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Technical Report

TR96-1

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Department of
Soil and Crop
Sciences

February 1996

Sorghum Hybrid Performance Tests in Colorado, 1995

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SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1995

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SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1995
K.J. Larson, F.C. Schweissing, and D.L. Thompson /1

Introduction

The 1995 Colorado grain sorghum crop was estimated at 5.61 million bushels, 27 % lower than the 1994 production level. The decrease in production was due to an 12 bu/A decrease in yield, from 45 bu/A in 1994 to a 10 year low of 33 bu/A in 1995. Most of the sorghum producing areas in Colorado experienced an early freeze which lowered yields and test weights. Sorghum silage production in 1994 was 270,000 tons, down 23 % from 1993. The decrease in silage production is attributed to both few acres and lower per acre yield, 18,000 acres and 15 tons/A for 1994, and 22,000 acres and 16 tons/A for 1993 (Colorado Agricultural Statistic Service, 1995).

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 Holly and Walsh; a greenbug study at Rocky Ford; 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 1995 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, 1995), 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;
Researcher I, Plainsman Research Center, Walsh.

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 specialized sorghum guards 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 became 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 have reached physiological maturity, i.e., the black layer becomes visible at the base of the kernel.

Maturity Group. The relative maturity group of grain sorghum hybrids as stated by seed firms. The hybrids in the grain sorghum hybrid performance tables are grouped by maturity.

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. Because the combine was equipped with specialized sorghum guards, 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 before the first freeze or that it suffered environmental stress, such as 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 the 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 10 and 20 percent significance levels. Frequently only minor yield differences separate the top hybrids, and these differences are generally due to chance and are not statistically significant.

Acknowledgements

Thank you to the grower-cooperators for their assistance in the off-station trials: Tim Weeks, Eads; Donald and Dale Seufer, Holly; and Terrill Swanson, Vilas. A thank you is also due to the NOAA weather observers for collecting the weather data utilized for the off-station trials: Ben Fisher, Eads; William Davis, Holly.

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Dryland Grain Sorghum Hybrid Performance Test at Eads, 1995

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 13.
HAND-HARVESTED: October
27.

EMERGENCE DATE: 10 days
after planting. SOIL
TEMP: 72 F.

PEST CONTROL:
Preemergence Herbicides:
none. Post Emergent
Herbicides: Buctril 16
oz/A, Banvel 4 oz/A, 2,4-
D 0.25 lb/A. Insecticide:
none. CULTIVATION: once.

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	2.06	378	7	0	17
July	1.07	758	23	8	48
August	0.06	795	27	7	79
September	0.93	384	7	1	101
Total	4.12	2315	64	16	101

/1 Growing season from June 13 (planting) to September
22 (first freeze, 29 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. Weed control was fair.
Below normal precipitation for growing season with August much
drier than normal. No greenbug infestation and only minor plant
lodging observed. Because of the early freeze, which occurred
nearly three weeks before the average killing freeze date, only
the earliest maturing hybrid matured. Grain yields and test
weights were low because of the early freeze.

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	0.3	0.7	4	3.7	224	0.5	6.8
8"-24"				4				
Comment	Alka	VLo	Lo	Lo	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P205	K20	Zn	Fe
	-----lb/A-----				
Recommended	45	30	0	5	0
Applied	50	20	0	0	0

Yield Goal: 45 bu/A.
Actual Yield: 28 bu/A.

Table 2.--Dryland Grain Sorghum Hybrid Performance Test at Eads, 1995. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Harvest Density	Test Wt.	Grain Yield	Yield % of Test Average	
			----- DAP	GDD	----- DAP	Group					
								plant/A (1000 X)	lb/bu	bu/A	%
PIONEER	8771	9	63	1514	97	E	14.2	56	26	94	
PIONEER	8500	9	69	1665	HD	ME/M	14.8	55	37	131	
PIONEER	8505	10	69	1665	HD	ME/M	14.6	55	36	127	
DEKALB	DK-39	10	71	1719	SD	ME	12.6	50	34	122	
NORTHRUP KING	X9315	10	66	1594	HD	ME	19.8	53	34	120	
PIONEER	8522Y	9	72	1746	SD	ME/M	13.8	49	32	114	
MYCOGEN	T-E Gage	10	70	1691	SD	ME	15.4	51	32	114	
NORTHRUP KING	KS 383Y	11	69	1665	HD	ME	12.0	51	30	105	
NORTHRUP KING	KS 560Y	10	72	1746	SD	ME/M	15.4	51	29	103	
MYCOGEN	X9570	9	68	1639	HD	ME	16.2	52	28	100	
MYCOGEN	T-E Hardy	10	70	1691	SD	ME	11.4	50	28	100	
MYCOGEN	X9569	10	69	1665	HD	ME	17.2	53	28	99	
PIONEER	8557Y	10	68	1639	HD	ME	14.4	52	27	97	
MYCOGEN	3838	11	70	1691	SD	ME	12.0	49	25	91	
DEKALB	DK-40y	11	73	1774	ED	ME	11.2	45	19	66	
DEKALB	DK-38y	11	70	1691	SD	ME	13.4	49	17	61	
(Check)	399 X 2536	11	78	1905	LM	M	10.2	40	12	42	
Average		10	70	1688	SD	ME	14.0	51	28		
L.S.D. (0.10)									9.8		
L.S.D. (0.20)									7.6		

\1 Planted: June 13; Hand-Harvested: October 27.

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.

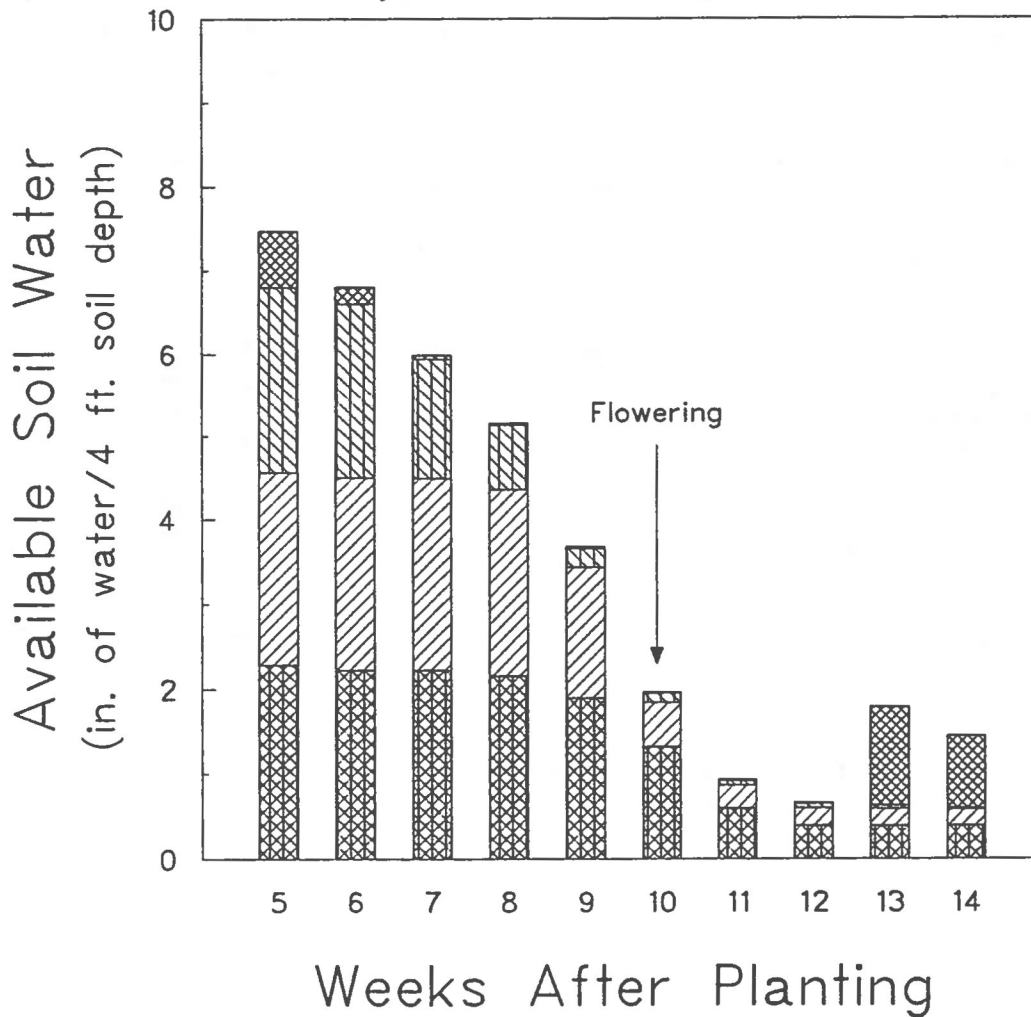
Grain Yield corrected to 14 % seed moisture content.

Table 3.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Eads, 1993-95.

Brand	Hybrid	-----Grain Yield-----					---Yield as % of Test Average---				
		1993\1	1994	1995	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----bu/A-----					-----%-----				
DEKALB	DK-38y	20	108	17	63	48	95	106	61	84	87
DEKALB	DK-39	28	108	34	71	51	131	106	122	114	120
DEKALB	DK-40y	12	118	19	69	50	54	116	66	91	79
GOLDEN HARVEST	H-301	16	66	--	41	--	74	64	--	69	--
GOLDEN HARVEST	H-388W	21	109	--	65	--	97	107	--	102	--
MYCOGEN	T-E Elite	21	92	--	56	--	97	90	--	94	--
MYCOGEN	T-E Hardy	27	98	28	63	51	125	96	100	98	107
NORTHROP KING	KS 383Y	20	100	30	65	50	92	98	105	102	98
NORTHROP KING	KS 560Y	25	99	29	64	51	117	97	103	100	106
PIONEER	8500	33	98	37	68	56	155	96	131	114	127
PIONEER	8505	28	116	36	76	60	130	113	127	120	123
PIONEER	8522Y	--	113	32	73	--	--	111	114	113	--
PIONEER	8771	21	106	26	66	51	98	104	94	99	99
(Check)	399 X 2536	16	102	12	57	43	74	100	42	71	72
Test Average		21	102	28	65	50					

\1 Grain yields for 1993 were reduced by hail.

Available Soil Water Dryland Grain Sorghum, Eads







-  Soil Depth 1 ft.
-  Soil Depth 2 ft.
-  Soil Depth 3 ft.
-  Soil Depth 4 ft.

Fig. 1. Available soil water in dryland grain sorghum at Eads. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Eads from planting to first freeze was 4.12 in. Any increase in available soil water between weeks is from rain.

Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1995

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 Loam soil.

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

EMERGENCE DATE: 13 days after planting. SOIL TEMP: 62 F.

PEST CONTROL: Preplant Herbicides: atrazine 0.5 lb/A. Post Emergent Herbicides: atrazine 0.5 lb/A and 2,4-D 0.25 lb/A. Insecticide: none. CULTIVATION: once.

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

Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	1.41	542	9	0	28
July	2.20	776	19	3	59
August	0.39	887	24	2	90
September	0.57	440	7	1	112
Total	4.57	2645	59	6	112

/1 Growing season from June 2 (planting) to September 22 (first freeze, 30 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. Weed control was fair. Growing season precipitation was below normal with August and September much drier than normal. A greenbug infestation was noted but considered too late to cause economic damage. Lodging was a significant problem. All hybrids had at least 10 % lodging and four hybrids lodged more than 40 %. Growing season was much cooler in June and much hotter in August than average. Marginal available soil water from flowering to harvest and severe plant lodging greatly reduced yields.

SOIL: Sandy Loam 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"	7.7	0.2	0.7	6	5.3	184	0.6	4.4
8"-24"				6				
Comment	Alka	VLo	Lo	Lo	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P205	K20	Zn	Fe
	-----lb/A-----				
Recommended	50	20	0	5	0
Applied	6/50	20	0	0.5	0

Yield Goal: 60 bu/A.

Actual Yield: 20 bu/A.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1995. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant		Harvest Density	Test Wt.	Grain Yield	Yield % of Test Average			
			DAP	GDD	DAP	Group	Ht.	Ldg							
										in.	%	plant/A (1000 X)	lb/bu	bu/A	%
TRIUMPH	TR 459	12	71	1578	110	ME	39	10	14.2	61	33	163			
NORTHRUP KING	X9315	12	65	1399	103	ME	38	15	18.4	59	30	150			
DEKALB	DK-38y	15	68	1487	106	ME	35	10	11.4	58	30	148			
NORTHRUP KING	KS 560Y	14	72	1611	111	ME/M	37	18	12.2	57	25	123			
NORTHRUP KING	KS 383Y	14	70	1548	108	ME	34	16	13.2	61	22	112			
MYCOGEN	T-E Hardy	13	72	1611	111	ME	38	14	12.2	62	20	102			
MYCOGEN	X9569	12	69	1516	107	ME	38	28	20.6	57	20	98			
MYCOGEN	X9570	13	70	1548	109	ME	37	22	12.2	57	19	95			
DEKALB	DK-40y	15	73	1639	111	ME	39	54	12.6	59	17	83			
DEKALB	DK-39	13	71	1578	110	ME	36	58	15.2	61	12	61			
MYCOGEN	T-E Gage	13	72	1611	110	ME	40	49	15.8	60	10	51			
MYCOGEN	3838	13	71	1578	110	ME	38	43	12.6	59	9	47			
(Check)	399 X 2536	15	79	1781	HD	M	37	33	10.4	55	18	89			
Average		13	71	1576	110	ME	37	28	13.9	59	20				
L.S.D. (0.10)									15			13			
L.S.D. (0.20)									11			10			

\1 Planted: June 2; Harvested: October 25.

