

## SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1997

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SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1997  
K.J. Larson, F.C. Schweissing, and D.L. Thompson \1

Introduction

The 1997 Colorado grain sorghum crop was estimated at 6.4 million bushels, 34 % lower than the 1996 production level. The decrease in production was due to both an decrease in yield and acreage: 9 % decrease in yield, from 44 Bu/A in 1996 to 40 Bu/A in 1997 and a 28 % decrease in acreage from 250,000 planted acres in 1996 to 180,000 planted acres in 1997. The decrease in planted acres is a reflection of the failed winter wheat acres planted to sorghum in 1996. Sorghum silage production in 1996 was 156,000 tons, down 8 % from 1995. The decrease in silage production is attributed to fewer acres, 12,000 acres and 13 Tons/A for 1996, and 13,000 acres and 13 Tons/A for 1995 (Colorado Agricultural Statistic Service, 1997)

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 1997 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, 1997), 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, 1997.

Brand	Entered by
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	The J. C. Robinson Seed Company, 100 J. C. Robinson Blvd., P.O. Box A, Waterloo, NE 68069-0301
MYCOGEN	Mycogen Seeds, 3600 N. Columbia, Plainview, TX 79072
NC+	NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504
NORTHRUP KING	Novartis Seeds, Inc., 11939A, Sugar Mill Rd., Longmont, CO 80501
OHLDE	Ohlde/Midwest Seed Genetics, 1577 4 <sup>th</sup> Rd., Palmer, KS 66962
PIONEER	Pioneer Hi-Bred International, Inc., 1616 South Kentucky St., C-150, Amarillo, TX 79102
RICHARDSON	Arkansas Valley Seed Co., 4625 Colorado Blvd., Denver, CO 80216
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 TXR2536 (399 X 2536); forage sorghums, NB 305F and NB 280S; corn hybrids, DEKALB DK 636 and NORTHRUP KING 7639 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:

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

### 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. It is also important because bloom is a sexual developmental stage that is very sensitive to environmental stresses.

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 the 20 percent significance level. 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: Tim Weeks, 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

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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.

## Dryland Grain Sorghum Hybrid Performance Test at Eads, 1997

**COOPERATORS:** Tim Weeks 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 18. **HAND-HARVESTED:** December 8.

**EMERGENCE DATE:** 8 days after planting. **SOIL TEMP:** 67 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:** Planting rains arrived in mid-June, therefore the study was planted late. Planting moisture was good. Broadleaf weed control was good. Grass control was fair. Near normal precipitation for the growing season, with August wetter than normal and September drier than normal. No greenbug infestation. A late October blizzard caused two of the replications to lodge completely and the study had to be hand-harvested. Average lodging was 15% in the least lodged replications, with five hybrids lodging more than 30 %. Grain yields were good.

**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"	7.2	0.3	0.6	5	5.9	135	0.5	10.7
8"-24"				7				
Comment	Alka	VLo	Lo	Mod	Lo	Hi	Lo	Adeq
Manganese and Copper levels were adequate.								

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	2.33	332	9	0	12
July	1.56	824	24	9	43
August	3.94	698	19	0	74
September	0.20	534	8	0	104
October	0.10	161	2	0	113
Total	8.13	2549	62	9	113
\1 Growing season from June 5 (planting) to October 9 (first freeze, 31 F).					
\2 GDD: Growing Degree Days for sorghum.					
\3 DAP: Days After Planting.					

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	20	2	0
Applied	6	20	0	0
Yield Goal: 45 Bu/A.				
Actual Yield: 63 Bu/A.				

**Available Soil Water**  
**Dryland Grain Sorghum, Eads, 1997**

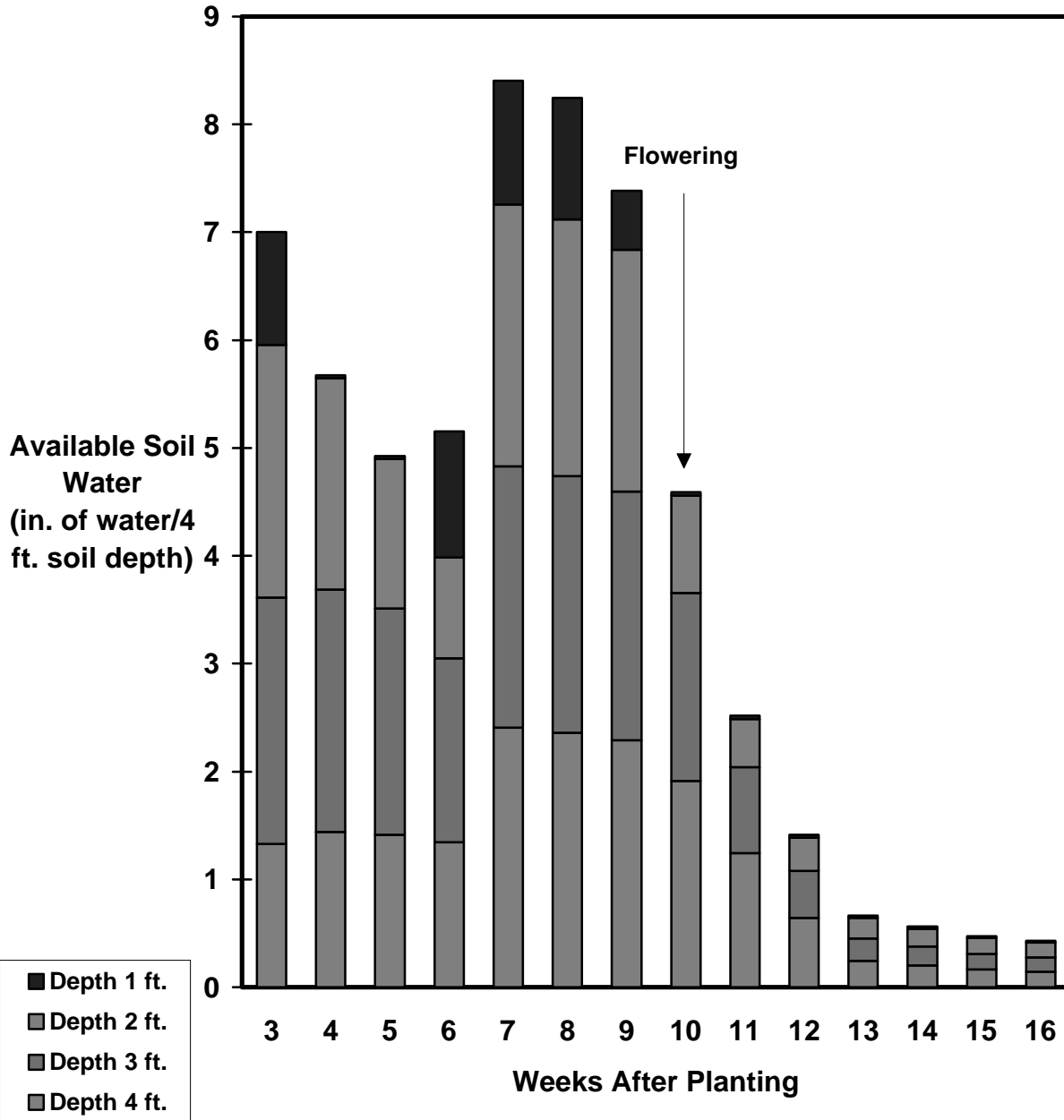


Fig. 1. Available soil water in dryland grain sorghum at Eads. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall from planting to first freeze was 8.13 in. Any increase in available soil water between weeks is from rain.



Table 2.--Dryland Grain Sorghum Hybrid Performance Test at Eads, 1997. \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							
<hr/>													
								In.	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
NORTHRUP KING	K35-Y5	9	64	1603	111	E	41	16.3	33	57	73	115	
PIONEER	8699	8	65	1630	111	E	46	16.1	33	57	62	97	
GOLDEN HARVEST	H-296W	8	60	1520	105	E	44	20.5	18	57	57	89	
PIONEER	87G57	8	63	1581	106	E	44	15.9	40	56	56	87	
<hr/>													
PIIONEER	8500	7	70	1752	HD	ME/M	45	17.0	11	56	82	128	
RICHARDSON	117	9	62	1559	112	ME	44	16.8	38	58	77	120	
MYCOGEN	9580-X	8	72	1806	MD	ME	44	18.8	15	51	68	107	
DEKALB	DK-40y	9	70	1752	HD	ME	45	14.9	11	53	68	106	
GOLDEN HARVEST	H-430Y	9	72	1806	MD	ME/M	44	14.3	5	53	66	102	
DEKALB	DK-43A	9	72	1806	MD	ME	43	16.7	9	52	66	102	
PIONEER	85Y34	8	66	1653	112	ME/M	46	15.9	18	56	66	102	
NORTHRUP KING	KS 310	7	66	1653	113	ME/E	43	16.3	8	56	64	100	
MYCOGEN	T-E Hardy	7	71	1779	HD	ME	43	16.7	3	55	62	97	
TRIUMPH	TR 432	8	68	1700	113	ME	41	19.6	4	56	62	97	
TRIUMPH	TR 445	8	65	1630	112	ME	47	18.2	30	57	58	91	
DEKALB	DK-44	10	72	1806	MD	ME	44	16.8	5	53	58	91	
DEKALB	DK-38y	9	69	1725	HD	ME	38	19.2	5	52	55	87	
GOLDEN HARVEST	H-403	7	74	1854	MD	ME	44	17.4	7	52	54	84	
<hr/>													
NORTHRUP KING	KS 585	8	76	1900	ED	M	44	22.3	3	51	58	91	
(Check)	399 X 2536	10	77	1918	ED	M	45	15.7	6	48	53	83	
<hr/>													
Average		8	69	1722	HD	ME	44	17.3	15	54	63		
LSD	0.20											10.5	

\1 Planted: June 18; Hand-Harvested: December 8.

Yields are corrected to 14.0% seed moisture content.

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 3.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Eads, 1995-97.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
DEKALB	DK-38y	17	37	55	46	36	61	99	87	93	82
DEKALB	DK-40y	19	--	68	34	--	66	---	106	86	---
DEKALB	DK-44	--	39	58	49	--	---	101	91	96	---
GOLDEN HARVEST	H-296W	--	32	57	45	--	---	82	89	86	---
MYCOGEN	T-E Hardy	28	39	62	51	43	100	106	97	102	101
MYCOGEN	9580-X	--	34	68	51	--	---	91	107	102	---
NORTHROP KING	KS 560Y	29	24	--	27	--	103	66	---	85	---
NORTHROP KING	KS 310	34	53	64	59	51	120	142	100	121	121
PIONEER	8500	37	52	82	67	57	131	141	128	135	133
PIONEER	8505	36	41	--	39	--	127	112	---	120	---
PIONEER	8522Y	32	35	--	34	--	114	95	---	70	---
PIONEER	8557Y	27	36	--	32	--	97	97	---	97	---
PIONEER	8771	26	44	--	35	--	94	120	---	107	---
(Check)	399 X 2536	12	34	53	44	33	42	92	83	88	72
Average		28	37	63	50	43					

Grain Yields were corrected to 14.0 % seed moisture content.

### Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1997

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: June 11. HARVESTED: November 23.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 65 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 0.6 Lb AI/A. Post Emergence Herbicides: Buctril 16 Oz/A, Banvel 4 Oz/A. CULTIVATION: Once. INSECTICIDE: None.

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	0.95	461	10	1	19
July	3.60	884	25	8	50
August	4.82	779	20	0	81
September	0.82	615	16	0	111
October	1.38	230	4	0	125
Total	11.57	2969	75	9	125

\1 Growing season from June 11 (planting) to October 14 (first freeze, 31 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Broadleaf and grass control was good. Above average precipitation for the growing season, with July and August wetter than normal. No greenbug infestation. Drifting snow from a late October blizzard caused two replications to completely lodge. Lodging was recorded from the least lodged replications. Grain yields were good, but yield potentials were reduced by poor emergence due to soil crusting.

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"	7.1	0.5	0.7	4	5.6	185	0.6	3.6
8"-24"				3				
Comment	Alka	VLo	Lo	Lo	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	25	20	0	0
Applied	50/6	20	0	0

Yield Goal: 60 Bu/A.  
Actual Yield: 40 Bu/A.

