

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 2000

TR01-2

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SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 2000
K.J. Larson, F.C. Schweissing, and D.L. Thompson \1

The 2000 Colorado grain sorghum crop was estimated at 5.7 million bushels, 35% lower than the 1999 production level. The decrease in sorghum production was due mainly to a decrease in average yield and secondly to fewer harvested acres. In 1999 the average yield was 44 Bu/A, whereas, in 2000 average yield was only 30 Bu/A. There was a small, 5%, decrease in acreage from 200,000 harvested acres in 1999 to 190,000 harvested acres in 2000. The yield of 30 Bu/A is well below average (second lowest in 10 years), which reflects the very dry conditions for the sorghum producing areas of Colorado during 2000. Sorghum silage production in 1999 was 170,000 tons, up 19% from 1998. Sorghum silage production for 1999 was the highest recorded over the past ten years. The increase in silage production was attributed to higher average yield in 1999 with 17 Tons/A and 10,000 acres, whereas in 1998 the average yield was 13 Tons/A from 11,000 acres (Colorado Agricultural Statistic Service, 2000).

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 four sites in Southeastern Colorado: dryland grain sorghum trials were conducted at 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 interested in entering sorghum hybrids in any of the tests should write to 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 2000 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 data (on-site portable weather stations and NOAA, 2000), soil analysis, 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, 2000.

Brand	Entered by
ASGROW	Monsanto, RR 3, Box 119, Plainview, TX 79072
BUFFALO BRAND	Sharp Brothers Seed Co., P.O. Box 140, Healy, KS 67850
DEKALB	Monsanto, RR 3, Box 119, Plainview, TX 79072
GARRISON & TOWNSEND	Garrison & Townsend, Inc., P.O. Drawer 2420, Hereford, TX 79045
GOLDEN HARVEST	Golden Harvest Seeds/The J.C. Robinson Seed Company, P.O. Box A, Waterloo, NE 68069
KAYSTAR	Kaystar Seed, P.O. Box 947, Huron, SD 57350
MYCOGEN	Mycogen Seeds, 1117 Recharge Road, York, NE 68467
NC+	NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504
NOVARTIS SEEDS	Novartis Seeds, Inc., P.O. Box 1211, 811 N. Wall St., Stratford, TX 79084
PIONEER	Pioneer Hi-Bred International, Inc., 1616 South Kentucky St., C-150, Amarillo, TX 79102
RICHARDSON	Richardson Seed's, Inc., P.O. Box 60, Vega, TX 79092
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 TXR2737 (399 X 2737); forage sorghum, NB 305F; corn hybrids, MYCOGEN 2725 and TRIUMPH TR 1514A Bt.

Growing Degree Days for sorghum were calculated using 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.

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

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

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

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

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

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

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

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

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

Available Soil Water

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

Statistical Method

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

Acknowledgments

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

References

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Early Maturing Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2000

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

PURPOSE: To identify high yielding hybrids, when planted late in the season (July 7), under irrigated conditions with 2200 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: July 7. HARVESTED: October 26.

EMERGENCE DATE: 5 days after planting. SOIL TEMP: 77 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb/A. Post Emergence Herbicides: None. CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planting conditions were very good; the site was pre-irrigated prior to planting. Weed control was good. Below normal precipitation for the growing season, with August and September being very dry. No greenbug infestation. None of the hybrids lodged. An early freeze (18 days earlier than average), lowered test weights and grain yields.

SOIL: Silty Clay for 0-8" and Silty Clay 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-----		
July	2.10	691	20	2	24
August	0.44	927	29	8	55
September	0.16	557	15	4	80
October	0.00	0	0	0	0
Total	2.70	2157	64	14	80

\1 Growing season from July 7 (planting) to September 25 (first freeze, 28 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	0.6	2.1	14	2.6	467	0.1	3.6
8"-24"				20				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	VLo	Marg
Manganese and Copper levels were adequate.								

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	125/6	20	0.75	0
Yield Goal: 75 Bu/A.				
Actual Yield: 35 Bu/A.				