OAP: Days After Planting.

GDD: Growing Degree Days for sorghum or seed maturation.

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

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

Yields are corrected to 14.0 % seed moisture content.

Table 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 1993-95.

Brand	Hybrid	-----Grain Yield-----					---Yield as % of Test Average---				
		1993	1994	1995	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----bu/A-----					-----%-----				
ASGROW	Seneca	79	68	--	73	--	115	97	--	106	--
DEKALB	DK-38y	66	69	30	50	55	97	98	148	123	114
DEKALB	DK-39	--	75	12	44	--	--	107	61	84	--
OEKALB	DK-40y	58	76	17	47	50	86	109	83	96	93
GOLDEN HARVEST	H-388W	66	70	--	68	--	96	100	--	98	--
MYCOGEN	T-E Hardy	67	68	20	44	52	99	97	102	100	99
NORTHROP KING	KS 383Y	57	63	22	43	47	84	89	112	101	95
NORTHROP KING	KS 560Y	64	67	25	46	52	95	96	123	110	105
TRIUMPH	TR 459	76	67	33	50	59	112	96	163	130	124
(Check)	399 X 2536	63	77	18	48	53	97	109	89	99	98
Test Average		68	70	20	45	53					

Available Soil Water Dryland Grain Sorghum, Vilas

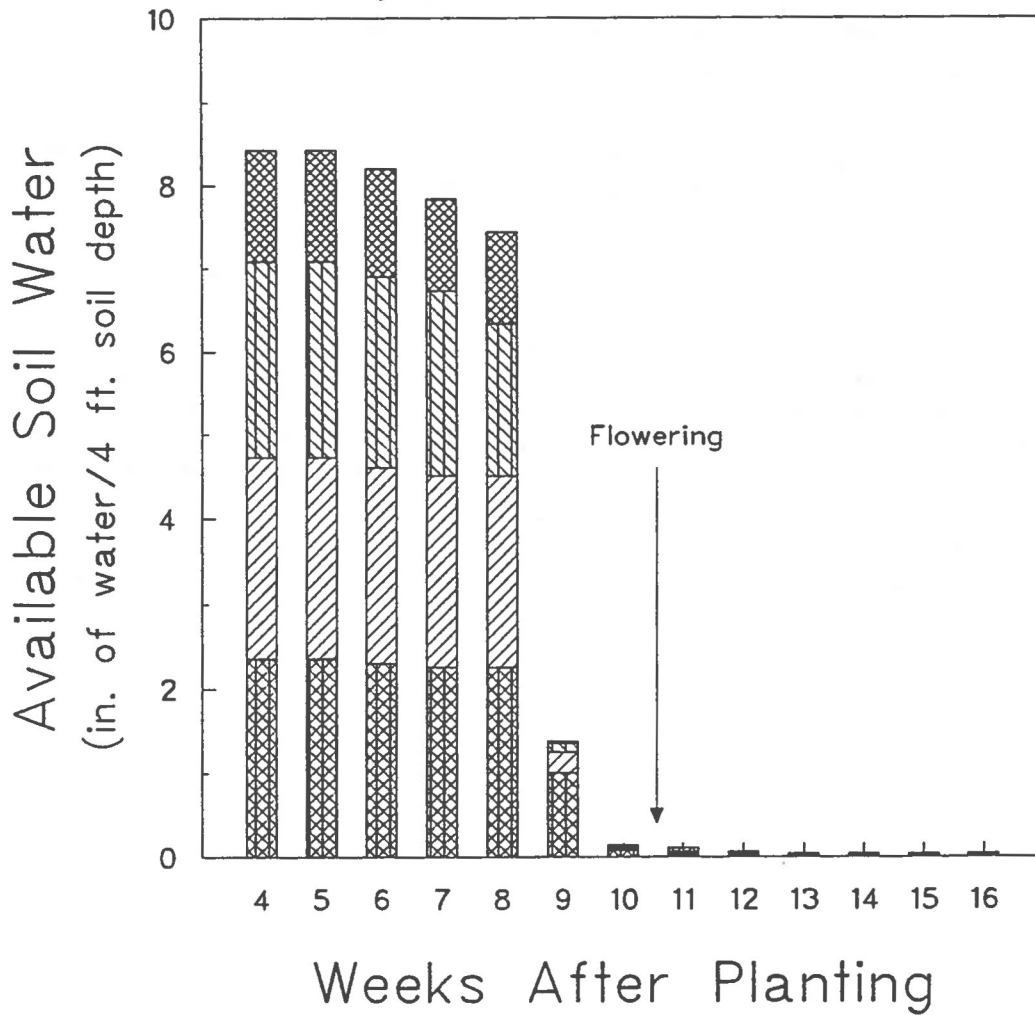


Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Vilas from planting to first freeze was 4.57 in. Any increase in available soil water between weeks is from rain.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1995

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

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

PLOT: Four rows with 30" row spacing, 50' long.
SEEDING DENSITY: 43,600 seed/A. PLANTED: June 6.
HARVESTED: October 29.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 64 F.

PEST CONTROL: Preplant Herbicides: LandMaster BW 54 oz/A. Post Emergent Herbicides: atrazine 0.5 lb/A, Bucril 16 oz/A, Banvel 4 oz/A, 2,4-D 0.13 lb/A. Insecticide: none. CULTIVATION: once.

Summary: Growing Season Precipitation and Temperature /1
Plainsman Research Center, Walsh, Baca County.

Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	3.21	469	9	0	24
July	2.20	776	19	3	55
August	0.39	887	24	2	86
September	0.57	440	7	1	108
Total	6.37	2572	59	6	108

/1 Growing season from June 6 (planting) to September 22 (first freeze).
/2 GDD: Growing Degree Days for sorghum.
/3 DAP: Days After Planting.

FIELD HISTORY: Last crop: wheat. FIELD PREPARATION: disc and sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was good. Growing season precipitation was below normal, with August and September much drier than normal. No greenbug infestation and only minor plant lodging observed. The growing season was much cooler in June and much hotter in August than average. Most of the hybrids did not mature before the first freeze (30 F, September 22), which came almost three weeks before the normal killing freeze date. Grain yields were poor because of the dry weather and early freeze.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.5	1.5	4	5.9	641	1.1	5.6
8"-24"				2				
Comment	Alka	VLo	Mod	VLo	Lo	VHi	Marg	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P205	K20	Zn	Fe
	-----lb/A-----				
Recommended	40	20	0	0	0
Applied	6/40	20	0	0	0

Yield Goal: 45 bu/A.
Actual Yield: 29 bu/A.

Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1995. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant Ht.	Harvest Density	Test Wt.	Grain Yield	Yield % of Test Average	
			----- DAP	GDD	----- DAP	Group						
								in.	plant/A	lb/bu	bu/A	%
								(1000 X)				
ASGROW	A298	10	67	1588	99	E	37	24.8	57	30	103	
PIONEER	8500	9	76	1845	107	ME/M	40	23.8	57	41	141	
NORTHROP KING	KS 560Y	11	78	1908	HD	ME/M	35	15.8	55	40	138	
PIONEER	8505	10	76	1845	107	ME/M	40	20.8	57	38	132	
ASGROW	XP3282	10	79	1939	HD	ME	37	21.6	54	38	130	
NC+	6850	9	82	2026	HD	ME/E	40	23.8	53	37	129	
OHLDE	219C	12	77	1876	HD	ME	38	14.4	56	35	121	
PIONEER	8557Y	10	76	1845	107	ME	37	21.6	58	32	110	
NORTHROP KING	X9315	9	75	1814	106	ME	37	21.2	58	32	109	
OHLDE	120C	10	79	1939	HD	ME	39	13.2	53	31	108	
DEKALB	DK-39	10	76	1845	107	ME	38	14.2	57	30	104	
CARGILL	X11432	10	76	1845	107	ME	40	22.0	57	30	103	
NORTHROP KING	KS 383Y	12	77	1876	HD	ME	33	14.4	56	29	100	
CARGILL	607E	11	75	1814	106	ME	39	18.6	55	29	99	
DEKALB	DK-36	12	76	1845	HD	ME/E	36	17.4	54	28	98	
DEKALB	DK-38y	12	77	1876	HD	ME	35	17.2	56	28	97	
PIONEER	8522Y	11	81	1998	HD	ME/M	39	21.6	55	28	96	
DEKALB	DK-45	10	81	1998	HD	ME/M	40	17.4	55	28	96	
TRIUMPH	TR 459	10	80	1968	HD	ME	38	15.0	55	26	91	
ASGROW	Seneca	10	81	1998	HO	ME	38	22.4	56	26	89	
PIONEER	8446	11	79	1939	HD	ME/M	38	24.8	55	25	87	
CARGILL	611Y	11	78	1908	HD	ME	36	19.0	55	25	85	
DEKALB	OK-40y	12	81	1998	SD	ME	39	14.2	52	22	77	
OHLDE	1202C	9	84	2089	SD	M/ME	40	22.4	52	30	104	
CARGILL	737	10	84	2089	SD	M	38	21.8	53	24	82	
CARGILL	X19225	11	90	2276	LM	M	38	17.8	50	18	63	
CARGILL	X19207	10	90	2276	LM	M	38	15.6	48	16	55	
(Check)	399 X 2536	11	89	2244	LM	M	38	13.8	49	15	51	
Average		10	79	1947	MD	ME	38	19.0	55	29		
L.S.D. (0.10)										9.2		
L.S.D. (0.20)										7.2		

\1 Planted: June 6; Harvested: October 29.

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.

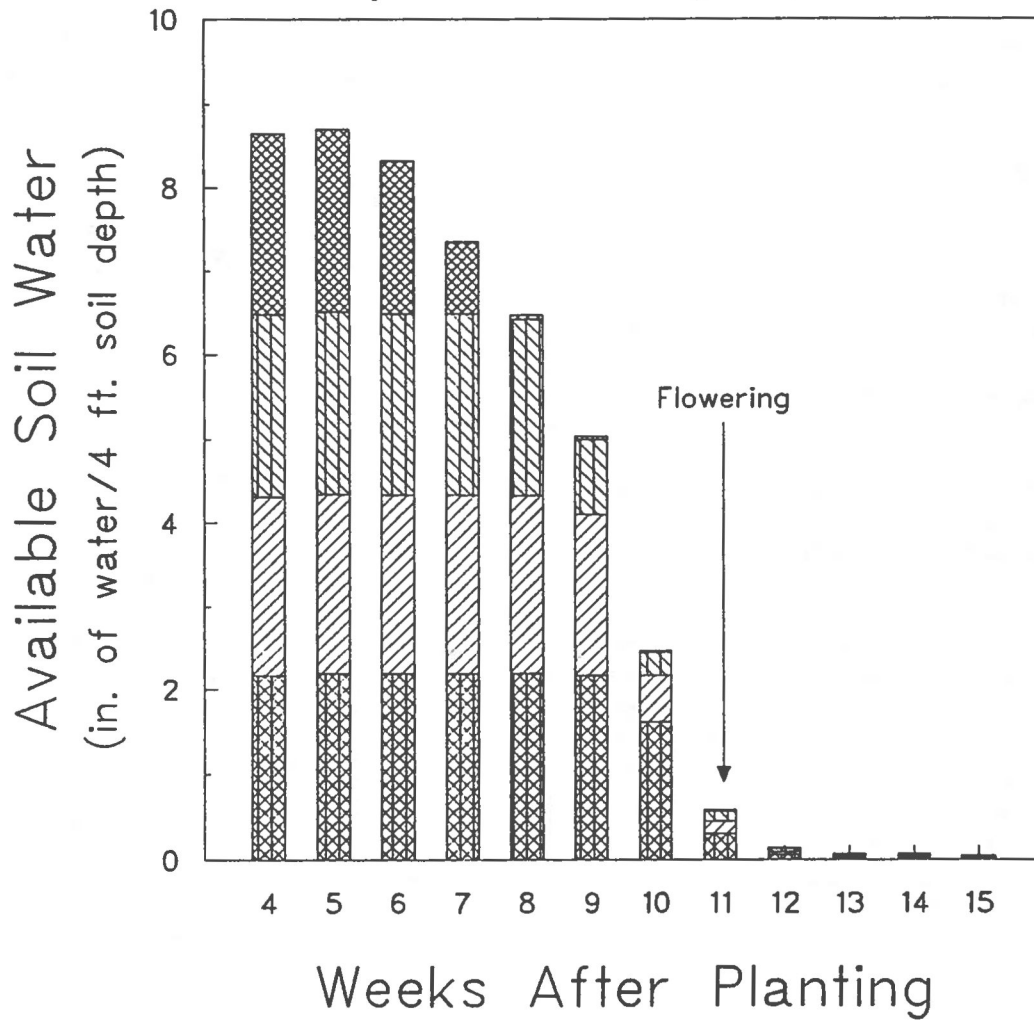
Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Yields are corrected to 14.0 % seed moisture content.

Table 7.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 1993-95.

