 5 Gal/A of 10-34-0 which contains 20 Lb P₂O₅ and 6 Lb N/A. High rates of seedrow N is reported to cause N salt toxicity which lowers germination (Mortvedt, 1976). Nonetheless, a moderate, nontoxic level of seedrow N may increase yields. We tested low seedrow P rates with added N to determine if the additional N would maintain high grain sorghum yields.

Materials and Methods

We tested eight rates of poly ammoniated phosphate (10-34-0) fertilizer banded with the grain sorghum seed on 30 in. row spacing in an alkaline Silty Clay Loam soil. The eight rates were 0, 0.75, 1.25, 2.5, 5.0, 7.5, 10.0 and 12.5 gallons of 10-34-0/A, corresponding to 0, 2.5, 5, 10, 20, 30, 40, 50 Lb P₂O₅/A. In addition we added 6 Lb/N (28-0-0) to the four lowest P rates, making a total of 12 treatments. The fertilizer was applied with a squeeze pump at 13.7 Gal/A and all fertilizer rates were diluted with water to their appropriate levels. Prior to planting, the soil was sampled at eight random locations at 0 to 8 in. (surface) and 8 to 24 in. (subsurface) depths. The soil was sent to Colorado State University Soil Testing Lab for analysis. Their soil test recommendation for a 50 Bu/A yield goal was banding 40 Lb P₂O₅/A; only 15 Lb N/A was recommend. The grain sorghum hybrid was CARGILL 627 sown at 43,500 Seed/A on June 8. We harvested the 10 ft. by 50 ft. plots on November 16 with a self-propelled combine with a four row crop header. Grain yields were corrected to 14% seed moisture content.

Results and Discussion

The seedrow applied 20 Lb P₂O₅, 6 Lb N/A rate produced the highest dryland grain sorghum yield, 88 Bu/A (Fig. 12). This seedrow 20 Lb P₂O₅/A rate was one-half the recommended banded rate. All treatments which received added N to the 6 Lb/A level produced more yield than their non-N-added counterparts. The 95% confidence interval for the optimum seedrow rate ranged from 10 to 45 Lb P₂O₅/A as 10-34-0; it also included 2.5, 5, 10 Lb P₂O₅/A when N was added to the 6 Lb/A level. The low P rates of 2.5 and 5 Lb P₂O₅/A yielded as much as the 10 to 45 Lb P₂O₅/A rates when N was added to the 6 Lb/A level to these low P rates.

Our study found that low seedrow P (10-34-0) rates, as low as one-sixteenth the recommended banded P rate, can be used to produce grain yields as high as those from soil test recommend banded P rates when N is added to the 6 Lb N/A level. However, more P is removed with grain than is added from rates below 20 Lb P₂O₅/A level: a 40 Bu/A sorghum grain crop removes about 18 Lb P₂O₅/A (extrapolated from Leonard and Martin, 1963). Since more P is removed with grain than is added with these low P rates, continuous use of these low P rates will eventually reduce yield levels because the small

soil P pool in these low P soils will be depleted. Therefore, this low seedrow P and N technology will only provide a short term benefit, used, perhaps, in cash flow crises.

Literature Cited

Leonard, W. H. and J. H. Martin. 1963. Cereal Crops. MacMillan Publishing Co., New York, New York. pp. 789-791.

Mortvedt, J. J. 1976. Band fertilizer placement - how much and how close? Fert. Solns. 20(6): 90-96.