Available Soil Water
Irrigated Grain Sorghum, Early Maturing, Walsh, 2000

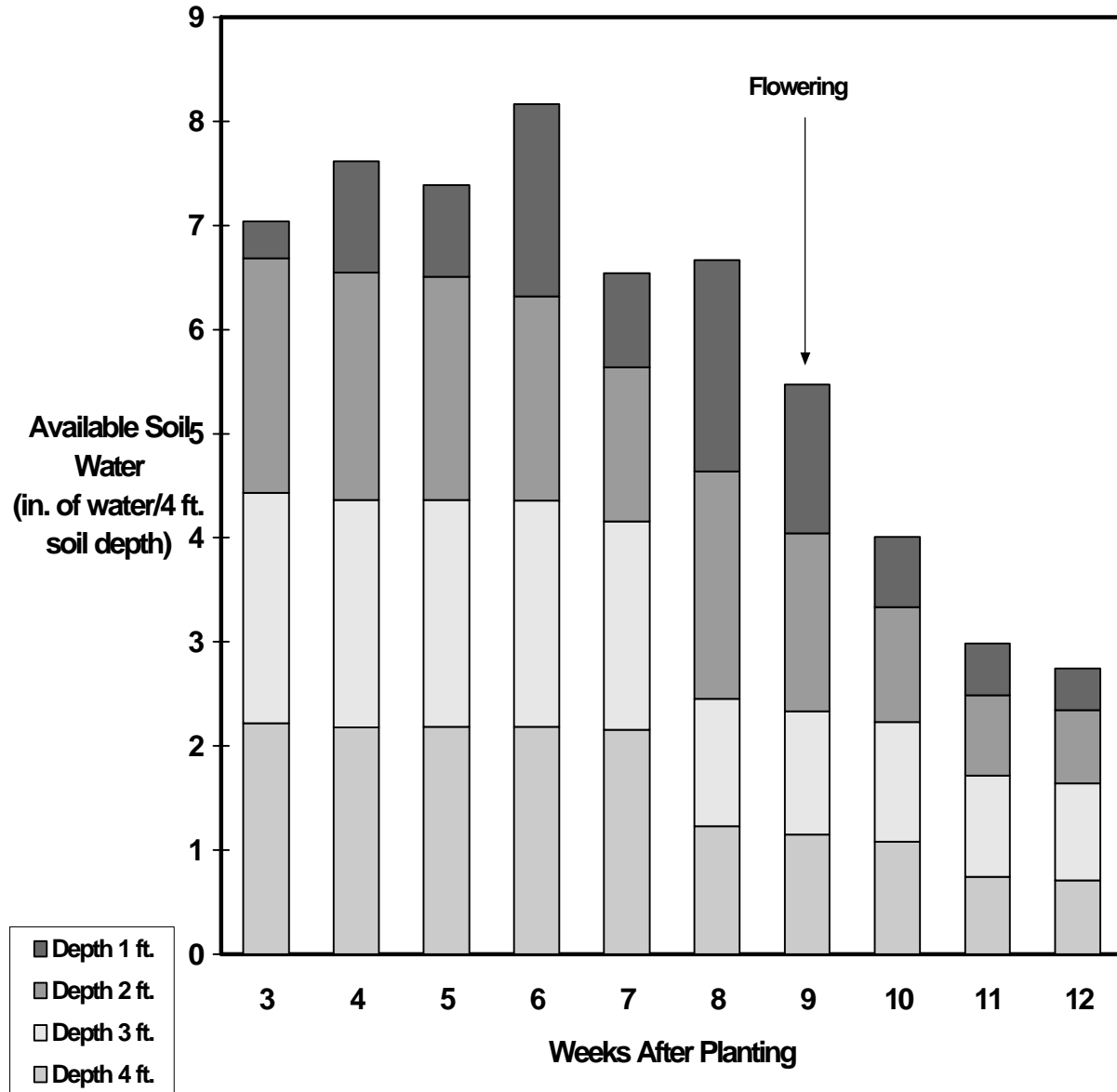


Fig. 1. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 2.70 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 3.--Summary: Grain Sorghum Early Maturing Hybrid Performance Tests, 1998-2000.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A298	56	56	43	50	52	124	111	123	117	119
ASGROW	A201	44	41	--	43	--	98	81	--	90	--
CARGILL	576	46	50	--	48	--	103	100	--	102	--
DEKALB	DK-28E	45	60	51	56	52	100	119	146	133	122
MYCOGEN	3556	48	61	40	51	50	107	122	114	118	114
PIONEER	87G57	41	59	52	56	51	92	118	149	134	120
(Check)	399 X 2737	36	20	4	12	20	80	39	11	25	43
Average		45	50	35	43	43					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland at Walsh for 1998; Dryland at Vilas for 1999 Irrigated at Walsh for 2000.

Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2000

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 2800 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 14. HARVESTED: November 3.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 69 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides: Atrazine 0.75 Lb AI/A, Banvel 2 Oz/A, COC 1.0 Qt/A. CULTIVATION: Once. INSECTICIDE: None.

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

COMMENTS: Planted in good soil moisture, but planting was delayed due to dry conditions prior to planting. Broadleaf weed control was very good; however, the site was highly infested with sandbur. Below normal precipitation for the growing season with a dry June, August and September. No greenbug infestation. Some of the hybrids lodged. Grain yields were fair.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.00	0	0	0	0
June	0.90	331	8	0	16
July	3.17	868	26	3	47
August	0.44	927	29	8	78
September	0.16	557	15	4	103
October	0.00	0	0	0	0
Total	4.67	2761	78	15	103

\1 Growing season from May 31 (planting) to October 4 (first freeze, 28 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"-24"	7.7	0.4	0.7	5 4	1.0	146	0.1	3.8
Comment	Alka	VLo	Lo	Lo	VLo	Hi	VLo	Marg
Manganese and Copper levels were adequate.								

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	19	40	2	0
Applied	50/6	20	0	0
Yield Goal: 60 Bu/A. Actual Yield: 34 Bu/A.				

Available Soil Water Dryland Grain Sorghum, Vilas, 2000

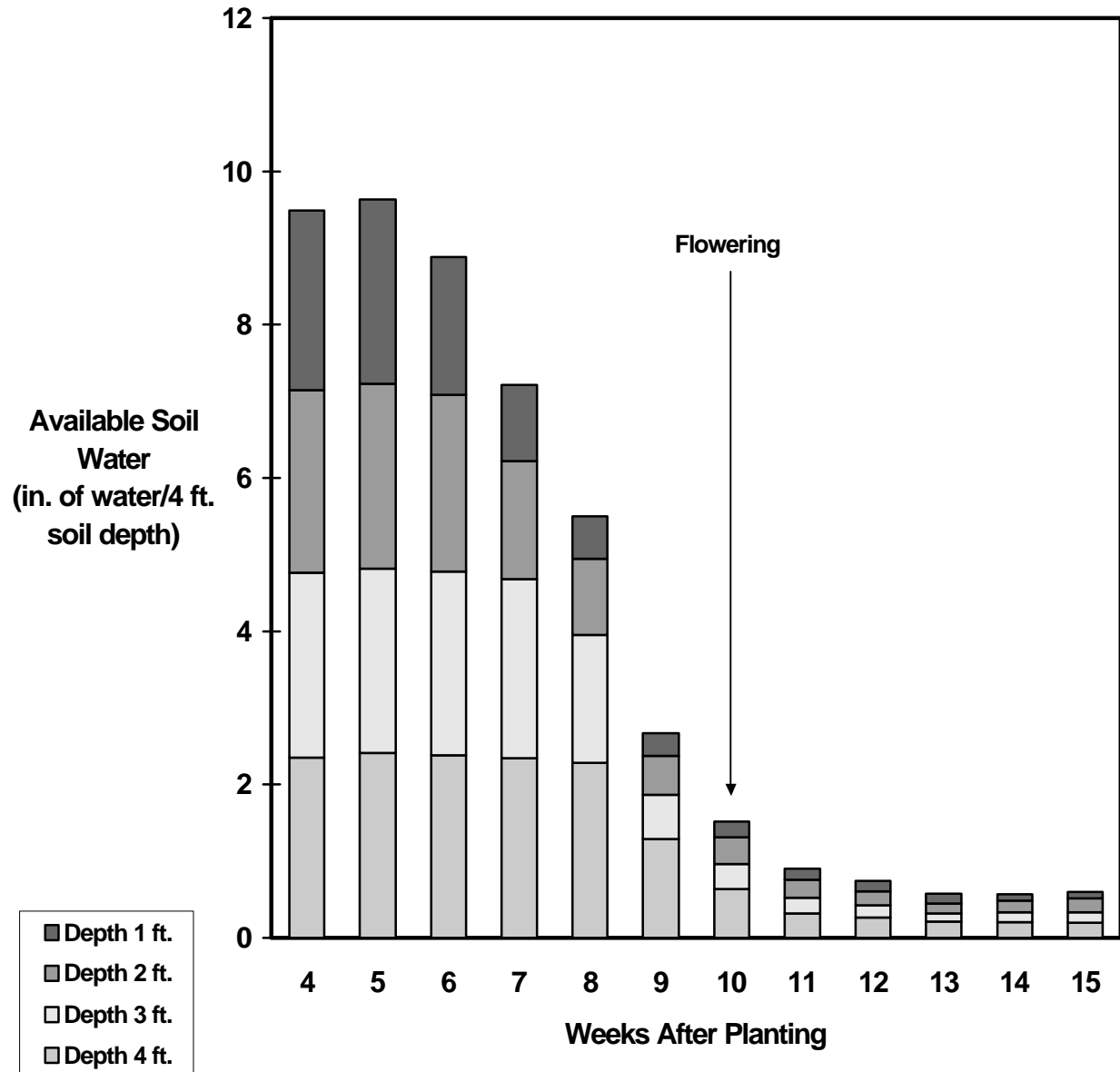


Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Vilas from planting to first freeze was 4.67 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2000. \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/>													
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
ASGROW	Seneca	8	69	1846	107	ME	36	20.5	0	60	40	118	