**Available Soil Water**  
**Dryland Grain Sorghum, Vilas, 1997**

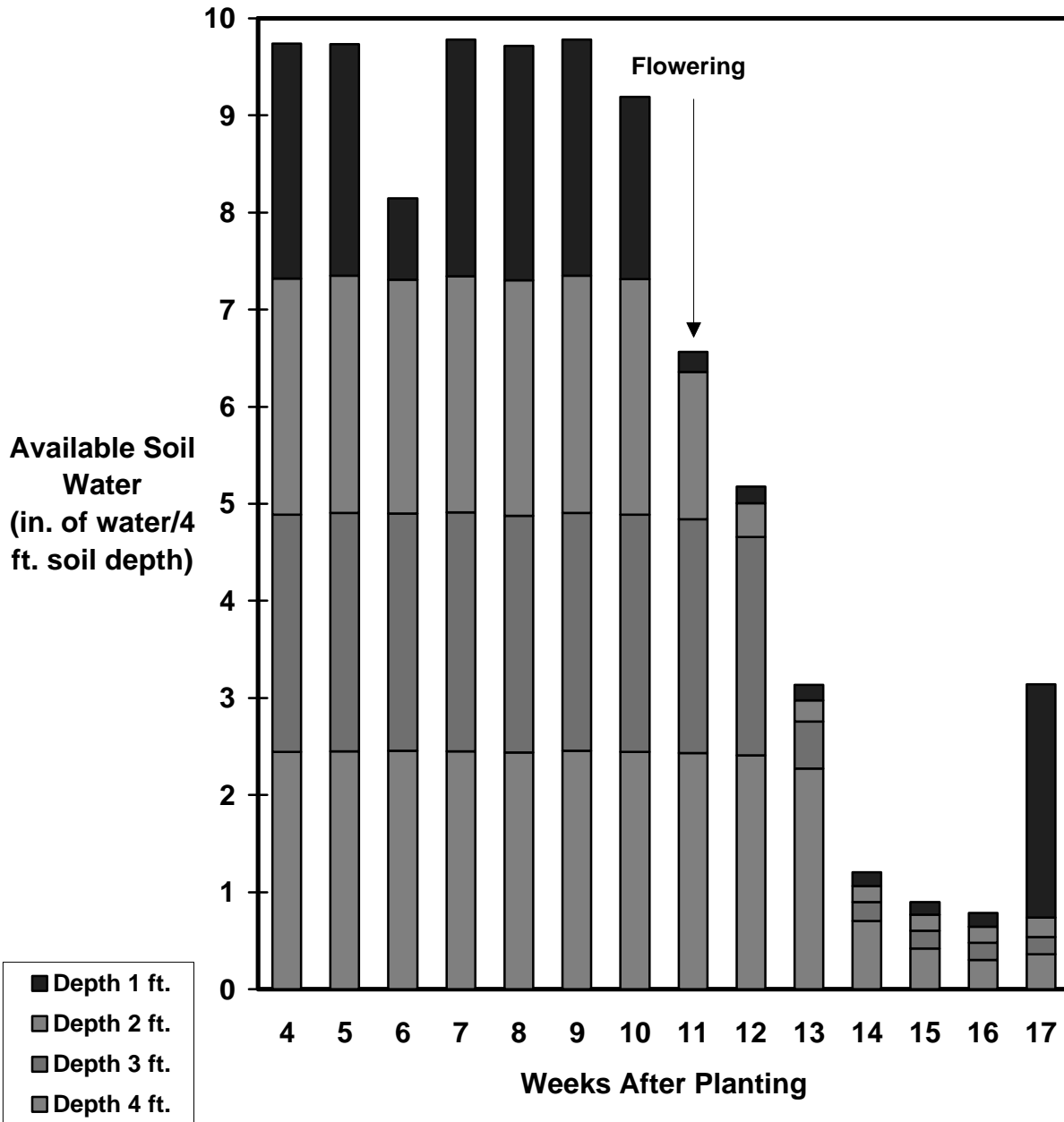


Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Vilas from planting to first freeze was 11.57 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1997. \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	%
TRIUMPH	TR 459	9	76	1982	123	ME	42	17.0	0	57	45	113		
CARGILL	627	9	73	1899	120	ME	45	21.7	4	59	42	105		
CARGILL	647	10	75	1954	122	ME	43	18.8	5	61	40	100		
MYCOGEN	T-E Hardy	9	75	1954	124	ME	41	13.4	3	59	38	96		
MYCOGEN	9580-X	9	74	1927	119	ME	42	18.0	11	59	38	96		
DEKALB	DK-38y	10	72	1872	121	ME	39	14.1	8	57	38	94		
DEKALB	DK-44	9	76	1982	124	ME	40	15.7	13	59	34	85		
DEKALB	DK-43A	11	76	1982	124	ME	40	17.2	14	57	34	84		
DEKALB	DK-36	10	72	1872	121	ME/E	43	13.2	10	60	33	82		
CARGILL	737	9	77	2009	127	M	44	20.3	1	59	55	137		
CARGILL	730	10	79	2068	126	M	41	22.7	2	57	46	114		
CARGILL	770Y	9	78	2038	128	M	46	17.0	8	60	45	114		
CARGILL	837	9	77	2009	126	M/ML	42	23.8	8	60	40	99		
(Check)	399 X 2536	10	79	2068	131	M	38	12.0	2	56	36	91		
Average		10	76	1973	124	ME	42	17.5	6	59	40			
LSD	0.20								4.1		8.4			

\1 Planted: June 11; Harvested: November 23.

Lodged Plants recorded from two replications only: the other two replications were completely lodged due to drifting snow.

Yields are corrected to 14.0% seed moisture content.

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 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 1995-97.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	627	--	79	42	61	--	---	97	105	101	---
CARGILL	647	--	81	40	60	--	---	99	100	100	---
CARGILL	730	--	80	46	63	--	---	97	114	106	---
CARGILL	737	--	86	55	71	--	---	104	137	121	---
CARGILL	770Y	--	90	45	68	--	---	110	114	112	---
DEKALB	DK-38y	30	79	38	59	49	148	96	94	95	113
DEKALB	DK-36	--	74	33	54	--	---	90	82	86	---
DEKALB	DK-44	--	76	34	55	--	---	93	85	89	---
MYCOGEN	T-E Hardy	20	75	38	57	44	102	92	96	94	97
MYCOGEN	9580-X	--	86	38	62	--	---	105	96	101	---
NORTHROP KING	KS 310	30	78	--	54	--	150	96	---	123	---
NORTHROP KING	KS 560Y	25	86	--	56	--	123	105	---	114	---
TRIUMPH	TR 459	33	92	45	69	57	163	112	113	113	129
(Check)	399 X 2536	18	89	36	63	48	89	109	91	100	96
Average		20	82	40	61	47					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1997

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 30. HARVESTED: November 4.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 63 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 60 Oz/A. Post Emergence Herbicides: Buctril 16 Oz/A, Banvel 4 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Above normal precipitation for the growing season, with more than half of the rain falling in August. No greenbug infestation. Drifting snow from a late October blizzard caused only minor lodging due to the leeward location of the study. 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	0.05	35	0	0	1
June	1.61	625	10	1	31
July	1.68	880	24	9	62
August	6.39	745	17	0	93
September	0.71	576	6	0	123
October	1.18	229	2	0	137
Total	11.62	3090	59	10	137

\1 Growing season from May 30 (planting) to October 14 (first freeze, 29 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.5	1.8	23	2.8	451	0.5	7.8
8"-24"				8				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	0	0
Applied	6	20	0	0

Yield Goal: 50 Bu/A.  
Actual Yield: 83 Bu/A.

**Available Soil Water**  
Dryland Grain Sorghum, Walsh, 1997

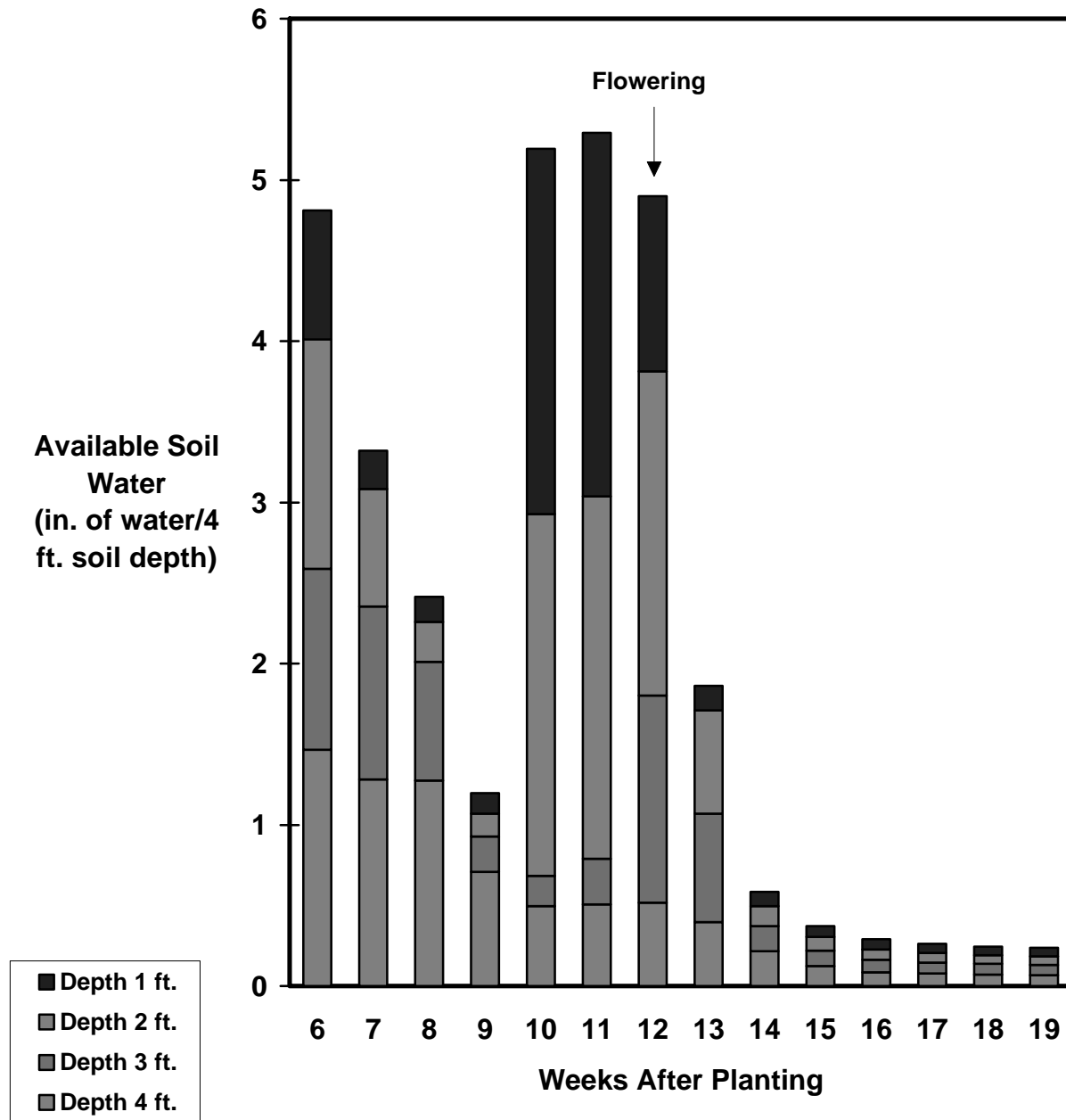


Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.62 in. Any increase in available soil water between weeks is from rain.



Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1997. \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							
<hr/>													
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
NORTHROP KING	K35Y5	10	70	1705	111	E	38	18.8	2	61	81	98	
PIONEER	87G57	9	67	1664	107	E	36	22.8	2	58	63	75	
GOLDEN HARVEST	H-296W	9	65	1611	108	E	38	26.1	1	59	55	66	
NC +	5B74E	9	84	2024	125	ME	42	23.8	4	60	96	116	
DEKALB	DK-38y	10	80	1925	120	ME	40	24.0	11	57	96	116	
PIONEER	8500	7	78	1880	117	ME/M	45	25.8	10	61	89	108	
DEKALB	DK-44	9	83	1995	126	ME	44	22.8	4	60	88	106	
OHLDE	G530	9	82	1970	125	ME	44	24.6	3	62	87	105	
CARGILL	627	9	79	1906	120	ME	45	23.0	3	59	86	104	
DEKALB	DK-43A	11	85	2048	124	ME	44	24.2	14	61	83	100	
TRIUMPH	TR 459	9	83	1995	127	ME	46	23.2	2	61	82	98	
CARGILL	647	8	80	1925	117	ME	46	23.4	5	60	79	95	
PIONEER	8505	8	77	1855	116	ME/M	45	22.1	4	59	77	92	
DEKALB	DK-36	10	76	1830	116	ME/E	40	21.9	2	60	71	85	
NORTHROP KING	KS 310	8	80	1925	115	ME/E	42	20.3	3	60	70	84	
PIONEER	85Y34	9	72	1753	113	ME/M	45	24.8	2	58	53	64	
NORTHROP KING	KS 585	9	86	2076	130	M	44	25.2	11	61	102	123	
CARGILL	837	10	90	2185	132	M/ML	50	23.6	27	60	98	118	
CARGILL	737	9	86	2076	135	M	44	20.9	6	59	94	113	
GOLDEN HARVEST	H-403	9	88	2130	133	M/ME	48	23.4	8	59	94	113	
CARGILL	770Y	8	88	2130	132	M	46	23.8	13	59	92	110	
GOLDEN HARVEST	H-430Y	11	83	1995	133	M	46	20.5	8	61	91	110	
NC +	6B50	8	88	2130	133	M/ME	46	26.5	14	58	89	107	
(Check)	399 X 2536	9	89	2157	136	M	44	25.0	21	57	86	103	
CARGILL	730	10	90	2185	134	M	46	23.2	10	59	82	99	
Average		9	81	1963	123	ME	44	23.3	8	60	83		
LSD 0.20									4.9		9.8		

\1 Planted: May 30; Harvested: November 4.