Brand	Hybrid	-----Grain Yield-----					---Yield as % of Test Average---				
		1993	1994	1995	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----bu/A-----					-----%-----				
ASGROW	Madera	40	51	--	44	--	136	98	--	117	--
ASGROW	Seneca	--	64	26	45	--	--	125	89	107	--
ASGROW	A 406	23	62	--	42	--	82	120	--	101	--
CARGILL	607E	23	48	29	39	33	84	94	99	97	92
CARGILL	727	22	82	--	52	--	79	160	--	120	--
CARGILL	797	27	81	--	54	--	96	157	--	127	--
DEKALB	DK-38y	26	48	28	38	34	92	94	97	96	94
DEKALB	DK-39	28	52	30	41	37	100	100	104	102	101
DEKALB	DK-40y	17	--	22	20	--	62	--	77	70	--
MYCOGEN	T-E Hardy	32	42	--	37	--	114	82	--	98	--
NORTHROP KING	KS 383Y	--	55	29	42	--	--	108	100	104	--
NORTHROP KING	KS 560Y	--	49	40	45	--	--	96	138	117	--
OHLDE	120C	--	52	31	42	--	--	101	108	105	--
PIONEER	8500	31	55	41	48	42	111	107	141	124	120
PIONEER	8505	26	48	38	43	37	93	92	132	112	106
PIONEER	8522Y	--	64	28	46	--	--	125	96	111	--
PIONEER	8771	31	49	--	40	--	111	94	--	103	--
TRIUMPH	TR 46	31	33	--	32	--	109	65	--	87	--
TRIUMPH	TR 459	--	61	26	44	--	--	118	91	105	--
(Check)	399 X 2536	21	66	15	41	34	77	129	51	90	86
Test Average		28	51	29	40	36					

Available Soil Water Dryland Grain Sorghum, Walsh







-  Soil Depth 1 ft.
-  Soil Depth 2 ft.
-  Soil Depth 3 ft.
-  Soil Depth 4 ft.

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 6.37 in. Any increase in available soil water between weeks is from rain.

Irrigated Grain Sorghum Hybrid Performance Test at Holly, 1995

COOPERATORS: Dale and Donald Seufer Farm, Holly, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

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

PLOT: Four rows with 30" row spacing, 50' long.
SEEDING DENSITY: 104,500 seed/A; PLANTED: June 10.
HARVESTED: November 2.

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

IRRIGATION: Four furrow irrigations: May (pre-irrigation), July 19, August 10, September 7.

PEST CONTROL: Preplant Herbicide: none. Post Emergent Herbicide: atrazine 0.5 lb ai/A, 2,4-D 0.25 lb ai/A. Insecticide: none. CULTIVATION: once.

FIELD HISTORY: Last crop: corn; FIELD PREPARATION: disc.

COMMENTS: Planted in good soil moisture. Weed control was good. Growing season precipitation was nearly normal, but unevenly distributed: July wetter than normal and August and September drier than normal. No greenbug infestation and only minor lodging. Soil water availability well maintained with irrigation. A frost on September 22 (31 F) did not halt maturation of the hybrids. All hybrids matured and produced fair yields.

SOIL: Sandy Clay 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"	7.9	3.3	1.9	37	5.3	395	1.8	6.6
8"-24"				15				
Comment	Alka	Mod	Hi	VHi	Lo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Growing Season Precipitation and Temperature /1 Holly, Prowers County.

Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	1.57	448	8	2	20
July	3.39	799	23	7	51
August	1.37	879	27	8	82
September	1.02	531	10	0	112
October	0.02	119	1	0	121
Total	7.37	2776	69	17	121

/1 Growing season from June 10 (planting) to October 9 (first freeze, 30 F).

/2 GDD: Growing Degree Days for sorghum.

/3 DAP: Days After Planting.

Summary: Fertilization.

Fertilizer	N	P2O5	K2O	Zn	Fe
	-----lb/A-----				
Recommended	0	50	0	0	0
Applied	100	40	0	2	0

Yield Goal: 120 bu/A.

Actual Yield: 75 bu/A.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Holly, 1995. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant Ht.	Harvest Density	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group						
								in.	plant/A (1000 X)	lb/bu	bu/A	%
ASGROW	A298	9	63	1577	99	E	41	50.8	57	57	76	
NC+	6R55E	7	73	1867	109	ME	48	50.4	59	82	110	
ASGROW	Seneca	9	72	1836	108	ME	42	51.6	59	80	106	
MYCOGEN	X9573	8	72	1836	108	ME/M	52	46.0	58	74	98	
ASGROW	XP3282	8	73	1867	109	ME	44	50.4	59	56	74	
NORTHROP KING	KS 710	8	77	1978	116	M/ML	44	45.2	59	85	113	
(Check)	399 X 2536	9	77	1978	116	M	44	39.6	56	84	112	
DEKALB	DK-56	9	77	1978	115	M/ML	51	46.8	58	83	110	
DEKALB	DK-55	9	76	1950	113	M/ML	49	44.0	55	79	105	
DEKALB	OK-45	9	74	1894	111	M	51	45.6	58	72	96	
NORTHROP KING	KS 714Y	9	78	2005	118	ML	45	44.8	57	79	105	
DEKALB	DK-51	9	78	2005	117	ML/M	45	43.2	57	78	105	
MYCOGEN	ORO Amigo	9	79	2032	118	ML	46	59.2	57	78	103	
TRIUMPH	TR 474	10	79	2032	120	ML	50	55.2	56	76	102	
TRIUMPH	TR 481	8	78	2005	118	ML	46	47.6	56	74	99	
MYCOGEN	T-E Y-75	8	79	2032	119	ML/M	48	49.6	55	72	96	
DEKALB	DK-54	9	79	2032	119	ML	54	48.0	56	71	95	
Average		9	76	1936	114	M	47	48.1	57	75		
L.S.D. (0.10)										8.7		
L.S.D. (0.20)										6.7		

\1 Planted: June 10; Harvested: November 2.

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

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

GDD: Growing Degree Days for sorghum.

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

Only minor nonconsistent lodging.

Table 9.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Holly, 1992, 1994, 1995.

Brand	Hybrid	-----Grain Yield-----					---Yield as % of Test Average---				
		1992	1994	1995	2-Year Avg	3-Year Avg	1992	1994	1995	2-Year Avg	3-Year Avg
		-----bu/A -----					-----%-----				
CARGILL	797	123	101	--	112	--	102	103	--	103	--
DEKALB	DK-51	--	128	78	103	--	--	131	105	118	--
DEKALB	DK-54	--	103	71	87	--	--	106	95	101	--
DEKALB	DK-55	--	119	79	99	--	--	122	105	114	--
DEKALB	DK-56	129	109	83	96	107	108	112	110	111	110
MYCOGEN	T-E Y-75	107	91	72	82	90	89	94	96	95	93
MYCOGEN	ORO Amigo	--	99	78	89	--	--	101	103	102	--
NORTHRUP KING	KS 710	121	117	85	101	108	100	120	113	117	111
NORTHRUP KING	KS 714Y	133	105	79	92	106	110	108	105	107	108
(Check)	399 X 2536	124	99	84	92	102	103	102	112	107	106
Test Average		121	97	75	86	98					

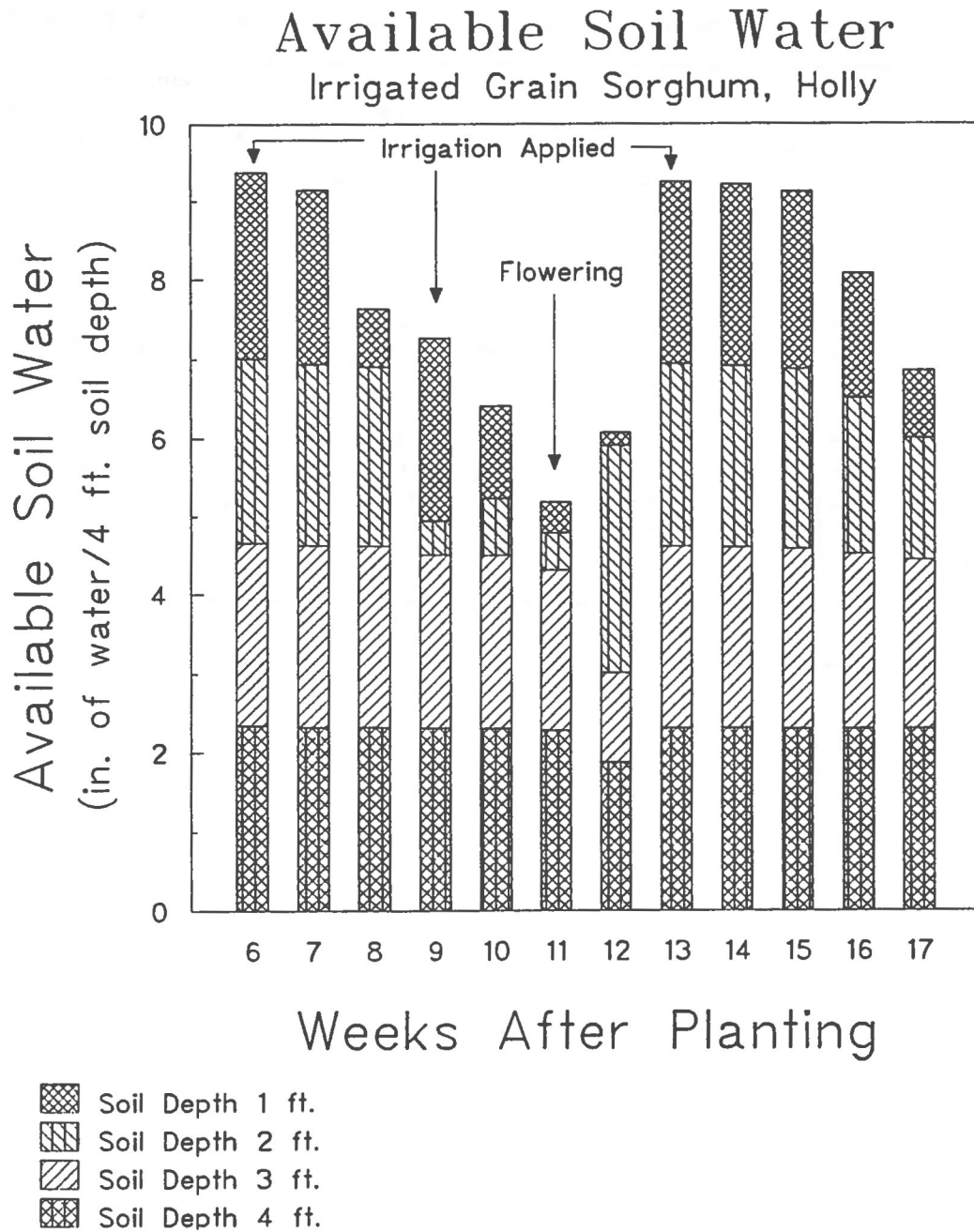


Fig. 4. Available soil water in irrigated grain sorghum at Holly. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Holly from planting to first freeze was 7.37 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1995

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

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

PLOT: Four rows with 30" row spacing, 50' long.
SEEDING DENSITY: 78,400 seed/A. PLANTED: June 1.
HARVESTED: October 27.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 59 F.

IRRIGATION: Three furrow irrigations: March (pre), August 4, September 6, total applied 17.8 acre-in/A.

Summary: Growing Season Precipitation and Temperature /1 Plainsman Research Center, Walsh, Baca County.					
Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	3.95	554	9	0	30
July	2.20	776	19	3	61
August	0.39	887	24	2	92
September	0.57	440	7	1	114
Total	7.11	2657	59	6	114
/1 Growing season from June 1 (planting) to September 22 (first freeze, 30 F).					
/2 GDD: Growing Degree Days for sorghum.					
/3 DAP: Days After Planting.					

PEST CONTROL: Preplant Herbicides: LandMaster BW 54 oz/A. Post Emergent Herbicides: atrazine 0.5 lb, Buctril 16 oz/A, Banvel 4 oz/A, 2,4-D 0.13 lb/A. Insecticide: none. CULTIVATION: once.

FIELD HISTORY: Last crop: wheat. FIELD PREPARATION: disc and sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was good. Growing season precipitation was below normal, with August and September much drier than normal. No greenbug infestation and only minor plant lodging observed. Growing season was much cooler in June and much hotter in August than average. Only one hybrid matured before the first freeze (30 F, September 22). The first freeze came almost three weeks before the normal killing freeze date. Grain yields were poor because of the early freeze.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.3	9	1.0	457	0.6	6.5
8"-24"				1				
Comment	Alka	VLo	Mod	Lo	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P205	K20	Zn	Fe
	-----lb/A-----				
Recommended	155	80	0	10	0
Applied	6/125	20	0	0	0

Yield Goal: 110 bu/A.
Actual Yield: 43 bu/A.

Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1995. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant Ht.	Harvest Density	Test Wt.	Grain Yield	Yield % of Test Average	
			OAP	GDD	OAP	Group						
								in.	plant/A (1000 X)	lb/bu	bu/A	%
ASGROW	A298	11	69	1550	109	E	42	34.0	56	64	150	
ASGROW	Seneca	11	83	1964	HO	ME	44	31.2	56	71	166	
ASGROW	XP4251	11	83	1964	HO	ME	43	41.6	55	59	137	
ASGROW	XP3282	10	83	1964	SD	ME	44	36.4	53	47	109	
CARGILL	737	10	89	2145	EO	M	47	39.0	53	62	144	
MYCOGEN	X9573	11	84	1995	SO	M/ML	52	35.6	54	56	131	
NORTHROP KING	KS 710	10	90	2176	ED	M/ML	44	29.4	53	55	129	
NORTHROP KING	KS 714Y	10	90	2176	ED	M/ML	49	35.2	51	52	121	
MYCOGEN	T-E Y-75	10	90	2176	ED	M	44	33.8	53	46	106	
TRIUMPH	TR481	11	88	2112	EO	M/ML	51	29.0	53	45	104	
TRIUMPH	TR 474	11	89	2145	ED	M/ML	49	28.6	52	43	100	
OEKALB	DK-54	11	89	2145	ED	M/ML	51	33.0	51	42	98	
OEKALB	DK-51	10	90	2176	EO	M	45	32.6	52	42	97	
OEKALB	DK-45	10	85	2025	SD	M	51	32.6	53	39	90	
NC+	7R37E	10	91	2206	LM	ML/M	48	40.0	51	47	108	
PIONEER	8212Y	11	92	2235	LM	ML	46	37.6	51	41	94	
MYCOGEN	ORO Amigo	11	92	2235	LM	ML	48	31.8	50	39	90	
(Check)	399 X 2536	12	92	2235	LM	ML/M	44	25.8	49	34	78	
OEKALB	DK-55	10	91	2206	LM	ML	49	34.0	51	32	75	
OHLOE	240W	11	93	2268	MM	ML/M	48	31.0	48	29	66	
CARGILL	X19225	11	91	2206	LM	ML/M	48	29.6	48	28	65	
PIONEER	8310	10	92	2235	LM	ML	52	39.8	48	27	63	
PIONEER	8282	10	93	2268	MM	ML	50	32.6	47	21	50	
OEKALB	DK-58	12	95	2332	EM	ML	49	30.4	46	18	41	
Average		11	89	2131	EO	M	47	33.5	51	43		
L.S.D. (0.10)										11.8		
L.S.D. (0.20)										9.2		

\1 Planted: June 1; Harvested: October 27.

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

Seed maturation: EM, early milk; MM, midmilk; LM, late milk; EO, 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.

Yields are corrected to 14.0 % seed moisture content.

Hybrids displayed only minor nonconsistent lodging.

Table 11.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Walsh, 1993-95.

Brand	Hybrid	-----Grain Yield-----					---Yield as % of Test Average---				
		1993	1994	1995\1	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----bu/A -----					-----%-----				
ASGROW	Seneca	66	101	71	86	79	102	97	166	132	122
ASGROW	XP4251	--	96	59	78	--	--	93	137	115	--
OEKALB	OK-54	--	110	42	76	--	--	107	98	103	--
OEKALB	DK-55	--	114	32	73	--	--	110	75	93	--
OEKALB	OK-58	58	111	18	65	62	90	107	41	74	79
MYCOGEN	T-E Y-75	71	103	46	75	73	110	99	106	103	105
MYCOGEN	ORO Amigo	74	99	39	69	71	115	95	90	93	100
HYPERFORMER	HSC Cherokee	76	104	--	90	--	118	100	--	109	--
HYPERFORMER	HY 1320	73	120	--	96	--	113	110	--	115	--
NORTHROP KING	KS 710	--	113	55	84	--	--	109	129	119	--
NORTHROP KING	KS 714Y	77	110	52	81	80	120	106	121	114	116
NORTHROP KING	KS 524	61	107	--	84	--	95	103	--	99	--
TRIUMPH	TR 459	62	87	--	75	--	97	84	--	91	--
(Check)	399 X 2536	61	98	34	66	64	94	95	78	87	89
Test Average		64	104	43	74	70					

\1 In 1995 an early freeze reduced yields.

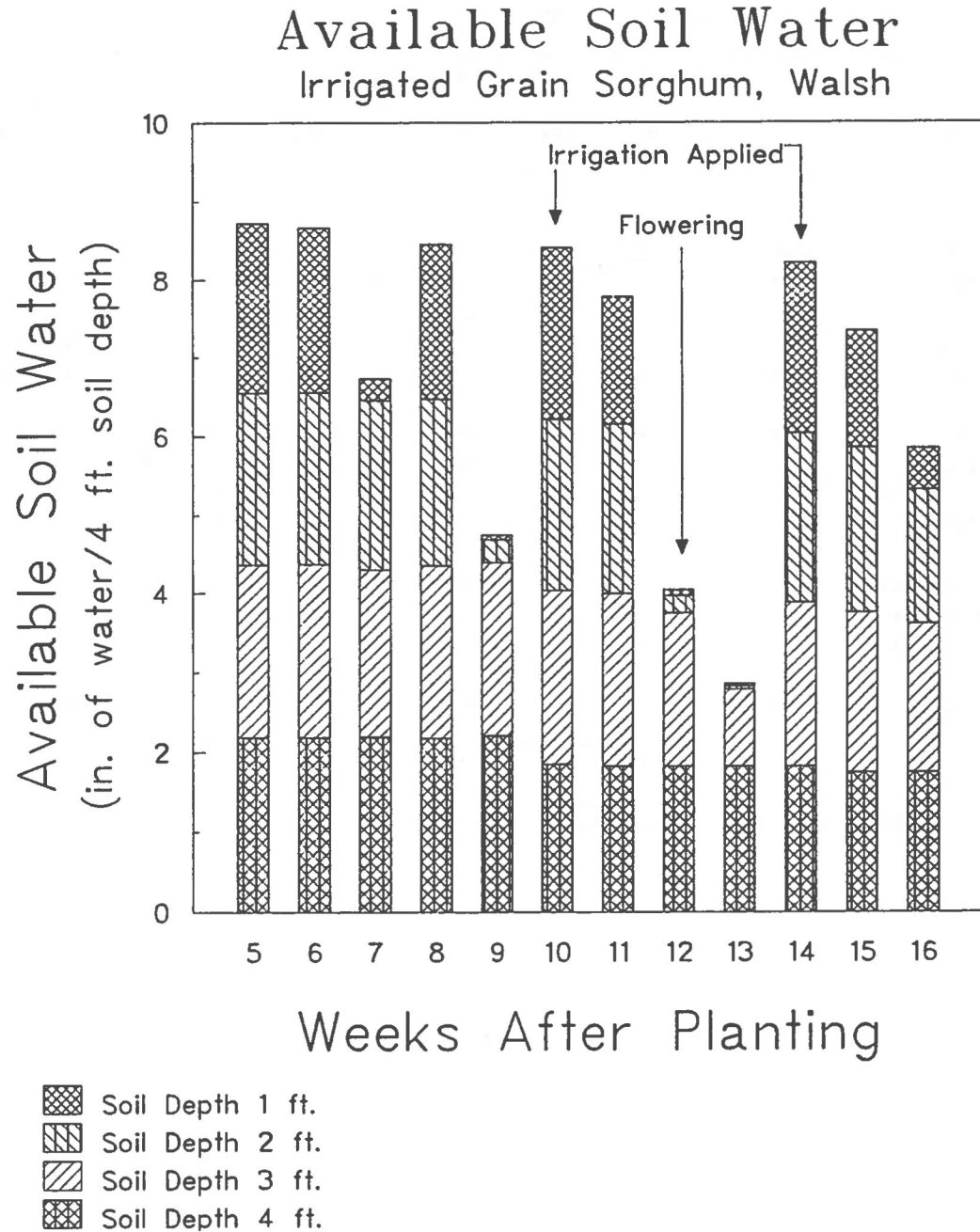


Fig. 5. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 7.11 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1995

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

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

PLOT: Four rows with 30" row spacing, 50' long.
SEEDING DENSITY: 52,300 seed/A. PLANTED: June 6.
HARVESTED: September 26.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 64 F.

PEST CONTROL: Preplant Herbicides: LandMaster BW 54 oz/A. Post Emergence Herbicides: atrazine 0.5 lb/A, Buctril 16 oz/A, Banvel 4 oz/A, 2,4-D 0.13 lb/A. Insecticide: none. CULTIVATION: once.

Summary: Growing Season Precipitation and Temperature /1
Plainsman Research Center, Walsh, Baca County.

Month	Rainfall	GDD /2	> 90 F	> 100 F	OAP /3
	in		-----no. of days-----		
June	3.21	469	9	0	24
July	2.20	776	19	3	55
August	0.39	887	24	2	86
September	0.57	440	7	1	108
Total	6.37	2572	59	6	108

/1 Growing season from June 6 (planting) to September 22 (first freeze, 30 F).
/2 GDD: Growing Degree Days for sorghum.
/3 OAP: Days After Planting.

FIELD HISTORY: Last crop: wheat. FIELD PREPARATION: disc and sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was fair. Below normal precipitation for growing season, with August and September much drier than normal. The growing season was much cooler in June and much hotter in August than average. No greenbug infestation or plant lodging observed. Forage yields were poor because of the dry weather.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.5	1.5	4	5.9	641	1.1	5.6
8"-24"				2				
Comment	Alka	VLo	Mod	VLo	Lo	VHi	Marg	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P205	K2O	Zn	Fe
	-----lb/A-----				
Recommended	40	20	0	0	0
Applied	6/40	20	0	0	0

Yield Goal: 9 ton/A @ 70 % M.C.
Actual Yield: 3.3 ton/A.

Table 12.--Oryland Forage Sorghum Hybrid Performance Test at Walsh, 1995. \1

Brand	Hybrid	Days	Days	Harvest Density	Plant Ht.	Stage \2		Plants Lodged	Forage Yield	Yield % of Test Average
		to Emerge	to 50% Bloom			at Harvest	Stem Sugar			
				plant/A (1000 X)	in.		%	%	ton/A	%
DEKALB	FS-5	10	105	17.8	58	PM	17	0	4.7	143
(Check)	NB 305F	10	94	18.4	61	EM	18	0	3.5	107
BUFFALO	Canex	11	87	16.2	57	E0	19	0	2.9	89
(Check)	NB 280S	12	73	13.6	73	MT	11	25	1.9	57
Average		11	90	16.5	62	MM	16	6	3.3	
L.S.D. (0.10)									1.32	
L.S.D. (0.20)									1.01	

\1 Planted: June 6; Harvest: September 26.

\2 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: Oryland Forage Sorghum Hybrid Performance Tests at Walsh, 1993-95.

Brand	Hybrid	-----Forage Yield-----					---Yield as % of Test Average---				
		1993	1994	1995\1	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----ton/A -----					-----%-----				
BUFFALO	Canex	5.5	11.3	2.9	7.1	6.6	96	110	89	100	98
DEKALB	FS-5	9.2	13.5	4.7	9.1	9.1	159	131	143	137	144
(Check)	NB 280S	5.9	9.3	1.9	5.6	5.7	102	91	57	74	83
(Check)	NB 305F	7.7	12.9	3.5	8.2	8.0	133	126	107	117	122
(Check)	Corn	2.7	3.0	--	2.8	--	46	29	--	38	--
Test Average		5.8	10.3	3.3	6.8	6.5					

\1 Forage yields for 1995 were reduced by late season dry weather.

Table 14.--Oryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1995.

Brand	Hybrid	Days	Plant	CP	OP	ADF	NOF	TDN	P	Ca	K	Mg
		to	Height									
		Boot	at Boot	-----%-----								
		in.										
(Check)	NB 280S	65	45	9.8	6.3	37.0	69.6	64.7	0.33	0.24	1.77	0.21
BUFFALO	Canex	81	51	9.4	6.0	37.9	68.3	64.4	0.31	0.23	1.54	0.21
DEKALB	FS-5	96	51	8.7	5.7	39.0	73.9	64.1	0.32	0.17	1.63	0.20
(Check)	NB 305F	87	49	6.8	4.2	41.2	75.7	63.4	0.28	0.15	1.14	0.24
Average		82	49	8.7	5.6	38.8	71.9	64.2	0.31	0.20	1.52	0.22

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; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Available Soil Water