DEKALB	DK-44	9	67	1791	105	ME	39	19.8	0	60	40	118	
PIONEER	85G85	10	67	1791	108	ME/M	34	19.8	10	59	39	115	
PIONEER	85Y34	9	61	1620	100	ME	41	18.6	0	59	38	112	
MYCOGEN	1482	9	65	1745	105	ME	39	14.7	3	58	36	106	
DEKALB	X944	9	67	1791	107	ME	43	15.1	3	59	35	103	
PIONEER	8505	9	65	1745	102	ME/M	39	22.8	7	58	35	103	
TRIUMPH	TR 438	9	65	1745	102	ME	38	23.2	11	59	34	100	
MYCOGEN	M3838	9	67	1791	106	ME	41	17.8	0	58	33	97	
DEKALB	DK-43A	9	68	1820	106	ME/M	34	16.7	5	59	32	94	
TRIUMPH	TR 459	9	68	1820	107	ME	39	19.4	0	60	31	91	
ASGROW	Laser	8	59	1553	99	ME	39	16.7	0	59	29	85	
(Check)	399 X 2737	8	73	1966	HD	M/ML	37	17.4	0	55	25	74	
<hr/>													
Average		9	66	1771	105	ME	38	18.7	3	59	34		
LSD 0.20												7.1	

\1 Planted: June 14; Harvested: November 3.

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, 1998-2000.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	109	116	40	78	88	99	96	118	107	104
CARGILL	627	123	120	--	122	--	111	100	--	106	--
CARGILL	647	120	114	--	117	--	108	85	--	97	--
CARGILL	697	116	127	--	122	--	105	105	--	105	--
CARGILL	770Y	115	125	--	120	--	104	104	--	104	--
DEKALB	DK-38y	96	108	--	102	--	87	90	--	89	--
DEKALB	DK-43A	119	126	32	79	92	109	105	94	100	103
DEKALB	DK-44	113	122	40	81	92	102	101	118	110	107
DEKALB	X-944	--	117	35	76	--	--	97	103	100	--
MYCOGEN	1482	--	119	36	78	--	--	98	106	102	--
PIONEER	8505	--	120	35	78	--	--	99	103	101	--
PIONEER	85Y34	--	116	38	77	--	--	96	112	104	--
TRIUMPH	TR 447	121	118	--	120	--	110	98	--	104	--
TRIUMPH	TR 459	99	118	31	75	83	90	98	91	95	93
(Check)	399 X 2737	111	122	25	74	86	100	101	74	88	92
Average		110	120	34	77	88					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2000

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 3200 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 24. **HARVESTED:** October 26.