Yields are corrected to 14.0% seed moisture content.

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 7.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 1995-97.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	627	--	104	86	95	--	---	110	104	107	---
CARGILL	647	--	95	79	87	--	---	101	95	98	---
CARGILL	730	--	91	82	87	--	---	96	99	98	---
CARGILL	737	24	97	94	96	72	82	103	113	108	99
CARGILL	770Y	--	89	92	91	--	---	94	110	102	---
DEKALB	DK-38y	28	90	96	93	71	97	95	116	106	103
DEKALB	DK-36	28	98	71	85	66	98	104	85	95	96
DEKALB	DK-44	--	99	88	94	--	---	105	106	106	---
NC+	6B50	37	106	96	101	80	129	115	116	116	120
NORTHRUP KING	KS 310	32	88	70	79	63	109	93	84	89	95
NORTHRUP KING	KS 560Y	40	93	--	67	--	138	99	---	119	---
NORTHRUP KING	KS 585	--	102	103	103	--	---	110	123	117	---
OHLDE	G530	--	93	87	90	--	---	99	105	102	---
PIONEER	8500	41	103	89	96	78	141	110	108	109	120
PIONEER	8505	38	107	77	92	74	132	113	92	103	112
PIONEER	8557Y	32	90	--	61	--	110	95	---	103	---
TRIUMPH	TR 459	26	100	82	91	69	91	106	98	102	98
(Check)	399 X 2536	15	96	86	91	66	51	104	104	104	86
Average		29	91	83	87	67					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1997

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 20; Replanted: June 2. HAND-HARVESTED: December 15.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 68 F.

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

Summary: Growing Season Precipitation and Temperature \1 Hartman, Prowers County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
June	1.24	655	16	2	28
July	1.77	876	26	13	59
August	6.26	840	23	13	90
September	1.38	668	20	8	120
October	0.07	191	6	0	129
Total	10.72	3230	91	36	129

\1 Growing season from June 2 (replanting) to October 9 (first freeze, 32 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Broadleaf weed control was fair. Above normal precipitation for the growing season with more than half of the rain falling in August. No greenbug infestation. Drifting snow from a late October blizzard caused severe lodging throughout the entire study, hybrids ranged from 38 to 99% lodging. The study was hand-harvested. Grain yields were excellent.

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"-24"	8.0	0.8	2.4	18 11	8.7	233	1.4	6.4
Comment	Alka	VLo	VHi	Hi	Med	VHi	Marg	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	0	0	0
Applied	100	20	0	0

Yield Goal: 140 Bu/A.  
Actual Yield: 142 Bu/A.

**Available Soil Water**  
Irrigated Grain Sorghum, Hartman, 1997

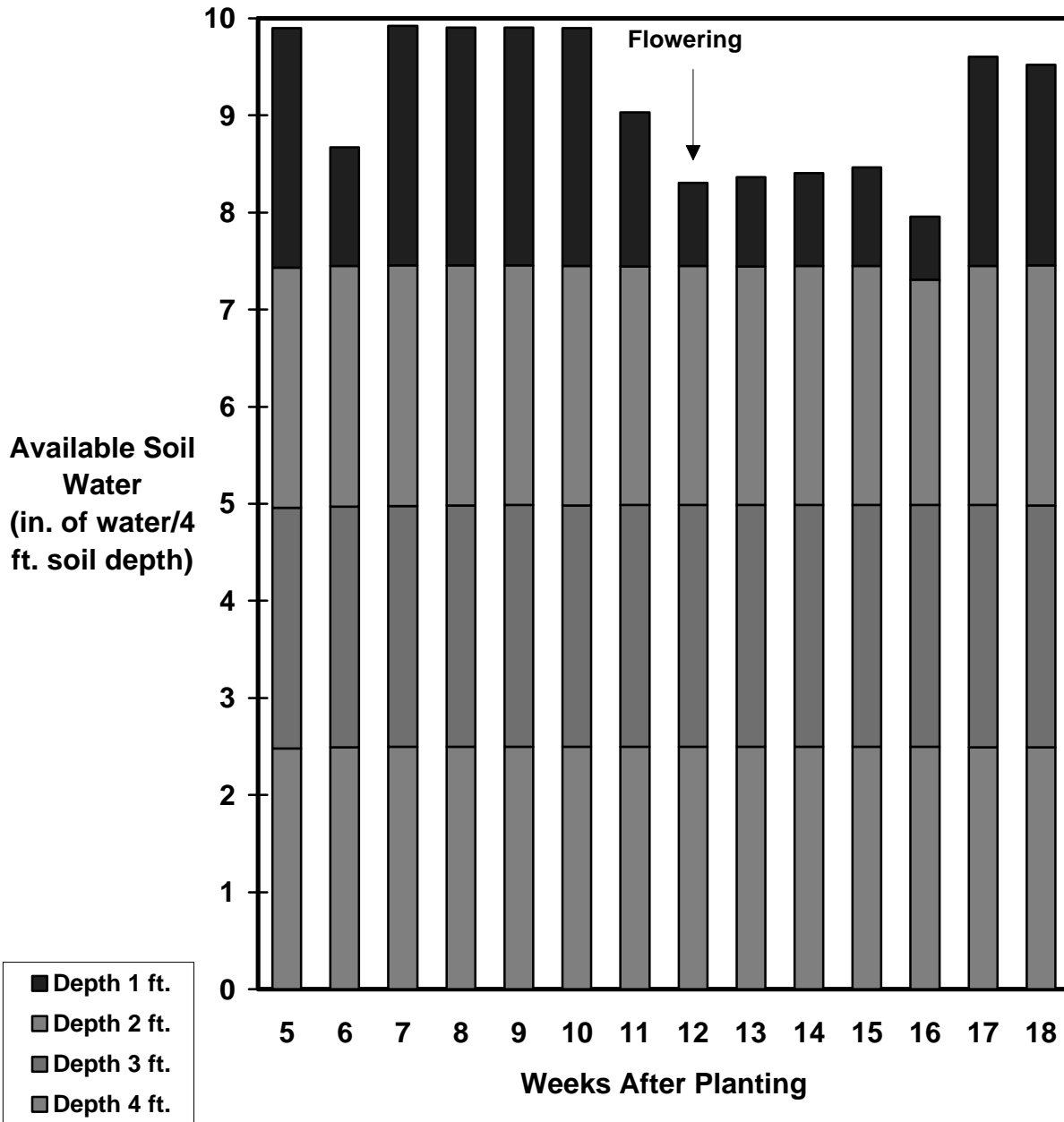


Fig. 4. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 10.72 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1997. \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 %	
			DAP	GDD	DAP	Group						of Test Average	
<hr/>													
<hr/>													
								In.	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
MYCOGEN	1506	8	77	1950	121	M/ML	65	41.5	98	57	154	109	
DEKALB	DK-55	9	81	2058	124	M/ML	59	46.0	99	52	148	104	
NORTHRUP KING	KS 585	8	77	1950	120	M	52	46.0	55	57	140	99	
DEKALB	DK-47	10	78	1974	123	M	53	32.4	93	58	139	98	
(Check)	399 X 2536	9	80	2027	125	M	51	41.8	85	52	136	96	
DEKALB	DK-51	9	84	2148	123	M	54	46.3	85	54	130	92	
<hr/>													
DEKALB	DK-56	13	82	2088	126	ML	58	38.0	97	57	163	115	
NORTHRUP KING	KS 711Y	12	82	2088	128	ML	47	36.6	38	56	141	99	
NORTHRUP KING	K73-J6	9	82	2088	128	ML	54	38.7	43	54	137	96	
TRIUMPH	TR 481	8	81	2058	126	ML	57	41.1	85	58	136	95	
<hr/>													
TRIUMPH	TR 82-G	9	87	2244	132	L/ML	56	40.4	99	57	143	101	
MYCOGEN	3747	10	85	2179	134	L/ML	54	29.3	87	54	136	96	
<hr/>													
Average		10	81	2071	126	M	55	39.8	80	56	142		
LSD 0.20											16.3		

\1 Planted: May 20; Replanted: June 2; Hand-Harvested: December 15.

Yields are corrected to 14.0% seed moisture content.

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 9.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Hartman, 1995-97.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
DEKALB	DK-47	--	158	139	149	--	---	116	98	107	---
DEKALB	DK-51	78	--	130	104	--	105	---	92	99	---
DEKALB	DK-55	79	130	148	139	119	105	96	104	100	102
DEKALB	DK-56	83	147	163	155	131	110	108	115	112	111
MYCOGEN	1506	--	136	154	145	--	---	100	109	105	---
MYCOGEN	3747	--	130	136	133	--	---	96	96	96	---
NORTHROP KING	KS 585	--	147	140	144	--	---	108	99	104	---
NORTHROP KING	KS 711Y	--	141	152	147	--	---	99	112	106	---
TRIUMPH	TR 481	74	--	136	105	--	99	---	95	97	---
(Check)	399 X 2536	84	141	136	139	120	112	104	96	100	104
Average		75	136	142	139	118					

Grain Yields were corrected to 14.0 % seed moisture content.

## Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1997

**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 28. **HARVESTED:** November 26.

**EMERGENCE DATE:** 9 days after planting. **SOIL TEMP:** 62 F.

**IRRIGATION:** Three furrow irrigations: March (pre), August 6, September 24, total applied 17.5 acre-in./A.

**PEST CONTROL:** Preemergence Herbicides: LandMaster 60 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. **CULTIVATION:** Once. **INSECTICIDES:** None.

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

**COMMENTS:** Planted in good soil moisture. Weed control was fair. Above normal precipitation for the growing season, with more the half of the rain falling in August. No greenbug infestation. Drifting snow from a late October blizzard caused the study to complete lodge. Grain yields were good, but yield potentials were reduced by lodging.

**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	0.12	58	0	0	3
June	1.61	625	10	1	33
July	1.68	880	24	9	64
August	6.39	745	17	0	95
September	0.71	576	6	0	125
October	1.18	229	2	0	139
Total	11.69	3113	59	10	139

\1 Growing season from May 28 (planting) to October 14 (first freeze, 29 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.6	2.0	27	5.9	461	0.9	5.3
8"-24"				9				
Comment	Alka	VLo	Hi	Hi	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	10	20	0	0
Applied	106	20	0	0

Yield Goal: 100 Bu/A.

Actual Yield: 90 Bu/A.

**Available Soil Water**  
Irrigated Grain Sorghum, Walsh, 1997

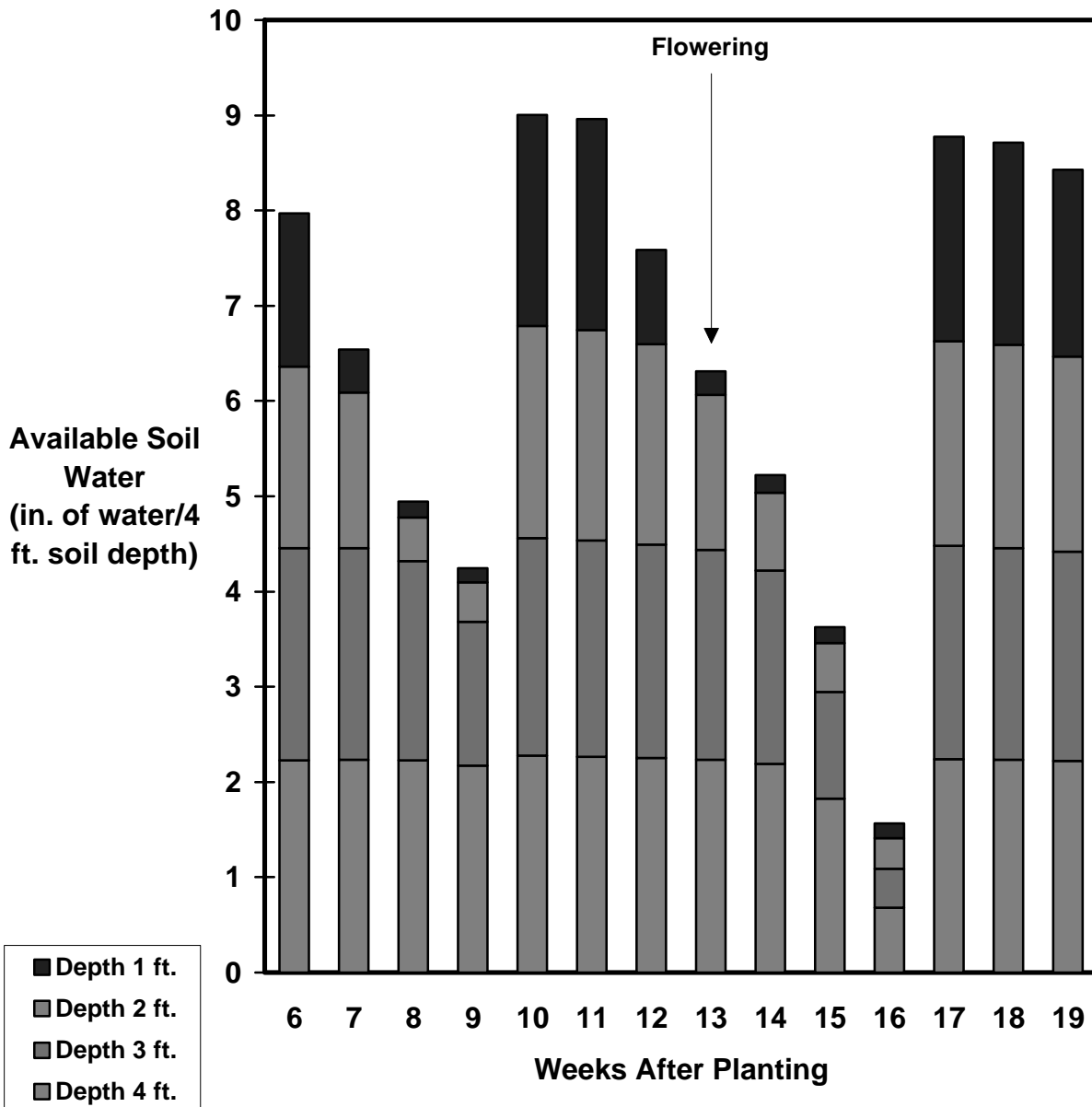


Fig. 5. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.69 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.



Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1997. \1

Brand	Hybrid	Days to Emerge	_50% Bloom		_50% Mature		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield %					
			DAP	GDD	DAP	Group						of Test Average					
												In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
RICHARDSON	117	8	75	1798	115	ME	45	34.5	100	59	81	89					
MYCOGEN	1506	8	86	2054	130	M	57	34.5	100	60	102	113					
CARGILL	737	9	88	2106	137	M	45	37.6	100	57	100	111					
CARGILL	837	10	90	2160	135	M/ML	51	29.8	100	60	100	111					
NORTHROP KING KS 585		9	87	2078	133	M	47	38.3	100	59	100	111					
NORTHROP KING K73-J6		8	92	2215	137	M/ML	47	32.5	100	60	98	109					
CARGILL	730	10	91	2187	136	M	47	30.6	100	58	98	108					
DEKALB	DK-47	9	85	2025	132	M	46	36.8	100	58	94	104					
DEKALB	DK-51	8	88	2106	137	M	48	35.2	100	58	93	103					
TRIUMPH	TR 481	8	91	2187	138	M	54	40.3	100	61	87	96					
DEKALB	DK-56	10	90	2160	136	M/ML	53	27.9	100	59	86	96					
NORTHROP KING KS 711Y		9	91	2187	138	M/ML	42	25.9	100	59	82	91					
PIONEER	XS 555	10	80	1910	129	M	46	30.2	100	59	81	90					
CARGILL	770Y	9	87	2078	134	M	47	34.5	100	59	80	89					
(Check)	399 X 2536	9	90	2160	138	M	45	27.1	100	57	79	87					
MYCOGEN	3747	10	90	2160	141	ML	47	31.8	100	57	88	98					
PIONEER	8310	8	94	2273	140	ML	52	33.3	100	58	88	98					
PIONEER	XS 366	9	93	2246	143	ML	50	31.4	100	57	85	94					
Average		9	88	2116	135	M	48	32.9	100	59	90						
LSD	0.20										8.6						

\1 Planted May 28; Harvested: November 26.

All hybrids were completely lodged due to blowing snow.

Yields are corrected to 14.0% seed moisture content.

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 11.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Walsh, 1995-97.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	730	--	89	98	94	--	---	98	108	103	---
CARGILL	737	62	93	100	97	85	144	103	110	107	119
CARGILL	770Y	--	97	80	89	--	---	106	89	98	---
CARGILL	837	--	94	100	97	--	---	104	111	108	---
DEKALB	DK-47	--	101	94	98	--	---	111	104	108	---
DEKALB	DK-51	42	90	93	92	75	97	99	103	101	100
DEKALB	DK-56	--	87	86	87	--	---	95	96	96	---
MYCOGEN	1506	--	96	102	99	--	---	105	113	109	---
MYCOGEN	3747	--	89	88	89	--	---	98	98	98	---
NC+	7R37E	47	95	--	71	--	108	104	---	106	---
NORTHRUP KING	KS 585	--	102	100	101	--	---	112	111	112	---
NORTHRUP KING	KS 711Y	--	99	82	91	--	---	109	91	100	---
PIONEER	8310	27	96	88	92	70	63	106	98	102	89
PIONEER	8212Y	41	90	--	66	--	94	98	---	96	---
TRIUMPH	TR 481	45	--	87	66	--	104	---	96	100	---
(Check)	399 X 2536	34	95	79	87	69	78	104	87	96	90
Average		43	91	90	91	75					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1997

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 30. HARVESTED: September 12.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 63 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 60 Oz/A. Post Emergence Herbicides: Buctril 16 Oz/A, Banvel 4 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Above normal precipitation for the growing season, with more than half of the rain falling in August. 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: Growing Season Precipitation and Temperature \1 Walsh, Baca County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.05	35	0	0	1
June	1.61	625	10	1	31
July	1.68	880	24	9	62
August	6.39	745	17	0	93
September	0.21	260	2	0	105
Total	9.94	2545	53	10	105

\1 Growing season from May 30 (planting) to September 12 (harvest).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.5	1.8	23	2.8	451	0.5	7.8
8"-24"				8				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	0	0
Applied	6	20	0	0

Yield Goal: 9 Ton/A.  
 Actual Yield: 10.1 Ton/A.

**Available Soil Water**  
**Dryland Forage Sorghum, Walsh, 1997**

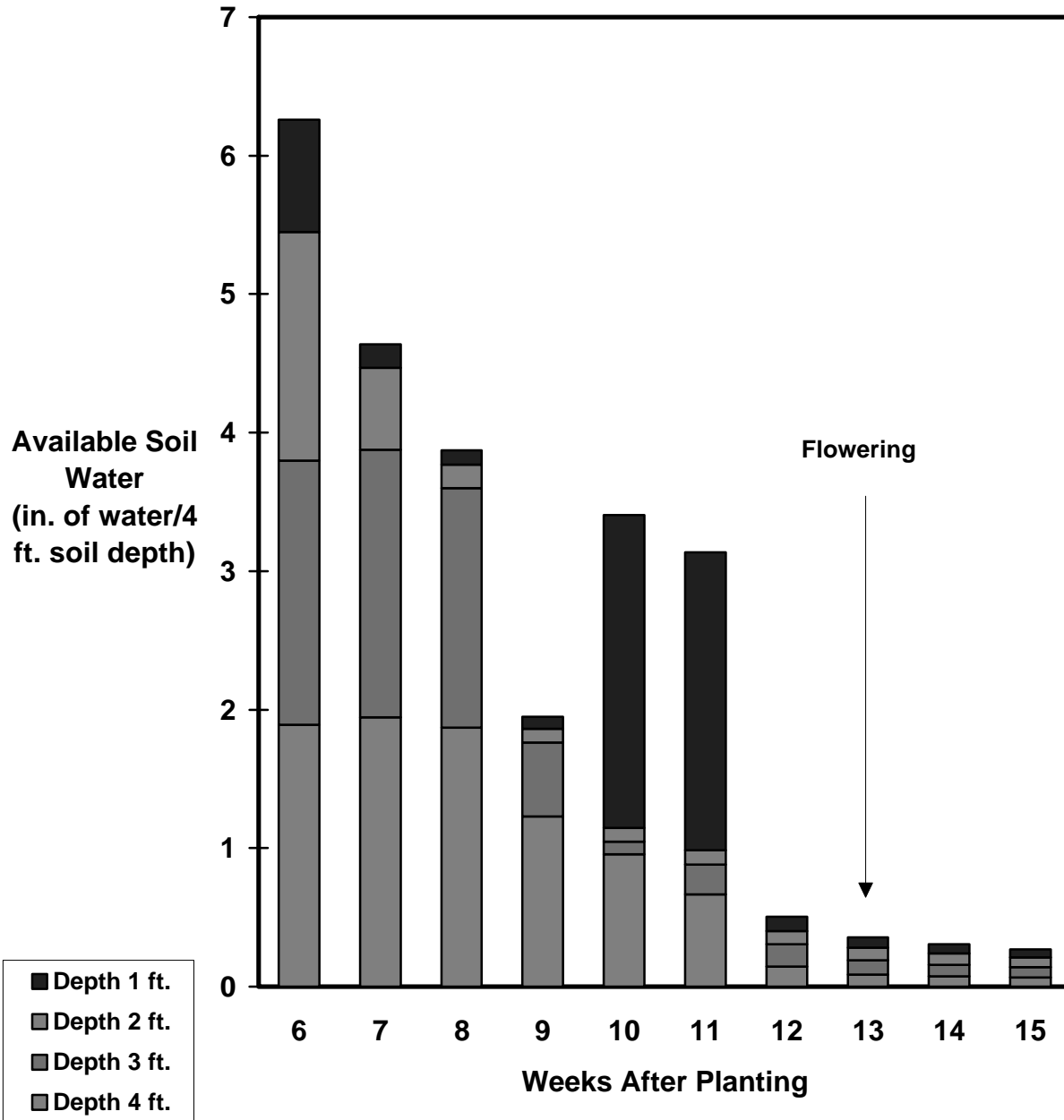


Fig. 6. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 9.94 in. Any increase in available soil water between weeks is from rain.

Table 12.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1997. \1

Brand	Hybrid	Forage Type \2	Days			Harvest Density	Stage \3				Yield % of Test Average
			Days to Emerge	to 50% Bloom	Harvest		Plant Ht.	at Harvest	Stem Sugar	Plants Lodged	
				Plants/A (1000 X)		In.	%	%	Tons/A	%	
DEKALB	FS-5	FS	9	99	27.9	94	PM	11	11	11.8	117
(Check)	NB 305F	FS	10	93	33.3	93	EM	12	28	11.4	113
BUFFALO BRAND	Canex II	FS	7	92	30.4	86	MM	15	11	10.3	102
BUFFALO BRAND	Canex	FS	9	92	31.0	80	MM	13	6	10.3	102
CARGILL	MorCane II	FS	7	96	35.2	85	PM	11	24	9.1	90
BUFFALO BRAND	Buffalo Brand	SS	8	84	30.6	104	SD	13	7	10.7	106
BUFFALO BRAND	Grazex	SS	9	82	29.4	108	SD	12	4	10.0	99
BUFFALO BRAND	BMR	BMR-SS	10	84	27.9	81	SD	12	30	9.6	95
BUFFALO BRAND	Grazex II W	SS	9	79	30.0	94	HD	15	3	9.4	93
NORTHRUP KING	N7639Bt	Com	5	80	20.3	81	ED	11	0	8.3	82
Average		FS	8	88	29.6	91	HD	13	12	10.1	
LSD 0.20										0.98	

\1 Planted: May 30; Harvested: September 12.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; BMR-SS, Brown Mid-Rid - 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.

Forage Yield corrected to 70% moisture content based on oven-dried sample.

Table 13.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 1995-97.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
BUFFALO BRAND	Canex	2.9	14.2	10.3	12.3	9.1	89	92	102	97	94
BUFFALO BRAND	Canex II	--	14.3	10.3	12.3	--	---	92	102	97	---
BUFFALO BRAND	Buffalo Brand	--	17.1	10.7	13.9	--	---	111	106	109	---
BUFFALO BRAND	Grazex	--	16.2	10.0	13.1	--	---	105	99	102	---
BUFFALO BRAND	Grazex II W	--	16.4	9.4	12.9	--	---	106	93	100	---
CARGILL	MorCane II	--	16.9	9.1	13.0	--	---	109	90	100	---
DEKALB	FS-5	4.7	17.3	11.8	14.6	11.3	143	112	117	115	124
(Check)	NB 280S	1.9	11.0	--	6.5	--	57	71	---	64	---
(Check)	NB 305F	3.5	14.4	11.4	12.9	9.8	107	93	113	103	104
(Check)	Corn	--	17.0	8.3	12.7	--	---	110	82	96	---
Average		3.3	15.5	10.1	12.8	9.7					

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

Table 14.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1997.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	In -----%-----									
					CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
DEKALB	FS-5	FS	89	74	12.4	8.1	37.9	56.9	59.4	97.2	0.37	0.46	2.58	0.27
(Check)	NB 305F	FS	83	74	11.7	7.8	40.1	56.6	56.9	94.9	0.37	0.50	2.55	0.29
CARGILL	MorCane II	FS	86	82	11.1	7.4	39.6	55.3	57.4	97.6	0.33	0.63	2.39	0.29
BUFFALO BRAND	Canex II	FS	83	79	10.9	7.2	39.2	55.8	57.8	97.2	0.34	0.53	2.47	0.28
BUFFALO BRAND	Canex	FS	81	73	9.9	6.9	37.1	53.0	60.2	105.3	0.33	0.43	2.51	0.27
BUFFALO BRAND	BMR	BMR-SS	75	58	14.0	9.2	37.2	57.8	60.1	96.4	0.41	0.37	2.96	0.25
BUFFALO BRAND	Grazex	SS	71	57	13.6	8.8	38.5	59.7	58.6	91.7	0.37	0.47	2.66	0.26
BUFFALO BRAND	Grazex II W	SS	69	55	13.3	8.7	38.3	58.4	58.9	83.6	0.36	0.48	2.72	0.26
BUFFALO BRAND	Buffalo Brand	SS	73	60	12.4	8.2	40.2	55.5	56.7	96.5	0.36	0.63	2.79	0.29
NORTHRUP KING	N7639Bt	Corn	73	70	11.0	7.7	37.3	50.7	60.1	109.9	0.31	0.65	2.43	0.27
Average		FS	78	68	12.0	8.0	38.5	56.0	58.6	97.0	0.36	0.52	2.61	0.27

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; BMR-SS, Brown Mid-Rib - Sorghum Sundangrass.