Dryland Forage Sorghum, Walsh

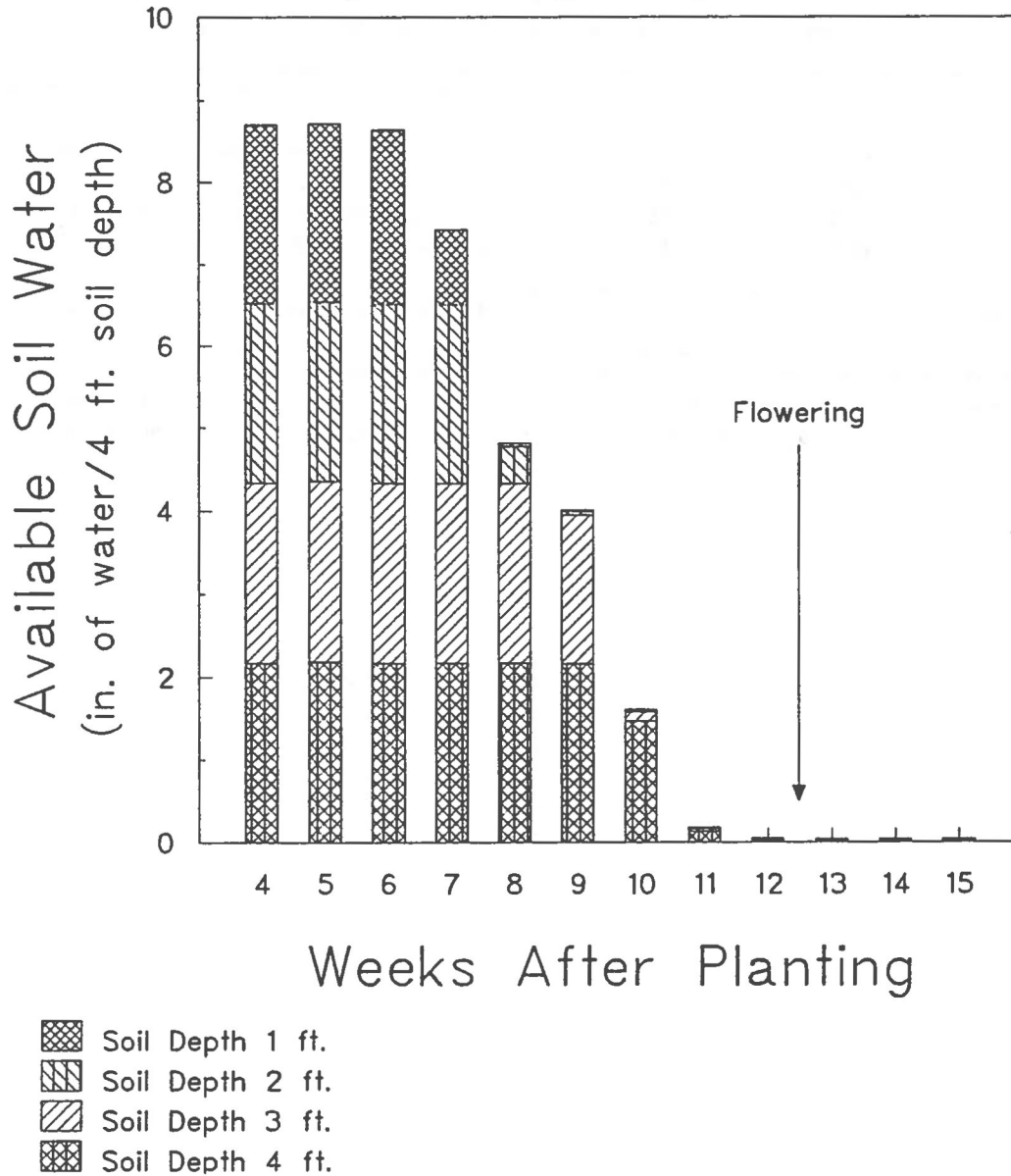


Fig. 6. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 6.37 in. Any increase in available soil water between weeks is from rain.

Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1995

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

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

PLOT: Four rows with 30" row spacing, 50' long.
SEEDING DENSITY: 87,100 seed/A. PLANTED: June 1.
HARVESTED: September 26.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 59 F.

IRRIGATION: Three furrow irrigations: March (pre), July 27, September 5, total applied 17.9 acre-in/A.

PEST CONTROL: Preplant Herbicides: LandMaster BW 54 oz/A. Post Emergence Herbicides: atrazine 0.5 lb/A, Buctril 16 oz/A, Banvel 4 oz/A, 2,4-D 0.13 lb/A. Insecticide: none. CULTIVATION: once.

FIELD HISTORY: Last crop: wheat; FIELD PREPARATION: disc and sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was good. Below normal precipitation for growing season, with August and September much drier than normal. Growing season was much cooler in June and much hotter in August than average. No greenbug infestation observed. Three hybrids had 50 % or greater plant lodging. Forage yields were fair.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.3	9	1.0	457	0.6	6.5
8"-24"				1				
Comment	Alka	VLo	Mod	Lo	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Growing Season Precipitation and Temperature /1
Plainsman Research Center, Walsh, Baca County.

Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	3.95	554	9	0	30
July	2.20	776	19	3	61
August	0.39	887	24	2	92
September	0.57	440	7	1	114
Total	7.11	2657	59	6	114

/1 Growing season from June 1 (planting) to September 22 (first freeze, 30 F).

/2 GDD: Growing Degree Days for sorghum.

/3 OAP: Days After Planting.

Summary: Fertilization.

Fertilizer	N	P205	K20	Zn	Fe
	-----lb/A-----				
Recommended	155	80	0	10	0
Applied	6/125	20	0	0	0

Yield Goal: 18 ton/A @ 70 % M.C.
Actual Yield: 12.7 ton/A.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1995. \1

Brand	Hybrid	Days	Days	Harvest Density	Plant Ht.	Stage \2		Plants Lodged	Forage Yield	Yield % of Test Average
		to Emerge	to 50% Bloom			at Harvest	Stem Sugar			
MYCOGEN	T-E Silomaker	10	88	43.6	88	SD	9	35	15.1	119
NORTHROP KING	Sucro Sorgo 405	11	94	29.5	98	ED	13	12	14.9	118
DEKALB	FS-25E	12	104	38.6	84	PM	14	5	14.2	112
MYCOGEN	ORO Red Top Kandy	11	95	36.0	109	ED	13	50	13.8	109
DEKALB	FS-5	10	95	30.2	90	ED	14	25	12.9	101
NORTHROP KING	KF 429	10	98	46.4	93	LM	15	40	12.9	101
BUFFALO	Buffalo Brand	10	80	47.4	102	HD	10	20	12.8	101
BUFFALO	Grazex II	11	81	41.8	105	HD	9	12	12.5	98
BUFFALO	Grazex IIW	10	73	44.8	104	MT	11	5	12.0	95
BUFFALO	Canex	12	84	36.6	89	HD	17	15	11.9	93
(Check)	NB 305F	10	90	41.8	89	SD	12	90	10.1	80
(Check)	NB 280S	12	72	23.4	88	MT	12	55	10.0	79
Average		11	88	38.3	95	SD	12	30	12.7	
L.S.D. (0.10)									2.50	
L.S.D. (0.20)									1.92	

\1 Planted: June 1; Harvest: September 26.

\2 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 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1993-95.

Brand	Hybrid	-----Forage Yield-----					---Yield as % of Test Average---				
		1993	1994	1995	2-Year Avg	3-Year Avg	1993	1994	1995	2-Year Avg	3-Year Avg
		-----ton/A-----					-----%-----				
BUFFALO	Canex	8.9	16.6	11.9	14.3	12.5	72	100	93	97	88
BUFFALO	Buffalo Brand	--	14.2	12.8	13.5	--	--	86	101	94	--
DEKALB	FS-25E	23.1	27.4	14.2	20.8	21.6	187	165	112	139	155
MYCOGEN	ORO Red Top Kandy	--	20.9	13.8	17.4	--	--	126	109	118	--
MYCOGEN	T-E Silomaker	14.7	16.4	15.1	15.8	15.4	119	99	119	109	112
NORTHROP KING	KF 429	19.3	21.2	12.9	17.1	17.8	156	127	101	114	128
(Check)	NB 280S	9.4	10.5	10.0	10.3	10.0	76	63	79	71	73
(Check)	NB 305F	14.1	16.4	10.1	13.3	13.5	114	99	80	90	98
(Check)	Corn	9.2	5.5	--	7.3	--	74	33	--	54	--
Test Average		12.4	16.6	12.7	14.7	13.9					

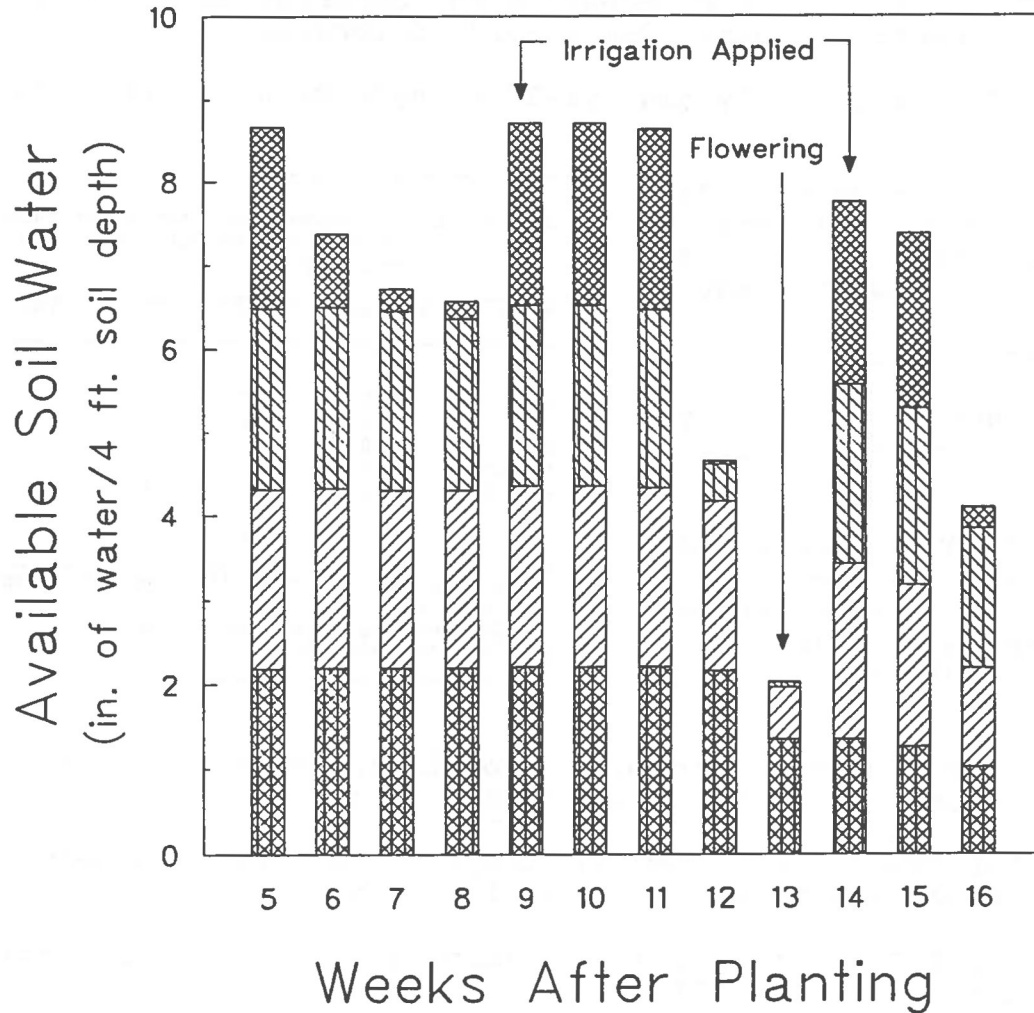
Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1995.

Brand	Hybrid	Days to Boot	Plant Height at Boot	CP	DP	ADF	NDF	TDN	P	Ca	K	Mg
NORTHROP KING	Sucro Sorgo 405	86	76	12.4	7.9	38.9	74.7	64.2	0.36	0.36	2.17	0.25
NORTHROP KING	KF 429	90	81	12.1	7.9	37.0	73.9	64.7	0.36	0.29	2.19	0.21
MYCOGEN	ORO Red Top Kandy	88	84	11.2	7.2	37.2	72.3	64.7	0.35	0.21	1.89	0.20
MYCOGEN	T-E Silomaker	81	64	10.9	6.8	39.2	74.0	64.1	0.33	0.30	1.86	0.26
BUFFALO	Buffalo Brand	72	80	10.5	6.7	40.3	74.7	63.7	0.34	0.30	2.06	0.21
BUFFALO	Canex	76	66	10.5	6.6	37.7	70.5	64.5	0.33	0.23	1.69	0.23
DEKALB	FS-5	88	72	10.3	6.6	39.9	74.7	63.8	0.33	0.28	1.92	0.23
(Check)	NB 305F	82	69	9.9	6.3	38.7	72.3	64.2	0.33	0.19	1.69	0.21
(Check)	NB 280S	66	59	9.4	6.0	39.2	71.2	64.1	0.33	0.21	1.79	0.20
BUFFALO	Grazex IIW	68	67	9.2	5.9	39.2	72.0	64.1	0.33	0.21	1.79	0.18
DEKALB	FS-25E	97	70	9.1	5.7	40.2	73.6	63.7	0.31	0.28	1.63	0.24
BUFFALO	Grazex II	72	66	9.0	5.7	41.4	75.6	63.4	0.32	0.28	1.83	0.22
Average		81	71	10.4	6.6	39.1	73.3	64.1	0.34	0.26	1.88	0.22

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; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Available Soil Water Irrigated Forage Sorghum, Walsh







-  Soil Depth 1 ft.
-  Soil Depth 2 ft.
-  Soil Depth 3 ft.
-  Soil Depth 4 ft.

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 7.11 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford,
1995

INVESTIGATOR: 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: 99,656 seed/A. PLANTED: May 11. HARVESTED: September 14.

EMERGENCE DATE: 17 days after planting. SOIL TEMP: 56 F.

IRRIGATION: Five furrow irrigations: May 15, July 13, July 26, August 10, and September 1, total applied 18 acre-in/A.

PEST CONTROL: Pre-emergence herbicides: bifenoX 2.0 + propachlor 3 lb AI/A. Insecticide: none.

CULTURAL PRACTICES: Previous crop: corn. Field preparation: plow, disk, and float. Cultivation: once.

SOIL & FERTILIZER: silty clay loam, 1 - 1.5 % O.M., pH-ca. 7.8; 150 lb N/A, 50 lb P2O5/A.

COMMENTS: Planted in dry soil and irrigated up. The weather was cool and wet in May and June, and hot and dry in August and September. There were no severe weather problems to impact yields. Weed control was good. There was no greenbug damage and only negligible lodging was observed at harvest.

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	3.25	137	0	0	20
June	2.87	490	9	0	50
July	1.50	649	18	4	81
August	0.41	799	30	5	112
September	0.36	233	6	2	126
Total	8.39	2308	63	11	126

/1 Growing season from May 11 (planting) to September 14 (harvest).

/2 GDD: Growing Degree Days for sorghum.