EMERGENCE DATE: 10 days after planting. **SOIL TEMP:** 67 F.

PEST CONTROL: Preemergence Herbicides: Atrazine 1.0 Lb/A. Post Emergence Herbicides: Buctril 16 oz/A, Banvel 2.0 Oz/A, Atrazine 0.5 Lb/A. **CULTIVATION:** Once. **INSECTICIDES:** None.

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

COMMENTS: Planted in maginal soil moisture. Weed control was good. Below normal precipitation for the growing season, with a dry May and June and very dry August and September. No greenbug infestation. A few of the hybrids lodged. Grain yields were good.

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

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.18	187	4	2	7
June	1.37	652	15	0	37
July	3.17	868	26	3	68
August	0.44	927	29	8	99
September	0.16	557	15	4	124
Total	5.32	3191	89	17	124

\1 Growing season from May 24 (planting) to September 25 (first freeze, 28 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	1.7	5	4.0	407	0.2	4.8
8"-24"				4				
Comment	Alka	Vlo	Hi	Mod	Lo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	20	2	0
Applied	60/6	20	0	0

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

Available Soil Water
Dryland Grain Sorghum, Walsh, 2000

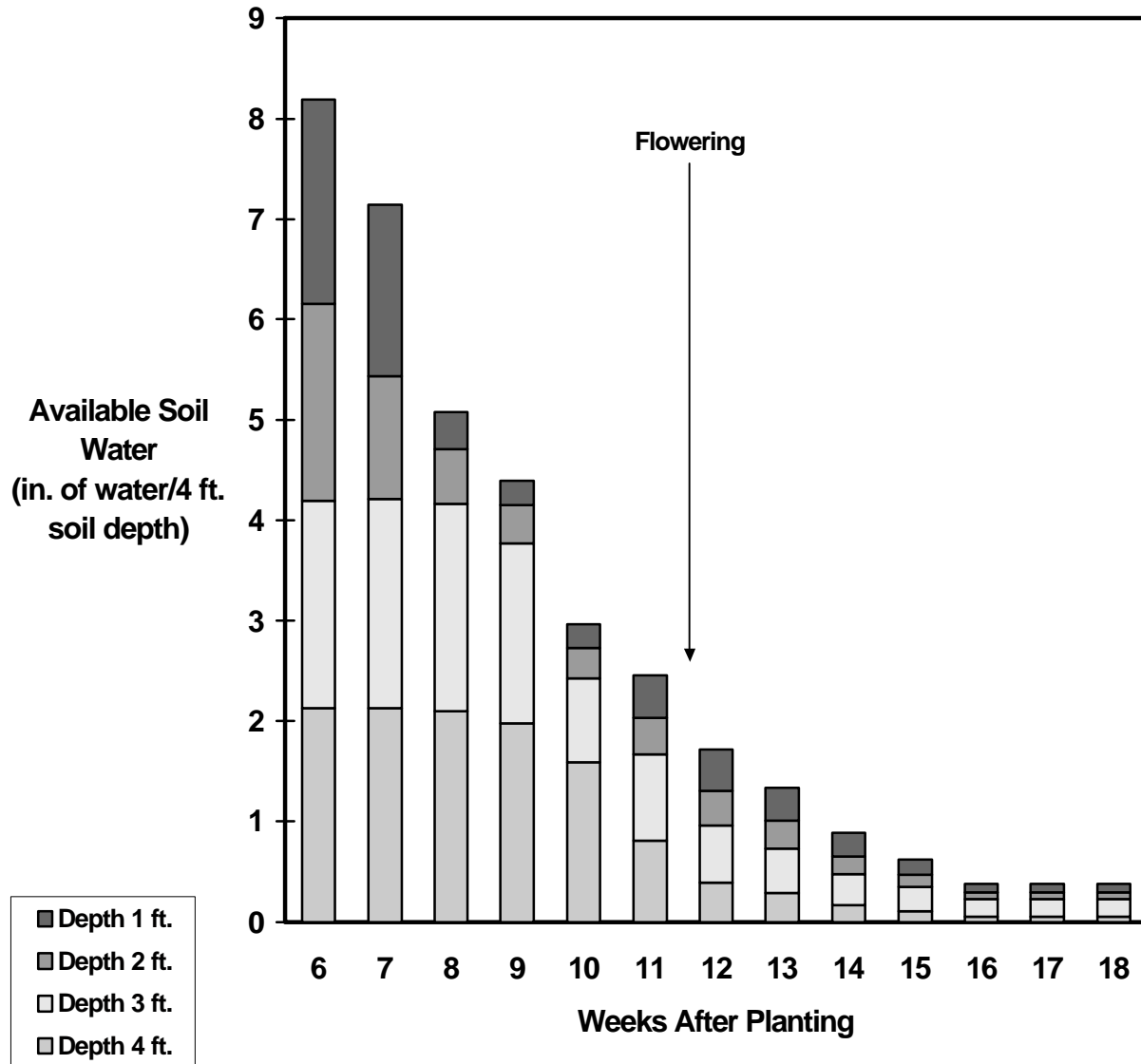


Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 5.32 in. Any increase in available soil water between weeks is from rain.

Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2000. \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	
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
NOVARTIS SEEDS	KS 310	9	74	1887	123	E	36	23.2	0	56	48	96	
DEKALB	DK-43A	12	81	2103	132	ME/M	38	23.6	0	60	57	114	
PIONEER	85Y34	10	75	1913	125	ME	40	25.9	0	59	56	112	
MYCOGEN	1482	10	77	1976	127	ME	38	20.5	0	59	56	112	
KAYSTAR	X060	10	82	2137	132	ME/M	37	22.1	35	59	55	110	
DEKALB	DK-44	10	80	2070	131	ME	38	28.3	2	60	55	110	
TRIUMPH	TR 438	9	75	1913	125	ME	41	23.2	0	59	54	108	