Seedrow P and N on Grain Sorghum Dryland, Walsh 1998

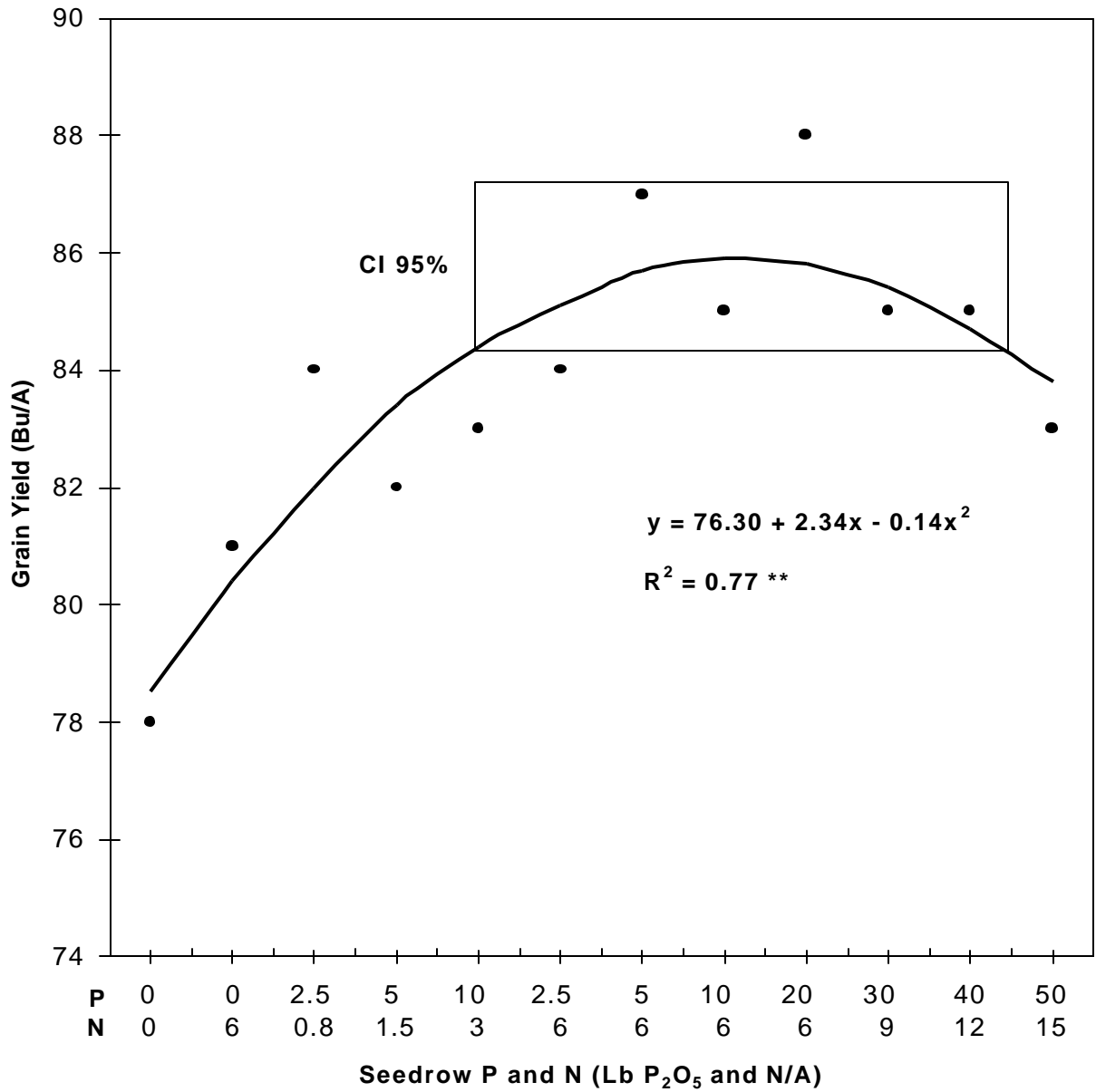


Fig. 12. Seedrow P and N on dryland grain sorghum at Walsh. The P fertilizer was liquid 10-34-0. All treatments with 6 Lb N/A, except 20 Lb P₂O₅, 6 N/A, had liquid 28-0-0 added. The grain sorghum hybrid was CARGILL 627 sown at 40,000 Seeds/A.