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, 1997

**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 28. **HARVESTED:** September 15.

**EMERGENCE DATE:** 9 days after planting. **SOIL TEMP:** 62 F.

**IRRIGATION:** Two furrow irrigations: March (pre), July 31, total applied 14.0 acre-in./A.

**PEST CONTROL:** Preemergence Herbicides: LandMaster 60 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. **CULTIVATION:** Once. **INSECTICIDES:** None.

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

**COMMENTS:** Planted in good soil moisture. Weed control was fair. Above normal precipitation for the growing season, with more the half of the rain falling in August. 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: Growing Season Precipitation and Temperature \1  
Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.12	58	0	0	3
June	1.61	625	10	1	33
July	1.68	880	24	9	64
August	6.39	745	17	0	95
September	0.21	335	6	0	110
Total	10.01	2643	57	10	110

\1 Growing season from May 28 (planting) to September 15 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.6	2.0	27	5.9	461	0.9	5.3
8"-24"				9				
Comment	Alka	VLo	Hi	Hi	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	10	20	0	0
Applied	106	20	0	0

Yield Goal: 18 Ton/A @ 70% M. C.

Actual Yield: 15.7 Ton/A.



**Available Soil Water**  
Irrigated Forage Sorghum, Walsh, 1997

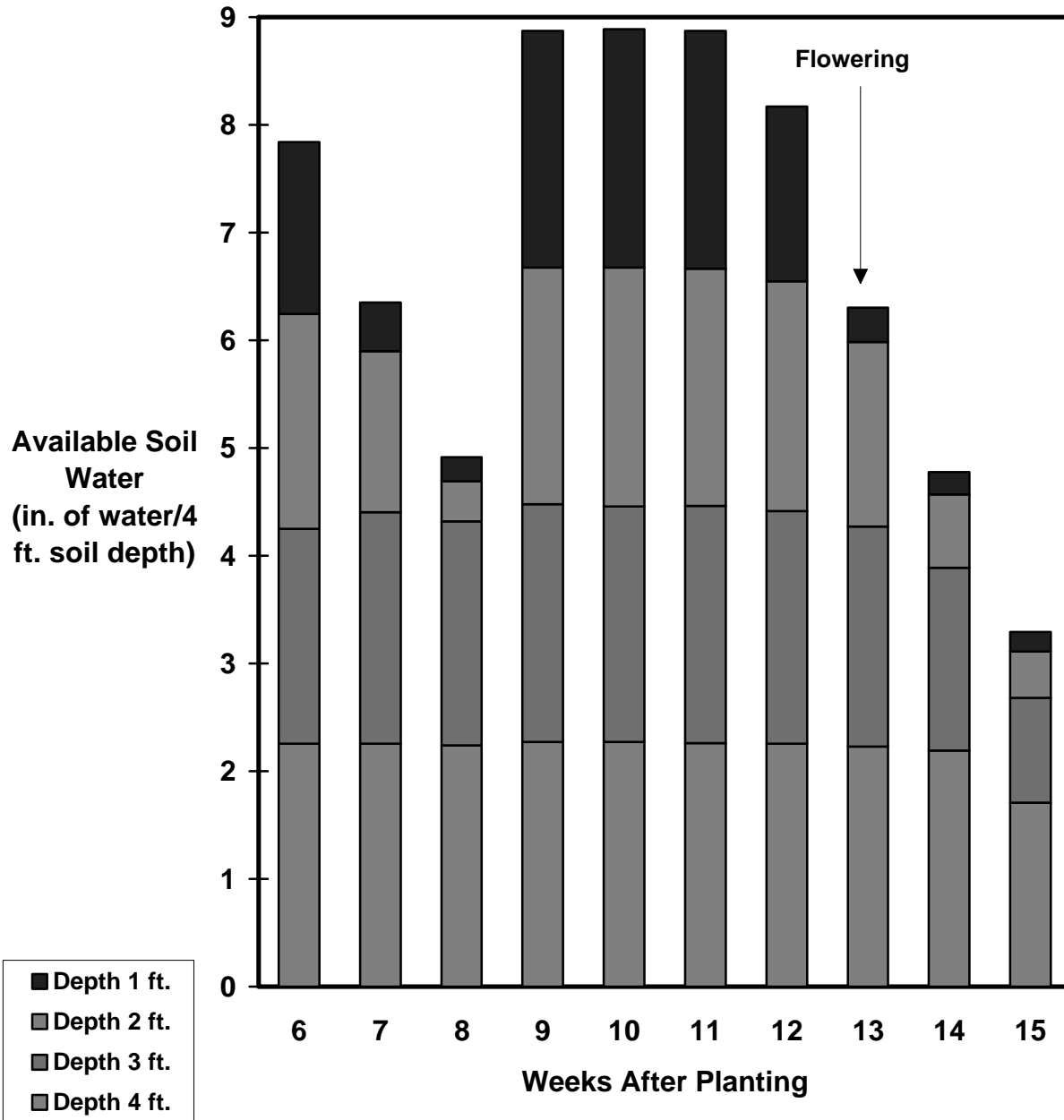


Fig. 7. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 10.01 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1997. \1

Brand	Hybrid	Forage Type \2	Days			Stage \3				Forage Yield	Yield % of Test Average
			Days to Emerge	to 50% Bloom	Harvest Density	Plant Ht.	at Harvest	Stem Sugar	Plants Lodged		
					Plants/A (1000 X)	In.	%	%	Tons/A	%	
CARGILL	FS466	FS	8	97	42.6	100	PM	7	0	16.8	107
MYCOGEN	T-E Silomaker	FS	8	95	36.0	86	EM	10	0	15.9	101
MYCOGEN	Greenchopper	FS	8	Veg \4	44.1	104	Veg \4	6	0	15.0	96
RICHARDSON (Check)	Mega Green NB 305F	FS	8 10	Veg \4	42.6	108	Veg \4	4	2	14.5	92
CARGILL	MorCane II	FS	7	92	35.6	108	MM	6	0	14.1	90
DEKALB	FS-5	FS	8	93	38.7	116	MM	6	2	13.9	89
BUFFALO BRAND	Canex	FS	8	84	41.0	101	SD	11	0	12.8	82
BUFFALO BRAND	Canex II	FS	8	87	33.3	92	ED	13	0	11.2	71
CARGILL	Sweet Souix V	SS	7	91	43.4	117	LM	5	7	19.4	124
CARGILL	X25477	SS	9	85	33.3	113	SD	10	3	19.3	123
BUFFALO BRAND	Grazex II W	SS	8	80	39.5	122	HD	7	0	19.0	121
BUFFALO BRAND	Grazex	SS	8	81	47.6	110	HD	6	0	18.5	118
BUFFALO BRAND	Buffalo Brand	SS	7	84	38.7	137	SD	10	2	17.8	113
DEKALB	SX-15	SS	7	90	45.3	124	LM	7	7	15.9	101
BUFFALO BRAND	BMR	BMR-SS	10	86	48.0	111	ED	11	10	14.8	94
NORTHROP KING	N7639Bt	Corn	7	82	29.4	97	ED	11	0	13.5	86
Average		FS	8	78	39.6	109	LM	8	2	15.7	
LSD 0.20										1.65	

\1 Planted May 28; Harvested: September 15.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; BMR-SS, Brown Mid-Rib - Sorghum Sudangrass.

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

\4 RICHARDSON Mega Green and MYCOGEN Greenchopper remained vegetative.

Forage Yield corrected to 70% moisture content based on oven-dried sample.

Table 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1995-97.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
BUFFALO BRAND	Canex	11.9	15.6	12.8	14.2	13.4	93	84	82	83	86
BUFFALO BRAND	Canex II	--	16.6	11.2	13.9	--	---	90	71	81	---
BUFFALO BRAND	Buffalo Brand	12.8	18.1	17.8	18.0	16.2	101	98	113	106	104
BUFFALO BRAND	Grazex	12.5	18.3	18.5	18.4	16.4	98	99	118	109	105
BUFFALO BRAND	Grazex II W	12.0	17.5	19.0	18.3	16.2	95	95	121	108	104
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	19.5	--	---	106	123	115	
DEKALB	FS-5	12.9	18.1	13.9	16.0	15.0	101	98	89	94	96
MYCOGEN	T-E Silomaker	15.1	19.5	15.9	17.7	16.8	119	105	101	103	108
MYCOGEN	Greenchopper	--	19.6	15.0	17.3	--	---	106	96	101	---
(Check)	NB 280S	10.0	14.5	--	12.3	--	79	78	---	79	---
(Check)	NB 305F	10.1	19.4	14.3	16.9	14.6	80	105	91	98	92
(Check)	Corn	--	17.2	13.5	15.4	--	---	93	86	90	---
Average		12.7	18.5	15.7	17.1	15.6					

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

Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1997.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	In -----%-----									
					CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
DEKALB	FS-5	FS	83	93	11.5	7.6	41.4	56.5	55.3	93.3	0.33	0.67	2.39	0.30
CARGILL	FS466	FS	89	83	11.4	7.6	44.2	58.1	52.2	87.2	0.35	0.70	2.15	0.31
(Check)	NB 305F	FS	83	86	10.9	7.3	41.2	60.4	55.6	87.5	0.35	0.50	2.44	0.26
BUFFALO BRAND	Canex	FS	73	72	10.6	7.2	42.5	58.0	54.1	89.4	0.36	0.55	2.41	0.29
CARGILL	MorCane II	FS	83	98	10.1	6.9	42.6	59.9	54.0	86.5	0.34	0.53	2.27	0.27
BUFFALO BRAND	Canex II	FS	76	76	9.4	6.4	42.2	57.4	54.4	90.7	0.32	0.58	2.17	0.28
MYCOGEN	T-E Silomaker	FS	86	83	8.9	6.1	42.4	58.3	54.2	89.1	0.30	0.61	2.06	0.26
RICHARDSON	Mega Green	FS	Veg \2	108	8.0	5.6	40.2	57.4	56.8	93.3	0.28	0.54	2.05	0.27
MYCOGEN	Greenchopper	FS	Veg \2	104	8.0	5.7	39.4	54.3	57.6	99.7	0.29	0.57	2.16	0.25
CARGILL	X25477	SS	75	77	14.2	9.2	38.4	56.2	58.8	97.6	0.38	0.57	2.71	0.28
BUFFALO BRAND	Grazex	SS	71	76	11.6	7.7	41.7	59.4	55.0	88.3	0.34	0.58	2.32	0.25
BUFFALO BRAND	Buffalo Brand	SS	73	84	11.3	7.5	43.9	61.0	52.5	83.4	0.35	0.61	2.29	0.27
BUFFALO BRAND	BMR	BMR-SS	76	78	11.0	7.4	41.8	60.7	54.7	86.3	0.36	0.42	2.49	0.26
BUFFALO BRAND	Grazex II W	SS	69	85	10.7	7.1	44.7	60.2	51.5	83.6	0.32	0.70	2.06	0.28
CARGILL	Sweet Sioux V	SS	82	98	9.9	6.7	44.0	57.9	52.4	87.7	0.31	0.71	1.97	0.28
DEKALB	SX-15	SS	81	99	9.2	6.3	43.6	60.2	52.8	84.8	0.31	0.61	2.21	0.24
NORTHROP KING	N7639Bt	Corn	74	76	10.1	7.2	41.6	55.6	55.1	94.6	0.30	0.72	2.26	0.28
Average		FS	69	87	10.4	7.0	42.1	58.3	54.5	89.6	0.33	0.60	2.26	0.27

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; BMR-SS, Brown Mid-Rib - Sorghum Sudangrass.

\2 RICHARDSON Mega Green and MYCOGEN Greenchopper remained vegetative.

\3 RICHARDSON Mega Green and MYCOGEN Greenchopper heights were 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, 1997

**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 23. **HARVESTED:** September 9.

**EMERGENCE DATE:** 14 days after planting. **SOIL TEMP:** 64 °F.

**IRRIGATION:** Three furrow irrigations: May 27, July 4, July 28, total applied 16 acre-in/A.

**PEST CONTROL:** Preemergence Herbicides: Bifenox 2 Lb AI/A + propachlor 2.5 Lb AI/A. Post Emergence Herbicides: None. Insecticide: None.

**CULTURAL PRACTICES:** Previous crop: watermelons. Field Preparation: Chisel, disc, roller-pack, float. Cultivation: Once.