DEKALB	X944	9	79	2037	130	ME	39	27.1	0	59	53	106	
ASGROW	Seneca	10	82	2137	132	ME	36	25.2	0	60	50	100	
PIONEER	8505	9	77	1976	126	ME/M	39	24.4	0	60	50	100	
MYCOGEN	M3838	9	81	2103	131	ME	37	21.3	0	60	49	98	
PIONEER	85G85	11	81	2103	132	ME/M	35	24.0	0	59	49	98	
ASGROW	Laser	11	74	1856	126	ME	40	20.1	4	60	46	92	
DEKALB	DK-40y	11	80	2070	131	ME	38	26.3	0	56	44	88	
KAYSTAR	KS-505	9	78	2007	127	ME	39	19.8	0	59	43	86	
NC+	5B74E	10	81	2103	132	ME	35	20.1	0	58	40	80	
NOVARTIS SEEDS	KS 585	9	84	2209	134	M	36	19.4	0	61	55	110	
KAYSTAR	X080	11	85	2239	134	M	39	24.8	18	58	52	104	
NC+	6B50	10	84	2209	134	M	39	24.8	0	58	49	98	
(Check)	399 X 2737	9	88	2308	138	M/ML	36	21.3	0	59	38	76	
Average		10	80	2068	130	ME	38	23.3	3	59	50		
LSD 0.20											5.6		

\1 Planted: May 24; Harvested: October 26.

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, 1998-2000.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	80	85	50	68	72	89	103	100	102	97
CARGILL	770Y	99	81	--	90	60	110	99	--	105	--
DEKALB	X-944	--	79	53	66	--	--	96	106	101	--
DEKALB	DK-40y	--	85	44	65	--	--	103	88	96	--
DEKALB	DK-38y	96	77	--	87	58	107	94	--	101	--
DEKALB	DK-43A	113	85	57	71	--	126	104	114	109	--
DEKALB	DK-44	88	86	55	71	76	98	104	110	107	104
MYCOGEN	1482	--	83	56	70	--	--	101	112	107	--
NC+	6B50	85	--	49	67	--	95	--	98	97	--
NC+	5B74E	101	79	40	60	73	112	96	80	88	96
NOVARTIS SEEDS	KS 310	--	78	48	63	--	--	95	96	96	--
NOVARTIS SEEDS	KS 585	97	83	55	69	78	108	103	110	107	107
PIONEER	8505	95	84	50	67	76	106	102	100	101	103
PIONEER	85Y34	99	86	56	71	80	110	105	112	109	109
TRIUMPH	TR 438	--	85	54	70	--	--	103	108	106	--
(Check)	399 X 2737	74	75	38	57	62	82	92	76	84	83
Average		90	82	50	66	74					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 2000

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3200 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 16; Replanted May 30. HARVESTED: October 16.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 65 F.