/3 DAP: Days After Planting.

Table 18.-Forage Sorghum Hybrid Performance Test at Rocky Ford, 1995.¹

Brand	Hybrid	Days	Harvest	Plant	Stage ²	Stem	Dry	Forage	Yield %	
		to	Density		at					Sugar
		Bloom	Stlks/A	Ht.	Harvest			(T/A)	Avg.	
		(No.)	(1000X)	(In.)			(%)	(%)		
BUFFALO	Buffalo Brand	91	110.2	106	5.3	7.7	38	35.10	120	
OEKALB	FS-25E	96	84.9	79	5.0	3.5	34	33.62	115	
DELTAPINE	G1990	--	85.2	113	2.0	9.0	24	33.39	114	
DEKALB	FS-5	100	84.7	95	5.0	10.5	28	32.81	112	
NORTHROP KING	Sucro Sorgo 405	97	76.1	95	5.0	11.0	32	30.45	104	
BUFFALO	Grazex IIW	88	119.5	100	5.5	10.2	38	29.54	101	
MYCOGEN	ORO Red Top Kandy	97	77.6	89	5.0	11.2	30	29.37	100	
BUFFALO	Canex	93	83.9	82	5.5	12.2	29	26.50	91	
(Check)	NB280S	89	93.7	87	5.5	8.5	36	26.33	90	
BUFFALO	Grazex II	90	120.1	99	5.3	9.5	37	26.33	90	
(Check)	NB305F	96	95.6	83	5.3	17.7	26	25.45	87	
MYCOGEN	T-E Silomaker	91	82.8	69	5.3	2.7	33	23.84	81	
OEKALB	OK656 (corn)	84	38.7	79	5.5	11.0	33	27.64	94	
Average		93	92.8	90			32	29.26		
LSD (P=0.05)									3.46	
LSD (P=0.10)									2.88	

¹Planted May 11, 1995; Harvest September 14, 1995. Planting rate 99,565 seeds/A.

²2.0, preboot; 3.0, boot; 4.0, flowering; 5.0, soft dough; 6.0 hard dough

Forage yield adjusted to 70% moisture.

Table 19.-Summary: Forage Sorghum Hybrid Performance Tests at Rocky Ford, 1993-95.

Brand	Hybrid	Forage Yield					Yield as % of		
		1993	1994	1995	2 Year	3 Year	Test Average		
		(T/A)	(T/A)	(T/A)	Avg.	Avg.	1993	1994	1995
		(T/A)	(T/A)	(T/A)	(T/A)	(T/A)	(%)	(%)	(%)
BUFFALO	Canex	21.82	23.59	26.50	25.05	23.97	81	98	91
BUFFALO	Buffalo Brand	-----	23.91	35.10	29.51	-----	---	99	120
OEKALB	FS-25E	29.06	23.55	33.62	28.59	28.74	107	98	115
DELTAPINE	G1990	35.73	27.18	33.39	30.29	32.10	132	113	114
MYCOGEN	ORO Red Top Kandy	-----	23.66	29.37	26.52	-----	---	99	100
MYCOGEN	T-E Silomaker	26.39	23.57	23.84	23.71	24.60	97	98	81
NORTHROP KING	Sucro Sorgo 405	33.65	31.24	30.45	30.85	31.78	124	130	104
(Check)	NB280S	23.84	20.31	26.33	23.32	23.49	88	85	90
(Check)	NB305F	22.21	21.01	25.45	23.23	22.89	82	88	87
Average Test Yield		27.09	24.00	29.26	26.63	26.78			

Seeding Rate on Limited Irrigation Grain Sorghum at Walsh
K. Larson and D. Thompson

PURPOSE: To find the seeding rate which results in highest yields for Early, Medium Early and Medium maturity grain sorghum hybrids under limited irrigation.

MATERIALS and METHODS: Four hybrids representing Early, PIONEER 8771; Medium Early (early), CARGILL 607E; Medium Early (late), ASGROW Seneca; and Medium, TRIUMPH TR481 maturation groups were sown at 60, 65, and 75,000 seeds/A. The site was pre-irrigated with 7.8 acre-in. of furrow applied water in March. One in-season irrigation of 5.3 acre-in. was applied September 5. Soil moisture was measured with gypsum blocks placed at 6, 18, 30, and 42 in. depths. To control broadleaf weeds, a tank mix of 0.75 lb/A atrazine, 4 oz/A Banvel, 0.13 lb/A 2,4-D was applied. The study was sidedressed with 100 lb N/A as anhydrous ammonia at cultivation. Plant density was taken prior to harvest. The plots, two rows 30 in. wide and 500 ft. long, were harvested with a self-propelled combine and weighed in a digital weigh cart where test weight and seed moisture content was measured.

RESULTS and DISCUSSION: Most seeding rate recommendations for limited irrigation grain sorghum are between dryland rates and fully irrigated rates: 4 to 6 lb/A or 55,000 to 85,000 seeds/A. Under limited irrigation conditions, it is generally recommended that the seeding rate for earlier maturing hybrids be increased compared to later maturing hybrids.

In this study all hybrids, regardless of maturity group, produced their highest yields at the highest seeding rate, 75,000 seeds/A. The lowest yield response from increasing seeding rate was for the earlier maturing hybrids (0.31 and 0.48 bu/1000 seeds) and the highest yield response was from the later maturing hybrids (1.29 and 0.62 bu/1000 seeds).

Under the field conditions of this study, only about 40 % of the seeds germinated; therefore, the seeding rate of 60, 65, and 75,000 seeds/A developed 22, 26, and 29,000 plants/A, respectively. A previous seeding rate study under dryland conditions showed maximum yield at 26,000 plants/A (Larson, Schweissing, Clay, 1995). With the low harvest density in this limited irrigation study, it is not surprising that yield increased with increasing seeding rate, even with the very dry late-season weather.

Reference:

Larson, K.J., F.C. Schweissing, D. Clay. 1991. Sorghum hybrid performance tests in Colorado, 1990. Technical Report, TR91-3. CSU, AES, Dept. of Agronomy. 34 p.

Seeding Rate on Limited Irrigation Grain Sorghum at Walsh

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

PURPOSE: To find the seeding rate which results in highest yields for Early, Medium Early and Medium maturity grain sorghum hybrids under limited irrigation.

RESULTS: All hybrids, regardless of maturity group, produced their highest yields at the highest seeding rate of 75,000 seed/A. Only about 40 % of the seeds germinated, therefore 75,000 seeds/A developed 29,000 plants/A. With this low plant density, there were too few plants to negatively affect grain yields.

PLOT: Two rows with 30" row spacing, 1250' long.
SEEDING DENSITY: 60, 65, 75,000 seed/A. **PLANTED:** June 7. **HARVESTED:** November 1.

IRRIGATION: March (pre), September 5 (in-season), total applied: 13.1 in.

FIELD HISTORY: Last crop: wheat. **FIELD PREPARATION:** no-till.

PEST CONTROL: Preplant Herbicides: LandMaster BW 54 oz/A. Post Emergent Herbicides: atrazine 0.75, Banvel 4 oz/A, 2,4-D 0.13 lb/A. Insecticide: none. **CULTIVATION:** once.

COMMENTS: Planted in good soil moisture. Weed control was good. Below normal precipitation for growing season, with August and September much drier than normal. The first freeze came almost three weeks before the average killing freeze date. The Medium maturity hybrid was not fully mature before the first freeze.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.5	1.3	9	1.0	457	0.6	6.5
8"-24"				1				
Comment	Alka	VLo	Mod	Lo	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Growing Season Precipitation and Temperature /1 Plainsman Research Center, Walsh, Baca County.

Month	Rainfall	GDD /2	> 90 F	> 100 F	DAP /3
	in		-----no. of days-----		
June	3.21	440	9	0	23
July	2.20	776	19	3	54
August	0.39	887	24	2	85
September	0.57	440	7	1	107
Total	6.37	2543	59	6	107

/1 Growing season from June 7 (planting) to September 22 (first freeze, 30 F).

/2 GDD: Growing Degree Days for sorghum.

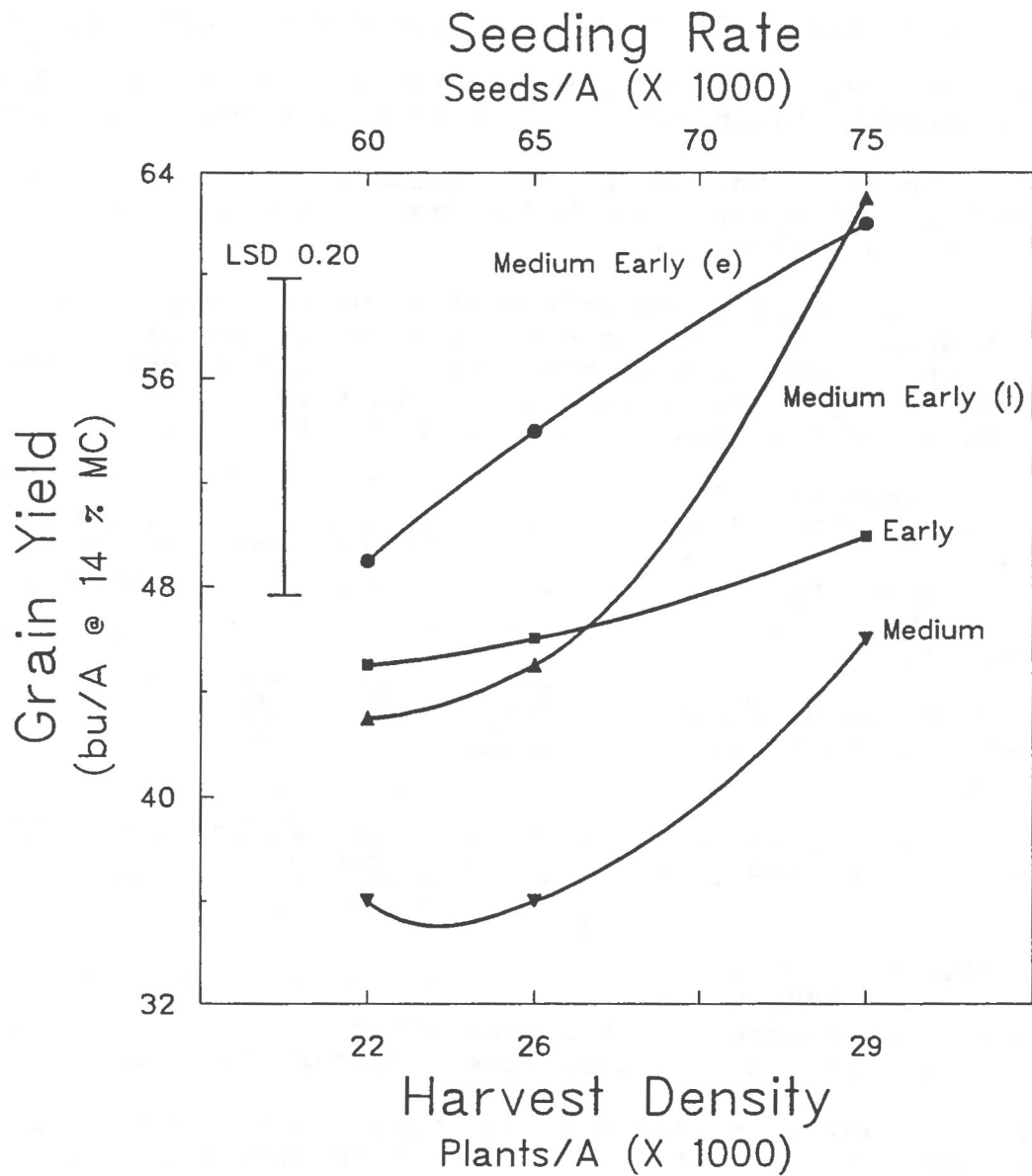
/3 DAP: Days After Planting.

Summary: Fertilization.