**SOIL:** Silty Clay Loam, 1 - 1.5 % O.M., pH-ca. 7.8. **FERTILIZER:** 50 Lb P<sub>2</sub>O<sub>5</sub> and 100 Lb N/A.

**COMMENTS:** Planted in dry soil and irrigated up. Severe rainstorm June 6 caused crusting problems. Three rainstorms in late July and August, including some hail and high winds, caused considerable lodging in all plots with leaf loss. Greenbugs were not a problem.

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	0.13	104	0	0	8
June	2.53	603	16	3	38
July	2.19	800	25	6	69
August	5.14	664	17	0	100
September	0.86	176	5	0	109
Total	10.85	2347	63	8	109

\1 Growing season from May 23 (planting) to September 9 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Table 18.--Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 1997. \1

Brand	Hybrid	Forage Type \2	Days		Plant Stand \3	Stage \4		Stem Sugar	Dry Matter	Forage Yield	Yield % of Test Average
			to 50% Bloom			at Harvest					
			Plants/A (1000 X)	In.		%	%	Tons/A	%		
RICHARDSON	Mega Green	FS	Veg	77.0	100	Veg	6	21	30.1	122	
BUFFALO BRAND	Buffalo Brand	SS	79	75.1	112	SD	6	31	29.5	119	
MYCOGEN	Greenchopper	FS	Veg	90.9	92	Veg	8	22	28.2	114	
DEKALB	FS-25E	FS	94	77.6	93	MM	9	23	27.0	109	
BUFFALO BRAND	Grazex II W	SS	75	61.8	93	HD	7	34	26.2	107	
BUFFALO BRAND	Grazex II	SS	77	84.4	107	HD	3	31	25.7	104	
RICHARDSON	Sweet "T"	FS	95	76.0	110	MM	9	22	25.7	104	
MYCOGEN	T-E Silomaker	FS	83	80.9	75	SD	5	26	25.6	103	
RICHARDSON	Bundle King IV	FS	85	78.4	93	ED	8	25	25.1	101	
BUFFALO BRAND	Exp. BMR	BMR-SS	76	68.1	98	SD	4	29	24.7	100	
BUFFALO BRAND	Canex	FS	82	69.7	86	LM	8	25	22.6	91	
(Check)	NB 305F	FS	90	80.3	88	LM	11	22	22.3	90	
BUFFALO BRAND	Canex II	FS	84	76.2	100	SD	10	24	20.9	85	
DEKALB	X568	FS	92	80.3	76	MM	7	21	19.5	79	
DEKALB	DK 636	Corn	71	34.0	73	HD	4	25	18.4	74	
Average		FS	83	74.1	93	SD	7	25	24.8		
LSD 0.20									2.88		

\1 Planted May 23; Harvested: September 9.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; BMR-SS, Brown Mid-Rib - Sorghum Sudangrass.

\3 Plant Population rated June 14.

\4 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

MYCOGEN Greenchopper and RICHARDSON Mega Green remained vegetative.

Table 19.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Rocky Ford, 1995-97.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1995	1996	1997	2-Year Avg	3-Year Avg	1995	1996	1997	2-Year Avg	3-Year Avg
		-----Ton/A-----					-----%-----				
BUFFALO BRAND	Buffalo Brand	35.1	32.7	29.5	31.1	32.4	120	125	119	122	121
BUFFALO BRAND	Canex	26.5	24.8	22.6	23.7	24.6	91	95	91	93	92
BUFFALO BRAND	Canex II	---	20.8	20.9	20.9	---	---	80	85	83	---
BUFFALO BRAND	Grazex II	26.3	27.2	25.7	26.5	26.4	90	105	104	105	100
BUFFALO BRAND	Grazex II W	29.5	25.9	26.2	26.0	27.2	101	100	107	104	103
DEKALB	FS-25E	33.6	29.3	27.0	28.1	30.0	115	113	109	111	112
MYCOGEN	G1990	33.4	29.9	---	31.6	---	114	115	---	115	---
MYCOGEN	Greenchopper	---	29.5	28.2	28.9	---	---	114	114	114	---
MYCOGEN	T-E Silomaker	23.8	25.3	25.6	25.4	24.9	81	97	103	100	94
RICHARDSON	Sweet "T"	---	30.2	25.7	28.0	---	---	116	104	110	---
(Check)	NB 280S	26.3	19.1	---	22.7	---	90	74	---	82	---
(Check)	NB 305F	25.5	21.8	22.3	22.0	23.2	87	84	90	87	87
Average		29.3	26.0	24.8	26.1	27.0					

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

## Limited Furrow Irrigation Grain Sorghum Seeding Rate Study at Walsh, 1997

Kevin Larson and Dennis Thompson

Seeding rate recommendations vary with amount of applied water. The optimum seeding rate for limited furrow irrigation grain sorghum, receiving a pre-irrigation and one in-season irrigation at flowering, is not well defined.

### Materials and Methods

Five seeding rates, ranging from 2 to 10 Lb Seed/A at 2 Lb/A increments, were sown on May 28. The hybrid used for this study was ASGROW Seneca with 12,500 Seed/Lb which gave seeding densities of 25,000, 50,000, 75,000, 100,000 and 125,000 Seed/A. We used a complete block design with four replications for our study. Soil test recommendation was 80 Lb N/A and 20 Lb P<sub>2</sub>O<sub>5</sub>/A; we applied 100 Lb N/A and 20 Lb P<sub>2</sub>O<sub>5</sub>/A. The site was furrow irrigated twice: a pre-irrigation in March (8.3 acre-in/A of water) and one in-season irrigation on August 17 (5.8 acre-in/A of water). Soil moisture was measured with gypsum blocks placed at 6, 18, 30, and 42 in. depths (Fig. 1). We controlled weeds with Landmaster at 60 Oz/A and atrazine at 1.0 Lb/A. Plant density was taken prior to harvest. The four 30 in. rows, 50 ft. long plots were harvested on November 26 with a self-propelled combine equipped with a four row crop head. Grain yields were corrected to 14% seed moisture content.

### Results and Discussion

Most seeding rate recommendations for limited irrigation grain sorghum are between dryland and fully irrigated rates: 4 to 6 Lb/A or 55,000 to 85,000 Seed/A. From a previous study conducted in 1995 (Larson, Schweissing, Thompson, 1996), we found no optimum and that yields increase to our highest seed rate of 75,000 Seed/A (29,000 Plant/A). Our current study has the optimum seeding rate at about 75,000 Seed/A (30.3 Plant/A) (Fig. 2). The 95% confidence interval for the optimum seeding density ranges from about 28,000 to 34,000 Plant/A.

Under the field conditions of this study, only about 40% of the seeds germinated which was the same germination rate recorded in our 1995 study. With a 40% germination rate, seeding rates of 25,000, 50,000, 75,000, 100,000 and 125,000 Seed/A produced 17,500, 25,600, 30,300, 34,100, 43,700 Plant/A, respectively. Since field conditions change the germination of seeds, it is far more accurate to recommend the optimal plant density range than a seeding rate based on Lb Seed/A or Seed/A. A plant density range of 28,000 to 34,000 Plant/A for limited furrow irrigation grain sorghum is recommended.

### Literature Cited

Larson, K. J., F. C. Schweissing, D. L. Thompson. 1996. Sorghum hybrid performance tests in Colorado, 1995. Technical Report TR 96-1. AES, Dept. of Soil and Crop Sciences, CSU. 54p.



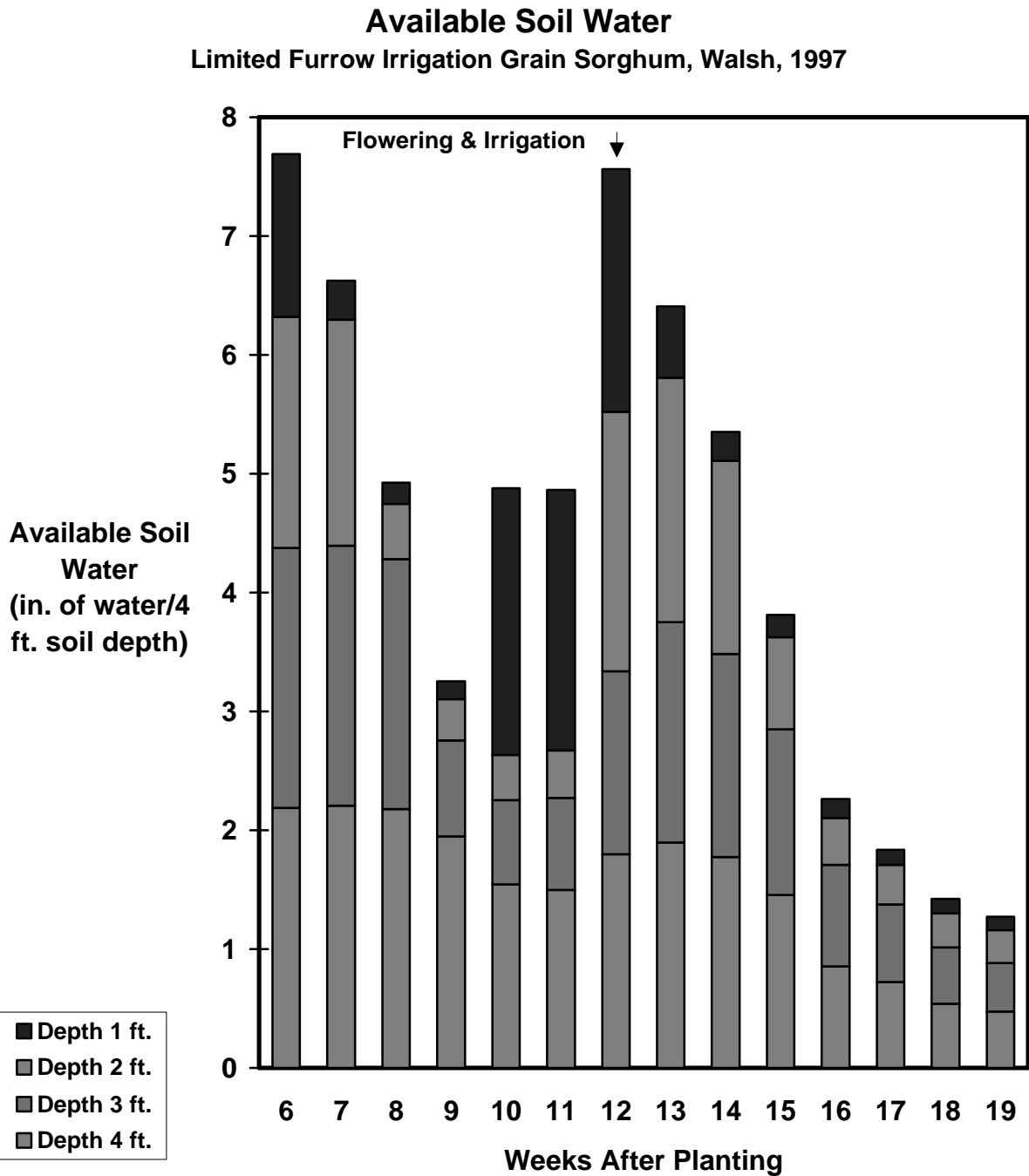


Fig. 1. Available soil water in limited irrigation grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.69 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