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

CULTIVATION: None. INSECTICIDE: Lorsban 16 oz/A for greenbug control.

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

Summary: Growing Season Precipitation and Temperature \1 Hartman, Prowers County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.21	292	4	1	15
June	0.92	650	13	1	45
July	2.34	866	22	5	76
August	2.71	919	27	7	107
September	0.38	522	14	2	132
Total	6.56	3249	80	16	132

\1 Growing season from May 16 (planting) to September 25 (first freeze, 27 F).
 \2 GDD: Growing Degree Days for sorghum.
 \3 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture. Weed control was fair. Below normal precipitation for the growing season with May and September below average. A greenbug infestation was controlled with insecticide. None of the hybrids lodged. Grain yields were very good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.9	2.3	26	2.6	219	0.5	4.4
8"-24"				8				
Comment	Alka	VLo	VHi	Hi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	150/6	40	2	0

Yield Goal: 140 Bu/A.
 Actual Yield: 129 Bu/A.

Available Soil Water
Irrigated Grain Sorghum, Hartman, 2000

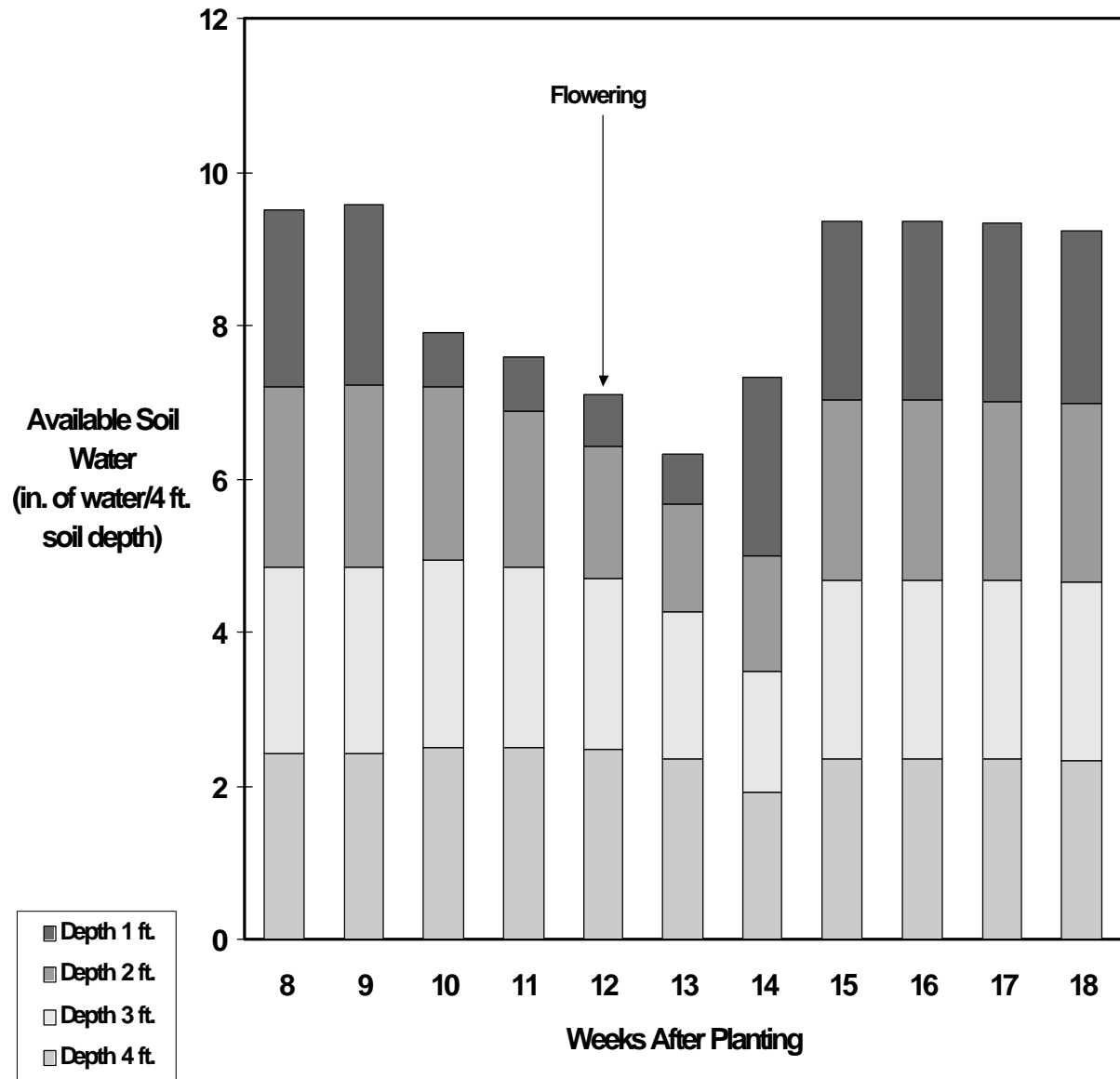


Fig. 4. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 6.56 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 2000. \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.
PIONEER	84G62	9	84	2074	130	M/ML	53	39.6	0	61	178	138
MYCOGEN	3694	11	83	2042	129	M/ML	50	59.2	0	60	153	119
ASGROW	A459	11	84	2074	130	M	51	38.7	0	61	139	108
(Check)	399 X 2737	9	84	2074	130	M/ML	48	49.6	0	60	138	107
TRIUMPH	TR 481	11	83	2016	129	M/ML	53	39.5	0	61	130	101
DEKALB	DK-53	11	84	2074	130	M/ML	53	43.8	0	61	127	98
DEKALB	DK-54	11	85	2105	131	ML	55	42.6	0	59	124	96
ASGROW	A571	10	91	2303	135	ML	54	42.6	0	60	124	96
MYCOGEN	3696	11	89	2232	134	ML	47	51.9	0	59	108	84
DEKALB	X918	11	85	2105	132	ML	51	32.9	0	61	108	84
ASGROW	Missile	12	90	2266	135	ML	47	41.8	0	59	90	70
Average		11	86	2124	131	M	51	43.8	0	60	129	