Fertilizer	N	P205	K2O	Zn	Fe
	-----lb/A-----				
Recommended	110	60	0	7	0
Applied	6/100	20	0	0	0

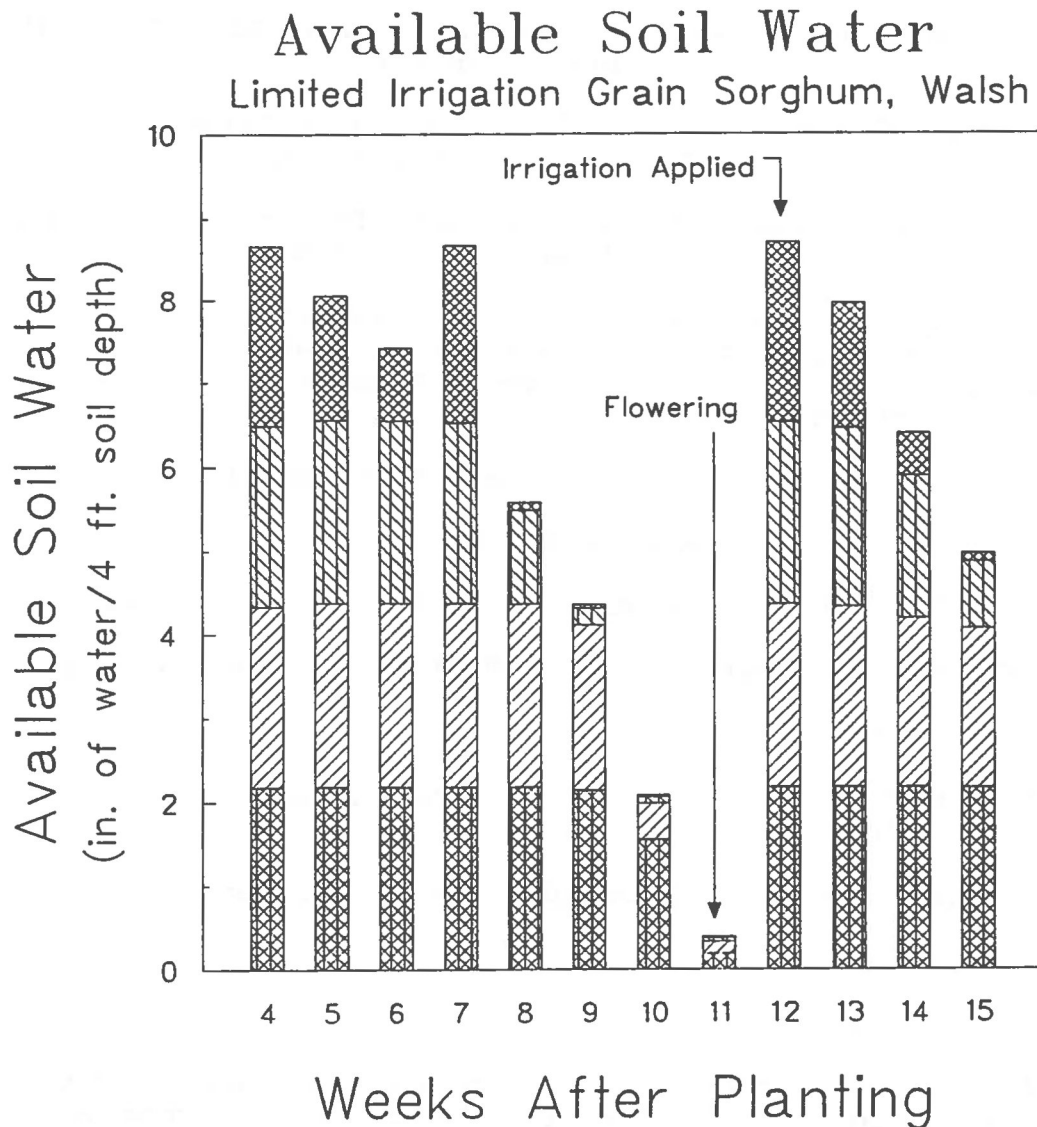
Yield Goal: 80 bu/A.

Actual Yield: 48 bu/A.



- Early, Pioneer 8771
- Medium Early (early), Cargill 607E
- ▲ Medium Early (late), Asgrow Seneca
- ▼ Medium, Triumph TR 481

Fig. 8. Seeding rate on limited irrigation grain sorghum at Walsh. Three seeding rates were tested 60, 65, and 75,000 seeds/A on four hybrids representing four maturity groups Early, Pioneer 8771; Medium Early (early), Cargill 607E; Medium Early (late), Asgrow Seneca; Medium, Triumph TR 481.



- Soil Depth 1 ft.
- Soil Depth 2 ft.
- Soil Depth 3 ft.
- Soil Depth 4 ft.

Fig. 9. Available soil water in limited 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 6.37 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Pre-Emergence Pigweed Control in a Sandy Loam Soil, 1995
Eads, Colorado

COOPERATORS: Tim Weeks Farm, Eads, and Kevin Larson,
Superintendent, Plainsman Research Center, Walsh.

PURPOSE: To evaluate herbicide mixtures for pre-emergence pigweed
control in a Sandy Loam soil on grain sorghum.

RESULTS: All pre-emergence herbicide treatments provided
excellent control of pigweed. Only MiloPro at 0.4 and 0.6 lb/A
caused no or almost no crop injury. MiloPro at 0.6 lb/A produced
the highest grain yield.

PLOT: four 30 in. rows, 50 ft. long; REPLICATIONS: 2.

PLANTED: June 13; HAND-HARVESTED: October 27.

HYBRID: CARGILL 607E; PLANTING DENSITY: 43,000 seed/A.

FIELD PREPARATION: Sweep plow; ROTATION: Continuous sorghum.

IRRIGATION: None.

PRE-EMERGENCE TREATMENTS APPLIED: June 21; Air Temp: 78 F; Soil
Temp: 72 F; Wind: 10 mph; Time: 6:00 pm.

VISUAL CONTROL RATING PERFORMED: July 22 and August 10.

SOIL: Sandy Loam.

INSECTICIDES: None.

COMMENTS: MiloPro (propazine) is an emergency use, section 18
herbicide. MiloPro must be reviewed each year to receive
emergency use status before it can be legally applied. Atrazine
is not labelled for use on sandy soils because of potential crop
injury. Pigweed was generally dispersed throughout the study
site; however, there were patches of puncture vine nonuniformly
distributed that may have contributed to the poor performance of
atrazine. Pre-emergence control of weeds is effective and
economical and is therefore a highly recommended practice.

Table 20.-Pre-Emergence Pigweed Weed Control in Sandy Loam Soil, Eads, Colorado, 1995.

Treatment	Rate	Pigweed Control		\1 Crop Injury	Treatment Cost\2	Grain Yield
		7/22	8/10			
	*/A	-----%-----		(0-4)	\$/A	bu/A
1 MiloPro	0.6 lb	100	100	0.0	8.74	59
2 MiloPro	1.2 lb	100	100	1.2	13.47	57
3 MiloPro	0.8 lb	100	100	0.5	10.32	54
4 MiloPro	0.4 lb	87	100	0.1	7.16	51
5 Atrazine	0.5 lb	100	100	0.3	5.56	46
6 MiloPro	0.8 lb	100	100	1.3	18.39	46
6 Dual	16 oz					
7 Cultivation Check		0	65	0.0	4.00	44
Average		84	95	0.5	9.66	51
LSD 0.10		2.6	31.2	0.55		10.8

\1 Pigweed control rating was performed after cultivation.

\2 All treatment costs include \$ 4.00/A for cultivation.

Planted: June 13; Harvested: October 27; Harvest Area: 5 ' X 10'.

Treatments applied: June 21; air temp., 78 F; soil temp. 72 F.

Weed control ratings performed July 22 and August 10.

Crop injury scale: 0, no injury; 4, 100 % injury.

Grain yields corrected to 14 % seed moisture content.

Post Emergence Pigweed Control in Grain Sorghum, 1995
Plainsman Research Center, Walsh

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

PURPOSE: To evaluate herbicide mixtures for post emergence pigweed control in grain sorghum.

RESULTS: All the post emergence herbicide mixtures provided good control of pigweed. Tough or Buctril (16 oz/A) mixed with atrazine (0.5 lb/A) and X-90 (0.5 %) caused the least crop injury and had significantly higher yields than the other herbicide mixtures.

PLOT: eight 30 in. rows, 876 ft. long; REPLICATIONS: 2.

PLANTED: June 15; HARVESTED: October 22.

HYBRID: CARGILL 607E; PLANTING DENSITY: 43,000 seed/A.

FIELD PREPARATION: Sweep plow; ROTATION: Wheat-Sorghum-Fallow.

IRRIGATION: None.

POST EMERGENCE TREATMENTS APPLIED: June 24; Air Temp: 86 F; Soil Temp: 72 F; Wind: 4 mph; Time: 10:30 am.

VISUAL CONTROL RATING PERFORMED: July 31 and August 9.

SOIL: Silty Clay Loam.

INSECTICIDES: None.

COMMENTS: Ally is not currently registered for use on sorghum. MiloPro is an emergency use, section 18 herbicide and is not labelled for post emergence use. Banvel and 2,4-D caused some leaf rolling injury to the grain sorghum crop. Recovery from crop injury may have been critical to high yields because it delayed maturation (the first freeze occurred almost three weeks before normal), and it used limited soil moisture for overcoming crop injury instead of filling seeds (the study received less than one inch of rain from boot to harvest).

Table 21.-Post Emergence Pigweed Weed Control in Grain Sorghum, Walsh, Colorado, 1995.

Treatment	Rate	Pigweed Control		Crop Injury	Treatment Cost\1	Grain Yield
		7/31	8/9			
	*/A	-----%-----		(0-4)	\$/A	bu/A
1 Tough	16 oz	95	98	0.4	14.57	43
1 Atrazine	1.0 lb					
1 X-90	0.5 %					
2 Buctril	16 oz	95	98	0.3	14.57	43
2 Atrazine	1.0 lb					
2 X-90	0.5 %					
3 Ally	0.05 oz	93	87	0.6	6.58	37
3 2,4-D Ester	0.25 lb					
3 X-90	0.5 %					
4 Ally	0.05 oz	93	87	0.6	6.65	36
4 2.4-D Amine	0.25 lb					
4 X-90	0.5 %					
5 Atrazine	1.0 lb	98	100	0.8	9.15	35
5 COC	32 oz					
5 2,4-D Amine	0.25 lb					
6 MiloPro	1.0 lb	93	100	0.8	13.91	35
6 COC	32 oz					
6 2,4-D Amine	0.25 lb					
7 Atrazine	1.0 lb	98	100	1.3	14.48	35
7 Banvel	4.0 oz					
7 2,4-D Amine	0.25 lb					
7 Buctril	8 oz					
7 X-90	0.5 %					
8 Atrazine	1.0 lb	98	100	1.1	11.20	33
8 Banvel	4 oz					
8 2,4-D Amine	0.25 lb					
8 X-90	0.5 %					
9 Check (Cultivation)		0	65	0	4.00	33
Average		85	93	0.7	10.57	37
LSD 0.10		4.8	5.1	0.45		3.1

\1 Treatment cost includes cultivation, \$ 4.00/A.

Planted: June 15; Harvested: October 22; Harvest Area: 20' X 876'.

Treatments applied: July 24; air temp., 86 F; soil temp. 72 F.

Weed control ratings performed July 31 and August 9.

Crop injury scale: 0, no injury; 4, 100 % injury.

Grain yields corrected to 14 % seed moisture content.

Performance of Greenbug Resistant Sorghum Hybrids in the
Arkansas Valley, 1995

by
F. C. Schweissing¹

1995 was the 20th year commercial greenbug-resistant hybrids were planted in a Colorado test. Since greenbugs can cause large yield reductions, producers of sorghum seed are continuing to incorporate greenbug resistance into their new hybrids.

This is a report of the grain sorghum test conducted at the Arkansas Valley Research Center. It provides farmers, Cooperative Extension personnel and commercial personnel with information on the performance of selected sorghum hybrids under a moderate to high infestation of greenbugs. Information from this test can assist the sorghum producer in knowing how much extra yield may result from control of greenbugs and yield reductions caused by greenbug feeding, under the existing populations, on cultivars entered in this test.

The test was financed, in part, by entry fees paid by participating firms. A comparable test is planned for 1996. Any firm or individual wishing to take part in the test should contact the author at the Arkansas Valley Research Center, Rocky Ford, CO 81067, telephone-FAX (719)254-6312; or Kevin Larson, Plainsman Research Center, Walsh, CO 81090, (719)324-5643.

Three commercial seed firms entered six hybrids in the test. Names and addresses of the firms involved are given in Table 1. Two hybrids were included as greenbug-susceptible check entries. These were DeKalb DK-64, a closed pedigree hybrid, and 399 X 2536, an open pedigree hybrid. The two check hybrids were entered by the Colorado Agricultural Experiment Station.

¹Superintendent and Entomologist, Arkansas Valley Research Center, Rocky Ford, CO.

Table 1.—Entrants in the Greenbug-Resistant Grain Sorghum Trial at Rocky Ford, 1995.

Brand	Entered by
CARGILL	CARGILL HYBRID SEEDS, Box 5645, Minneapolis, MN 55440
DEKALB	DEKALB GENETICS CORP., Rt. 2, Box 56, Lubbock, TX 79415
MYCOGEN	MYCOGEN PLANT SCIENCES, 624 27 th Street, Lubbock, TX 79404
	Colorado Agricultural Experiment Station entered the checks: DeKalb brand DK-64 and TXms 399 X TXR2536.

TESTING PROCEDURE

Individual plots of each hybrid consisted of four rows spaced 30 inches apart and 70 feet long. Each plot was split by four foot alleys, with one-half sprayed, at random, with an insecticide. Plots were replicated four times.

Plots were planted May 11, 1995 at ca. 6 lbs. per acre. Soil condition was slightly moist at the time, but a pre-emergence irrigation was needed. Germination and seedling emergence was delayed somewhat due to cool soil temperatures. The plot area was fertilized during the winter with 150 pounds of nitrogen and 50 pounds of P₂O₅ per acre. A pre-emergence application of 3.2 pounds AI of propachlor and 1.6 pounds of bifenoX AI per acre provided adequate weed control.

The plot area was irrigated five times: May 15, July 13, July 26, August 10 and September 4. 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 August 21, 1995. An aerial application of chlorpyrifos (.125 lbs. AI/A) was applied to the whole field August 4.

All plots were harvested November 8, 1995.

RESULTS

Agronomic data for the cultivars entered in the test are presented in Table 2. Greenbug activity did not influence the days to bloom or test weight, except for the open pedigree check, to any great degree. The overall days to bloom was longer than previous years due, probably, to a very cool, wet May and June. This was not a particularly good production year for grain sorghum at the Center. Yields were down about 2500 lbs. per acre from 1994.

Table 2.-Agronomic Data for Cultivars Tested in the Greenbug-Resistant Trial at Rocky Ford, 1995.