**Grain Sorghum Seeding Rate, 1997  
Limited Furrow Irrigation, Walsh**

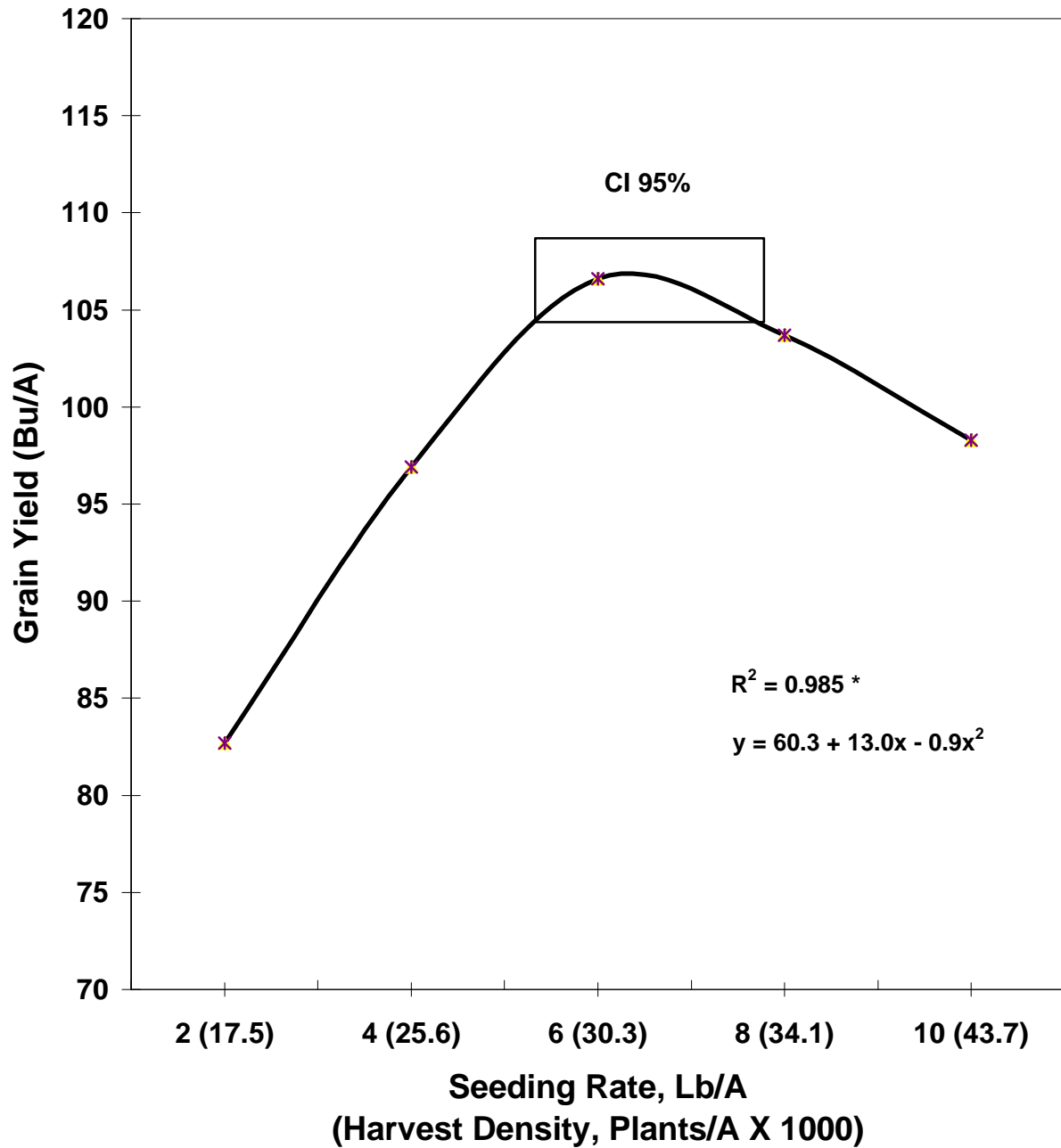


Fig. 2. Seeding rate and harvest density on limited irrigation grain sorghum at Walsh. Five seeding rates were tested: 25,000, 50,000, 75,000, 100,000, and 125,000 Seed/A on ASGROW Seneca with 12,500 Seed/Lb.

## Seedrow Placement of Liquid P<sub>2</sub>O<sub>5</sub> Fertilizer (10-34-0) Rates on Grain Sorghum Kevin Larson and Dennis Thompson

Availability of phosphate fertilizer is very low in high lime, high alkaline soils. When P was shown to be a yield limiting factor, the old recommendation was to broadcast dry P fertilizers. However, surface applied P fertilizers become tightly bound to the free lime in the soil, making much of the surface applied P unrecoverable. The modern recommendation for P fertilization is to band it. Moreover, on all of Colorado State University's Soil Test Reports, it is recommended that when banding P only half as much P fertilizer is required for the same yield response compared to broadcasting. We wanted to ascertain if seedrow placement of liquid poly ammoniated phosphate (10-34-0) fertilizer is a suitable P banding method.

### Materials and Methods

We tested six 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 six rates were 0, 2.5, 5.0, 7.5, 10.0 and 12.5 gallons of 10-34-0/A, corresponding to 0, 10, 20, 30, 40, 50 Lb P<sub>2</sub>O<sub>5</sub>/A. 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 45 Bu/A yield goal was banding 40 Lb P<sub>2</sub>O<sub>5</sub>/A; no N was required. The grain sorghum hybrid was NORTHRUP KING KS 310 sown at 43,500 Seed/A on June 3. We harvested the 10 ft. by 50 ft. plots on November 4 with a self-propelled combine with a four row crop header. Grain yields were corrected to 14% seed moisture content.

### Results and Discussion

The optimum dryland grain sorghum seedrow P<sub>2</sub>O<sub>5</sub> rate was about 20 Lb/A (Fig. 1). The 20 Lb seedrow rate is one-half the recommended banded rate. This suggests that seedrow placement of P fertilizer is a preferred banding method as less P fertilizer is needed for high yields. The 95% confidence interval for the optimum rate ranged from about 18 to 28 Lb P<sub>2</sub>O<sub>5</sub>/A. From a study we conducted in 1993 (Larson, Schweissing, Thompson, 1994), we found that 10-34-0 seedrow rates above 7 Gal/A (28 Lb P<sub>2</sub>O<sub>5</sub>/A, 8 Lb N/A) significantly reduced plant populations. The reduction in plant population is caused by salt toxicity primarily from N in the 10-34-0 fertilizer (Mortvedt, 1976). Thus the highest P rates saw a reduction in yield due to increased N salt toxicity and not from increasing P<sub>2</sub>O<sub>5</sub>.

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- Larson, K. J., F. C. Schweissing, D. L. Thompson. 1994. Sorghum hybrid performance tests in Colorado, 1993. Technical Report TR94-3. AES, Dept. of Agronomy, CSU. 47p.
- Mortvedt, J. J. 1976. Band fertilizer placement - how much and how close? Fert. Solns. 20(6): 90-96.

**Seedrow P<sub>2</sub>O<sub>5</sub> Rate, 1997**  
**Dryland Grain Sorghum, Walsh**

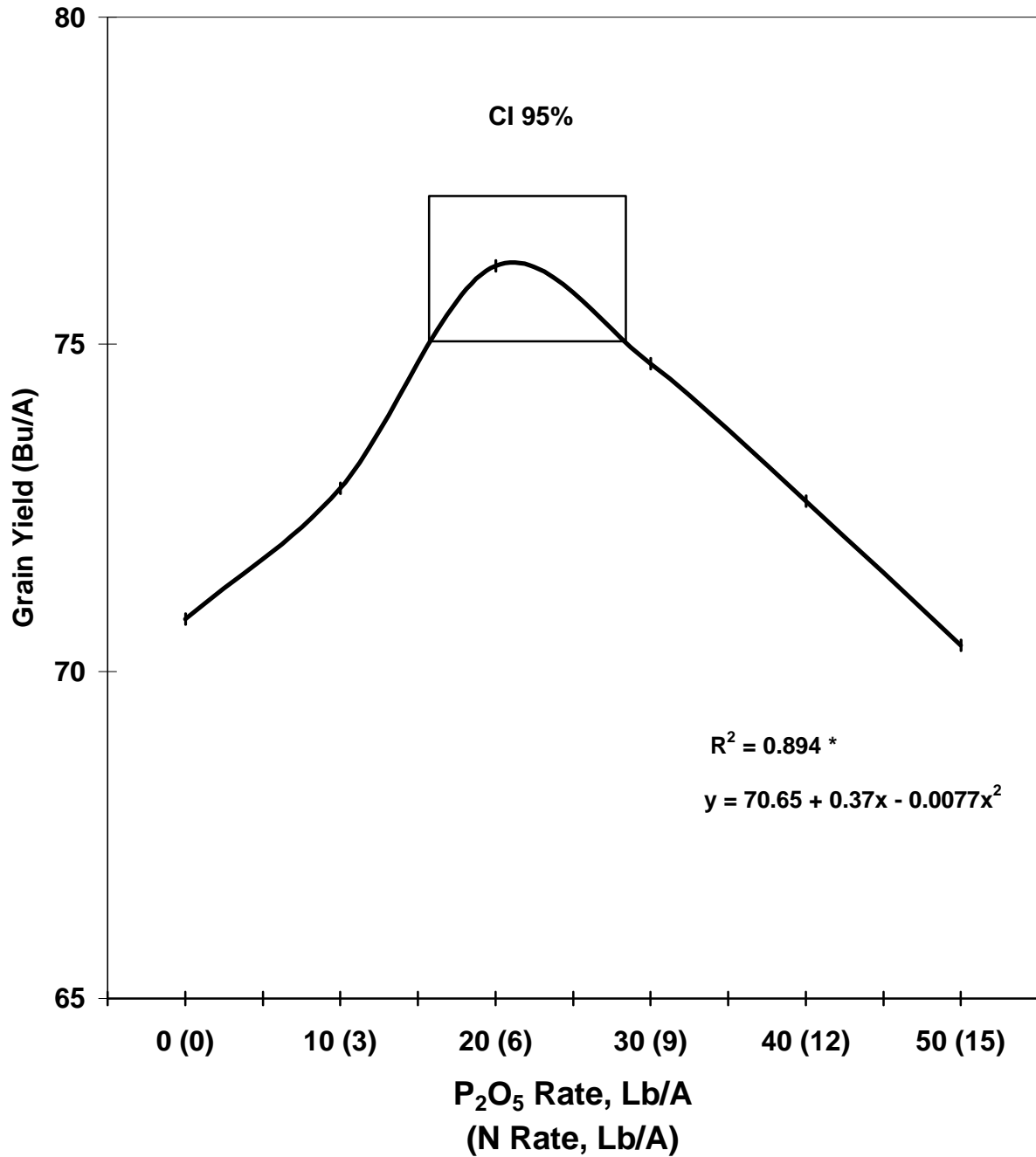


Fig. 1. Yield response of six seedrow placement rates of P<sub>2</sub>O<sub>5</sub> and N as 10-34-0 fertilizer on yield of dryland grain sorghum in an alkaline Silty Clay Loam soil on 30 in. row spacing with 11.48 in. of rain.

**Performance of Greenbug Resistant Sorghum Hybrids in the  
Arkansas Valley, 1997**  
**F. C. Schweissing<sup>1</sup>**

This is a report of a grain sorghum trial with greenbug-resistant hybrids conducted at the Arkansas Valley Research Center. The greenbug population was affected by wetter than usual conditions during June (2.53"), July (2.19") and August (5.14"), which was substantially above normal and included three severe rainstorms in late July and August which had high winds and some hail. This weather along with the inherent resistance of the hybrids and a significant predator population tended to keep the greenbug population low although the non-resistant open-pedigree hybrid did support a substantial greenbug population in the unsprayed plots.

**TESTING PROCEDURE**

Individual plots of each hybrid consisted of four rows spaced 30 inches apart and 70 feet long. Each plot was split by a four foot alley, with one-half sprayed with an insecticide and the other half left unsprayed. Plots to be sprayed were randomly selected. Plots were replicated three times.

The trial area was fertilized with 100 lbs. of nitrogen and 50 lbs. of P<sub>2</sub>O<sub>5</sub> per acre. Plots were planted May 23, 1997 at 81,995 seed per acre. Soil conditions were dry and a pre-emergence irrigation was needed. Rain on June 6 just as emergence was taking place caused some crusting but a stand was established for all hybrids. A pre-emergence application of 2 lbs. of bifenoxy and 2.5 lbs. of propachlor ai/acre provided adequate weed control.

The trial area was irrigated three times - May 27, July 4 and July 28. Carbaryl at 1.0 lb. ai/a was applied July 18 to reduce predator populations. Carbofuran (.5 lbs. ai/a) + chlorpyrifos (.5 lbs. ai/a) and PBO (.1 lbs. ai/a) were applied to the sprayed plots for greenbug control on July 24, 1997.

All plots were harvested October 23, 1997 with a self propelled two row combine.

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<sup>1</sup>Superintendent and Entomologist, Arkansas Valley Research Center, Rocky Ford, CO.

**Table 1.-Agronomic data for sorghum hybrids tested in the greenbug-resistant trial at Rocky Ford, 1997.**

Brand	Hybrid	Sprayed			Unsprayed		
		Days to Bloom	Height	Test Wt.	Days to Bloom	Height	Test Wt.
		(No)	(In)	(Lbs)	(No)	(In)	(Lbs)
MYCOGEN	T-E Y-75	85	53	56.3	85	54	56.7
MYCOGEN	3747	86	53	55.2	86	53	55.1
DEKALB	DK 54	78	55	56.3	78	55	55.7
DEKALB	DK 55	77	53	54.2	77	53	54.4
DEKALB	X-633	76	51	54.7	76	49	54.5
CARGILL	X-13116	84	52	57.4	84	51	58.1
CARGILL	576	66	40	56.2	66	39	57.6
CARGILL	627	69	47	56.9	69	46	56.7
CARGILL	647	71	48	59.6	71	49	59.1
CARGILL	730	86	50	56.5	86	50	56.7
CARGILL	797	88	51	55.3	88	50	55.1
CARGILL	611Y	77	45	55.7	78	44	55.5
CARGILL	607E	70	43	56.7	70	43	57.0
PIONEER	8500	70	48	59.9	70	47	60.0
PIONEER	8505	69	45	59.4	69	47	59.9
(Check)	399X2536	86	48	52.4	86	47	51.7
Average		77	49	56.4	77	49	56.5

## RESULTS

Agronomic data for the hybrids in this trial is presented in Table 1. Greenbug activity did not influence the three factors measured to any great degree. Even though we had more moisture than usual and some severe rainstorms, overall days to bloom were about average since degree-

days through the season were normal for our area (ca. 2800 DD). This was a fairly good production year for grain sorghum in the trial, better than the 1995 overall treated trial average of 6490 lbs. but not as good as the 1994 overall treated trial average of 9013 lbs.