Brand	Hybrid	Sprayed		Unsprayed	
		Days to Bloom	Test Wt	Days to Bloom	Test Wt
		(No)	(Lbs)	(No)	(Lbs)
CARGILL	X11432	86	50.5	86	50.4
CARGILL	X19225	97	50.2	97	50.4
CARGILL	X19207	98	47.6	98	48.4
DEKALB	DK-55	93	49.9	93	50.6
DEKALB	DK-54	93	52.6	93	52.9
DEKALB	DK-64 (CK)	94	52.5	94	52.0
MYCOGEN	T-E Y-75	95	50.2	95	51.1
	399 X 2536 (CK)	95	49.4	95	45.3
Average		94	50.3	94	50.1

Greenbug counts, obtained on August 27 and September 2 in both sprayed and unsprayed plots, are presented in Table 3 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 are an indication of relative levels of nonpreference (antixenosis) and/or antibiosis factors in the plant. Populations were higher on the plants of the unsprayed open pedigree check (399 X 2536), than they have been for several years, however populations were somewhat lower on the rest of the unsprayed hybrids than last year. The populations involved appeared to effect leaf loss and yields between treated and untreated plots in some cultivars.

The parasitic wasp, *Lysiphlebus testaceipes*, and the convergent lady beetle, *Hippodamia convergens*, were present in low numbers through the trial period and appeared to have little effect on the greenbug populations.

Greenbug samples collected on August 28 and September 12 were forwarded to Dr. Gerald Wilde at Kansas State University for biotype and insecticide resistance determinations. Samples collected August 28 from a biotype E resistant hybrid were biotype I while those collected from a non-resistant hybrid were a mixture of biotypes E and I. Pattern 2 insecticide resistance was greater than 90% Greenbugs collected September 12 were entirely biotype I from resistant and nonresistant hybrids while pattern 2 resistance continued above the 90% level.

Percent leaf loss or leaf damage is also presented in Table 3. Leaf loss or damage was determined from average number of leaves lost by September 24 divided by total number of green leaves on the plant on July 17. 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. Greenbug damage to the leaves progresses from lower to upper leaves. Data shows there was significant leaf loss in the unsprayed check (399 X 2536) resulting in a substantially reduced yield.

Table 3.-Greenbug Counts, Leaf Data, and Grain Yield per Acre for Cultivars Tested in the Greenbug-Resistant Trial at Rocky Ford, 1995.

Brand	Hybrid	Sprayed						Unsprayed				
		Counts		Leaf Data		Yield	Rank	Counts		Leaf Data		Yield
		8-27	9-2	Total	Loss	/Acre		8-27	9-2	Total	Loss	/Acre
(No)	(No)	(No)	(%)	(Lbs)	(No)	(No)	(No)	(%)	(Lbs)			
MYCOGEN	T-E Y-75	0	0	14	48	6770	5	11	16	14	49	7028
DEKALB	DK-55	0	0	13	48	6847	3	93	278	13	51	6436
DEKALB	DK-54	0	0	13	51	7155	1	207	77	13	57	6307
DEKALB	DK-64 (CK)	0	0	13	42	7117	2	193	342	13	52	6274
CARGILL	X19225	0	0	14	43	6782	4	310	152	14	48	6259
CARGILL	X11432	9	1	12	46	6653	6	197	38	12	46	5959
CARGILL	X19207	0	2	15	31	5307	7	304	459	14	41	5641
	399 X 2536 (CK)	4	66	14	47	5288	8	1600	1763	13	92	1945
Average						6490						5731
LSD (P=.05)						609						805

Differences in leaf loss and yield between sprayed and unsprayed plots for the other hybrids were variable. Results from past years indicate loss of lower leaves in the 50% range or under results in little yield loss. Reaction to leaf loss is variable depending on hybrid.

Leaf loss indicates a combination of damage by the greenbug and level of tolerance in the plant to infestation. Lower populations of greenbugs, for example, in unsprayed plots combined with a higher percentage of leaf loss indicates lower tolerance. Higher greenbug populations combined with a lower percentage leaf loss indicates increased tolerance levels in the plant.

Growers interested in the maximum yield available from a resistant cultivar in the presence of a moderate to high greenbug population should note the ranking of the yields in the unsprayed plots in either Table 3 or 4. In Table 3, the eight hybrids are ranked according to their yield performance in the unsprayed plots. It should be noted there was not a statistical difference in the top five hybrids. All of the other hybrids had substantially lower greenbug populations than the open pedigree check (399 X 2536) so it is possible to assume that these resistant hybrids exhibit some degree of non-preference and/or antibiosis along with tolerance. However, a couple of the hybrids, including the open pedigree check (DK-64) had substantially reduced yields in the untreated plots even though greenbug populations were not particularly high.

In Table 4, the hybrids are ranked from high to low according to their grain yield in the sprayed plots. Overall the sprayed plots produced a higher yield than the unsprayed plots, however, there was little difference between the sprayed and unsprayed plots for some hybrids. Choosing a hybrid producing high yields combined with little difference between treatments would allow a grower to gain maximum yields without spraying except, possibly, under a situation when very high greenbug populations are present. The lack of a difference in the sprayed vs. unsprayed plots is an indication of the degree of resistance and/or tolerance in the sorghum hybrid.

Biotype identification at the beginning and end of this trial period indicated a strong probability this was a very good test of the resistance of the entered hybrids to the biotype I greenbug.

Table 4.-Comparison of Grain Yields of Cultivars Tested in the Greenbug-Resistant Trial at Rocky Ford, 1995.

Brand	Hybrid	Sprayed	Unsprayed		Difference	
		Yield /Acre (Lbs)	Yield /Acre (Lbs)	Rank (No)	Yield /Acre (Lbs)	Rank (No)
DEKALB	DK-54	7155	6307	3	848	7
DEKALB	DK-64(CK)	7117	6274	4	843	6
DEKALB	DK-55	6847	6436	2	411	3
CARGILL	X19225	6782	6259	5	523	4
MYCOGEN	T-E Y-75	6770	7028	1	-258	2
CARGILL	X11432	6653	5959	6	694	5
CARGILL	X19207	5307	5641	7	-334	1
	399 X 2536(CK)	5288	1945	8	3343	8
Average		6490	5731		759	
LSD(P=.05)		609	805		1260	

Chemical Control of Greenbugs on Sorghum - 1995
Arkansas Valley Research Center
Colorado State University
Rocky Ford, Colorado

Weather for the season was defined by a very cool, wet (6.89") May and June followed by a hot, dry (1.09") August and September. Accumulated growing degree days (50-86°F) during May and June were about half of normal and even with a warm August and September total seasonal degree days were below normal. The irrigation water supply was adequate, but sorghum yields were lower than usual.

There was a mixture of biotypes E and I in the greenbug population at the beginning of the trial and most of the greenbugs were found to have pattern 2 resistance to insecticides. The parasitic wasp, *Lysephlebus testaceipes*, was present during the latter part of the season, but did not eliminate the greenbug population.

Methods and Materials - Supporting information relating to the test plots is given on page 3.

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. The seed treatment plots were in a separate area of the field from the foliar treatment plots.

Lorsban 4E at .125 lbs. ai/acre (2 gpa) was flown on the field on August 4 for the sole purpose of inducing insecticide resistance in the greenbug population. Insecticides were applied to the foliar test August 20, about 14 days after flowering, with a compressed air sprayer, mounted on a Hahn Hi-Boy, at 40 p.s.i. at the rate of 25 g.p.a. Granules were applied by hand over the row. In the Gaucho seed treatment test, Apron was applied to all seed including the Gaucho untreated seed.

Greenbug counts were taken from two whole plants per plot at each counting date August 27 and September 2 and 9. This amounts to 8 plants per treatment from 4 replications per date in each test.

Leaf loss was determined by comparing the average number of dead leaves per plant on September 24 with 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. Yields were obtained from 4 replications in the foliar test and 8 replications in the seed treatment test.

Results and Discussion - The trial was carried out on a biotype E susceptible hybrid and a sample taken the first week (8/28) of the test showed a mixture of E and I aphids, however, at the end of the test virtually all the sampled aphids were biotype I. The early sample also indicated a pattern 2 insecticide resistance of ca. 90 to 100% after an early application (8/4) of a low rate of Lorsban (.125 lbs. AI/A.). This level and pattern of resistance in the samples taken (9/12) after the conclusion of the test continued in aphids sampled from

the Capture, DiSyston, Cygon and untreated plots.

All of the treatments reduced greenbug populations below the untreated plots at the first count (Table 1), but it was particularly noteworthy for the treatments including Furadan, malathion and Supracide. Whether this is related to the early application of a low rate of Lorsban or the predominate pattern 2 resistance is not known. Overall yields were substantially lower than the previous year (1994) which probably had more to do with the weather conditions than greenbug populations. There was a significant yield difference between the untreated plots and several of the treatments; however yields in the untreated plots were much higher than the 1994 untreated plots. Table 2 shows the results of seed treatment with Gaucho and indicates this treatment continues to reduce greenbug populations and increase yields over untreated plots. Lodging was not a factor this year.

Yields in the untreated plots (Table 1) averaged 85.8 bu. per acre compared to 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 Schweissing

Test Plot Information - 1995
Arkansas Valley Research Center

Purpose - To evaluate the effectiveness of various insecticides for the control of greenbugs, Schizaphis graminum (Rondani), on sorghum. The greenbugs were mostly biotype I with >90% pattern 2 insecticide resistance.

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

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

Design - Randomized block (foliar test - 4 replications, seed - 8 replications).

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

Fertilizer - 50 lbs. P₂O₅ plowdown, 150 lbs. N as NH₃ chisel preplant.

Herbicide - Modown 2 lbs. AI + Ramrod 3 lbs. AI/Acre on May 11.

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

Plant - May 11, 1995

Flowering - August 6

Irrigate - 5/15, 7/13, 7/26, 8/10, 9/4

Treated - Lorsban .125 lbs. AI/A. aerial 2 g.p.a. - 8/4

Plots - August 20, 1995 - Hahn Hi-Boy - Compressed air sprayer - 40 p.s.i. 25 g.p.a. - TW12 cone nozzle - Seed treated preplant by Gustafson, Inc.

Harvest - November 8, 1995 - 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. 1995.

Treatment ¹		AI ²	Greenbug Counts ³			Leaf Loss	Yield ⁵ Bu./Acre	
			8/27	9/2	9/9			
Supracide	2E	.50	1	1	2	63	115.2	a
Cygon	4E	.50	92	8	13	65	109.7	ab
Malathion	5E	1.00	0	1	0	66	106.9	abc
Lorsban	4E	.50	137	29	11	69	106.4	abc
Capture + Lorsban ^a		.04 + .50	96	75	40	69	105.1	abc
Dyfonate	4E	1.00	52	40	10	69	104.5	abc
Furadan	4F	.50	0	0	1	63	104.5	abc
PBO + Lorsban ^b		.10 + .50	82	76	41	71	103.2	abc
Metasystox R	2E	.50	21	8	4	65	103.0	abc
Malathion + Lorsban ^b		.50 + .50	0	0	0	63	101.9	abc
Parathion	4E	.50	131	216	45	71	101.3	abc
Lorsban	75WG	.50	44	99	36	67	100.6	abcd
Lorsban WG + PBO ^a		.50 + .10	359	249	37	73	100.0	bcd
Capture		.04	389	762	571	77	99.7	bcd
Parathion + Lorsban		.50 + .50	199	4	81	71	97.6	bcde
Lorsban E + PBO ^a		.50 + .10	191	383	29	75	95.4	bcde
Thimet	20G	6 oz.	473	148	120	75	92.6	cde
DiSyston	8E	.50	151	228	71	73	92.0	cde
Untreated			1088	478	316	81	85.8	de
Pirimor	50DF	.25	575	398	120	77	84.5	e
Column Mean			204	160	77	70	100.5	
LSD(P=0.05)							12.4	

1 - Treated - August 20, 1995 a - tank mix b - 1st chemical applied 2 hrs. before 2nd.

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

3 - Average number per plant, 2 plants per plot, 4 replications per treatment.

4 - Determined (9/24/95) from average number of leaves lost per plant after lay-by time. Average 12 leaves per plant at lay-by time.

5 - Harvest November 8, 1995. Average of four replications per treatment adjusted to 14% moisture and 56 lb. bushel. Yields followed by the same letter are not significantly different DMRT (P=0.05).

Table 2.-Seed treatment for control of greenbugs on sorghum. Counts, leaf loss and yields. Arkansas Valley Research Center. C.S.U., Rocky Ford, Colorado. 1995.

Treatment ¹	AI ²	Greenbug Counts ³			Leaf Loss	Yield ⁵ Bu/Acre	
		8/27	9/2	9/9			
Gaicho	4805 4 oz.	215	28	0	58	117.6	a
Gaicho	4805 2 oz.	150	390	0	58	111.9	a
Untreated		350	1670	290	78	78.2	b
LSD (P=0.05)						7.5	

1 - Planted May 11, 1995

2 - The actual insecticide per 100 lbs. of seed.

3 - Average number per plant, 2 plants per plot, 4 replications per treatment.

4 - Determined (9/24/95) from average number of leaves lost per plant after lay-by time. Average 12 leaves per plant.

5 - Harvest November 8, 1995. Average of eight replications per treatment adjusted to 14% moisture and 56 lb. bushels. Yields followed by the same letter are not significantly different DMRT (P=0.05).