Greenbug counts, obtained on July 31, August 7, 14 and 21 in both sprayed and unsprayed plots, are presented in Table 2 as the average number of greenbugs per plant. The population was determined by counting the number of greenbugs on two plants in each plot. Greenbug counts in the untreated plots are an indication of relative levels of non preference (antixenosis) and/or antibiosis factors in the plant. Populations were substantially higher on the plants of the unsprayed open pedigree check (399X2536) than the other hybrids.

Greenbugs were not identified as to biotype or insecticide resistance pattern. In previous years it has been shown the biotype I to be well established in the area and that a pattern 2 insecticide resistance was present. The convergent lady beetle, *Hippodamia convergens* and the green lacewing, *Chrysopa spp.*, were numerous throughout the plots and undoubtedly contributed to the low number of greenbugs in most plots.

Percent leaf loss or leaf damage is also presented in Table 2. Leaf loss or damage was determined from average number of leaves lost by October 2 divided by total number of green leaves on the plant at lay-by time in July. Leaves lost in the sprayed plots are considered to be due to natural senescence of lower leaves and actual leaf loss due to greenbug damage should approximate the difference in leaf loss between sprayed and unsprayed plots for a particular hybrid. Leaf loss indicates a combination of damage by the greenbug and level of tolerance in the plant to infestation. However, this years results were affected by the severe weather conditions. Greenbug damage to the leaves progresses from lower to upper leaves. Differences in leaf loss and yield between sprayed and unsprayed plots for the hybrids were highly variable. Results from past years indicate loss of lower leaves in the 50% range or under results in little yield loss. It would be difficult to draw that conclusion looking at the inconsistency of this years results.

Growers interested in the yields that can be obtained from these hybrids should note the rankings in Tables 2 and 3. Significant differences occurred between hybrids in both the sprayed and unsprayed plots. Table 2 ranks the hybrids according to their yield performance in the unsprayed plots. Table 3 ranks the hybrids according to their performance in the sprayed plots. Four of the hybrids produced higher yields in the unsprayed plots than their sprayed counterparts (Table 3).

The results of this test are the most inconsistent produced in the 22 years it has been carried out, most probably due to the severe weather conditions of this past season. The only consistent part of the test was with the open pedigree hybrid (399X2536) which has been entered in the trial every year. It continues to have higher greenbug populations, greater leaf loss, and lower yields in the untreated plots compared to the treated plots as has been the case for the previous 21 years.





**Table 3.-Comparison of grain yields of sorghum hybrids tested in the greenbug-resistant trial at Rocky Ford, 1997.**

Brand	Hybrid	Sprayed	Unsprayed		Difference	
		Yield /Acre  (lbs)	Yield /Acre  (lbs)	Rank  (No)	Yield /Acre  (lbs)	Rank  (No)
DEKALB	DK55	8589	7712	3	877	13
DEKALB	X-633	8500	9225	1	-725	3
PIONEER	8505	8267	7253	8	1014	14
DEKALB	DK54	8166	7139	10	1027	15
CARGILL	730	8111	7248	9	863	12
PIONEER	8500	8024	7284	6	740	11
CARGILL	611Y	7959	7679	4	280	8
CARGILL	647	7729	8042	2	-313	4
CARGILL	607E	7551	7461	5	90	5
MYCOGEN	3747	7402	6910	13	492	9
CARGILL	627	7383	7279	7	104	6
CARGILL	X-13116	7278	7091	11	186	7
(Check)	399X2536	7027	5627	16	1400	16
CARGILL	576	6885	6247	14	639	10
MYCOGEN	T-E Y-75	6246	6997	12	-751	2
CARGILL	797	4924	5834	15	-910	1
Column Mean		7503	7189		313	
LSD (0.20)		562	499		691	
CV (%)		7.03	6.51			

**Chemical Control of Greenbugs on Sorghum - 1997**  
**Arkansas Valley Research Center**  
**Colorado State University**  
**Rocky Ford, Colorado**

Weather for the season was wetter than normal (11.47"), May through September, as compared to the 96 year average (7.63"). May was substantially below normal with .25" and all other months were above normal including August with 5.14". Three severe rainstorms in late July and August produced high winds and some hail. Yields were good but the excessive moisture and storms were detrimental to the greenbug populations. Accumulated growing degree days were normal.

We did not obtain biotype identification this year but the most recent information showed our populations to be biotype I with pattern 2 resistance to insecticides. Convergent lady beetles and green lacewings were very numerous predators in the plots.

**Methods and Materials** - Supporting information relating to the test plots is given on the next page.

Two row plots were separated by two rows of untreated sorghum to reduce chemical drift effects and help maintain greenbug population pressure on the various treatments.

Lorsban 4E at .125 lbs. ai/acre (16 gpa) was applied to the field on July 1 for the purpose of inducing insecticide resistance in the greenbug population. Sevin 4F at 1.0 lb. ai/acre (16 gpa) was applied to the field on July 18 to reduce predator populations. Insecticides were applied to the foliar test July 24 about 4 days before flowering, with a compressed air sprayer, mounted on a Hahn Hi-Boy, at 40 p.s.i. at the rate of 25 gpa. Granules were applied by hand over the row.

Leaf loss was determined by comparing the average number of dead leaves per plant on October 2 with the average number of green leaves per plant (12) at lay-by time for each treatment.

Plots were harvested with a two row plot combine and average grain yields for each treatment are reported on an acre basis. Grain moistures were determined and yields adjusted to 14% moisture and 56 pound bushels.

**Results and Discussion**-This trial was carried out on a biotype E & I susceptible hybrid, Pioneer 8500, however, we did not obtain identification of the aphid biotype in this test or the pattern of resistance. It would appear most of the treatments (Table 1) reduced greenbug populations below the untreated. Warrior was the notable exception due to the suppressive effect it had on the predator populations which were numerous in all of the other plots. It appears, as in previous tests, that leaf loss approaching or exceeding 70% is required to have significant yield reduction. The other factor in this years test were the severe rainstorms of July 29, August 5 and 12 which acted to reduce greenbug populations. The results are mitigated by the weather factor. The overall average yield of 136.7 bu/acre is good and the 125.4 bu/acre yield in the untreated plot would indicate the greenbugs were not a major factor in this trial.

Yields in the untreated plots (Table 1) averaged 125.4 bu. per acre compared to 1995-85.8 bu., 1994-29.2 bu., 1992-168.4 bu., 1989-65.6 bu., 1988-94.3 bu., 1987-24.9 bu., 1986-97.1 bu., 1985-14.9 bu., 1984-20.8 bu., 1983-21.1 bu., 1982-29.4 bu., 1981-76.1 bu., and 1980-81.8 bu.

Frank C. Schweissing

**Test Plot Information - 1997**  
**Arkansas Valley Research Center**

Purpose - To evaluate the effectiveness of various insecticides for the control of Greenbugs, *Schizaphis graminum* (Rondani), on sorghum.

Data - 1. Aphid populations  
 2. Leaf Loss  
 3. Grain yields

Plots - Treated - 43.56' X 2 rows (5') wide = 217.8 sq. ft. = 200<sup>th</sup> acre.  
 Harvest - Total plot.

Design - Randomized block, 3 replication

Variety - Pioneer 8500. Average 12 leaves after lay-by.

Fertilizer - 50 lbs. P<sub>2</sub>O<sub>5</sub> plowdown, 100 lbs. N as NH<sub>3</sub> preplant.

Herbicide - Modown 2 lbs. + Ramrod 2.5 lbs. AI/Acre - May 24

Soil - Silty-clay loam, 1-1.5% O.M., pH-ca. 7.8.

Plant - May 23, 1997

Flowering - July 28

Irrigate - 6/24, 7/4, 7/28

Treated - Lorsban .125 lbs. AI/Acre, 16 g.p.a. ground - 7/1

Sevin 4F 1.0 lb. AI/Acre, 16 g.p.a. ground - 7/18

Plots - July 24, 1997 - Hahn Hi-Boy - Compressed air sprayer - 40 p.s.i.,  
 25 g.p.a. - TW12 cone nozzle.

Harvest - October 23, 1997 - self propelled two row combine.

Table 1.-Chemical control of greenbugs on sorghum. Counts, leaf loss and yields. Arkansas Valley Research Center, C.S.U., Rocky Ford, Colorado. 1997.

Treatment <sup>1</sup>	AI <sup>2</sup>	Greenbug Counts <sup>3</sup>				% <sup>4</sup> Leaf Loss	Yield <sup>5</sup> Bu/Acre
		7/31	8/7	8/14	8/21		
Lorsban 4E	0.50	16	8	3	5	47	147.1
+ Supracide 2E	0.25						
Lorsban 4E	0.50	2	1	13	6	55	145.4
+ Furadan 4F	0.167						
Parathion 4E	1.00	46	0	17	1	50	143.9
Furadan 4F	0.50	1	0	7	0	42	142.0
Malathion 5E	0.94	0	0	4	4	53	141.7
Reldan 4E	0.25	21	25	16	2	58	141.4
Lorsban 4E	0.50	2	2	9	4	44	141.1
+Malathion 5E	0.50						
Reldan 4E	0.50	46	130	10	9	44	140.4
Parathion 4E	0.50	38	18	12	8	47	139.9
Dimethoate 4E	0.50	33	30	41	3	53	139.9
Lorsban 4E	0.50	36	30	18	1	61	138.1
Supracide 2E	0.25	13	9	12	5	53	137.7
Supracide 2E	0.50	20	18	21	1	56	136.7
Malathion 5E	0.50	18	10	13	10	47	135.8
DiSyston 15G	8 oz	135	65	48	1	50	134.8
Thimet 20G	6 oz	114	180	173	4	50	134.7
DiSyston 8E	0.50	108	225	89	6	47	132.2
Pirimor 50DF	0.25	117	100	88	1	50	128.0
Untreated		165	420	123	3	69	125.4
Warrior 1E	0.03	166	270	767	440	75	108.7
Column Mean						53	136.7
LSD 0.05							9.7

1 - Treated July 24, 1997.

2 - Actual insecticide in pounds per acre. Granules applied at the rate of ounces of formulation per 1000 ft. of row.

3 - Average number per plant, 2 plants per plot, 3 replications per treatment.

4 - Determined (9/22/97) from average number of leaves lost per plant after lay-by time. Average 12 leaves per plant.

5 - Harvested: October 23, 1997. Average of 3 replications per treatment adjusted to 14% moisture and 56 lb. bushel.

## Guacho Insecticide Seed Treatment Without Greenbug Infestation on Dryland Grain Sorghum at Walsh, 1997

Kevin Larson

Guacho seed treatment has been shown to be affective in controlling greenbug in grain sorghum (Larson, Schweissing, Thompson, 1995 and 1996). Some agronomists believe that even without greenbug pressure Guacho will bolstered grain yield by protecting against other normally present, less evasive insects.

### Materials and Methods

Two grain sorghum hybrids, NORTHRUP KING KS 585 and TRIUMPH TR 46, with and without Guacho seed treatment were planted on June 3, 1997 at 43,500 Seeds/A in a dryland double summer fallow site. The soil test indicated that the Silty Clay Loam soil needed 40 Lb P<sub>2</sub>O<sub>5</sub>/A and no N fertilizer to achieve the yield goal of 45 Bu/A. The only fertilizer we applied was at planting seedrow 20 Lb P<sub>2</sub>O<sub>5</sub>/A and 6 Lb N/A. The study was a complete block design with 4 replication. Plots were four 30 in. rows 50 ft. long and were harvested on October 11, 1997 with a self-propelled combine with a four row row-crop head. Grain yields were corrected to 14% seed moisture content.

### Results and Discussion

There were no greenbug or other insect infestations observed. There was also no significant yield difference between the same hybrid treated with or without Guacho (Table 1). This indicates that Guacho seed treatment cannot increase yield unless there are insects to control. The added expense of Guacho seed treatment is not necessary unless greenbugs (or other insects controlled by Guacho) are expected to be yield limiting pests.

### Literature Cited

- Larson, K. J., F. C. Schweissing, D. L. Thompson. 1995. Sorghum hybrid performance tests in Colorado, 1994. Technical Report TR95-2. AES, Dept. of Soil and Crop Sciences, CSU. 60p.
- Larson, K. J., F. C. Schweissing, D. L. Thompson. 1996. Sorghum hybrid performance tests in Colorado, 1995. Technical Report TR96-1. AES, Dept. of Soil and Crop Sciences, CSU. 54p.

Table 1.-Guacho Insecticide Seed Treatment Comparison Without Greenbug Infestation on Dryland Grain Sorghum at Walsh, 1997.

Brand	Hybrid	Guacho Applied	Seed Moisture Content	Test Weight	Grain Yield
			%	Lb/Bu	Bu/A
NORTHRUP KING	KS 585	No	13.5	60	81
NORTHRUP KING	KS 585	Yes	12.9	61	77
Orthogonal Contrast					NS
TRIUMPH	TR 46	No	12.3	59	65
TRIUMPH	TR 46	Yes	12.3	58	67
Orthogonal Contrast					NS
NORTHRUP KING	KS 585		13.2	61	79
TRIUMPH	TR 46		12.3	59	66
Orthogonal Contrast					*

Orthogonal Contrast significance levels: NS, not significant; \*, 0.05; \*\*, 0.01.