LSD 0.20												7.6

\1 Planted: May 16 and Replanted: May 30; Harvested: October 16.

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, 1998-2000.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A459	--	146	139	143	--	--	106	108	107	--
DEKALB	DK-47	140	144	--	142	--	109	104	--	107	--
DEKALB	DK-53	--	134	127	131	--	--	97	98	98	--
DEKALB	DK-56	123	131	--	127	--	96	95	--	96	--
MYCOGEN	1506	145	136	--	141	--	113	98	--	106	--
MYCOGEN	3696	--	131	108	120	--	--	95	84	90	--
PIONEER	84G62	--	153	178	166	--	--	111	138	125	--
TRIUMPH	TR 481	125	--	130	128	--	98	--	101	100	--
(Check)	399 X 2737	114	144	138	141	132	89	105	107	106	100
Average		127	138	129	134	131					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2000

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3200 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 23. **HARVESTED:** October 21.

EMERGENCE DATE: 9 days after planting. **SOIL TEMP:** 65 F.

IRRIGATION: Three furrow irrigations: July 20, August 4 and August 27, total applied 17.7 acre-in./A.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. **CULTIVATION:** Once. **INSECTICIDES:** None.

FIELD HISTORY: Last Crop: Sorghum. **FIELD PREPARATION:** Sweep plow.

COMMENTS: Planted in good moisture. Weed control was good. Below normal precipitation for the growing season, with a dry May and June and a very dry August and September. No greenbug infestation. None of the hybrids lodged. Grain yields were good.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.18	210	5	2	8
June	1.37	652	15	0	38
July	3.17	868	26	3	69
August	0.44	927	29	8	100
September	0.16	557	15	4	125
Total	5.32	3214	90	17	125

\1 Growing season from May 23 (planting) to September 25 (first freeze, 28 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	0.6	2.1	14	2.6	467	0.1	3.6
8"-24"				20				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	125/6	20	0.75	0

Yield Goal: 120 Bu/A.

Actual Yield: 132 Bu/A.

Available Soil Water
Irrigated Grain Sorghum, Walsh, 2000

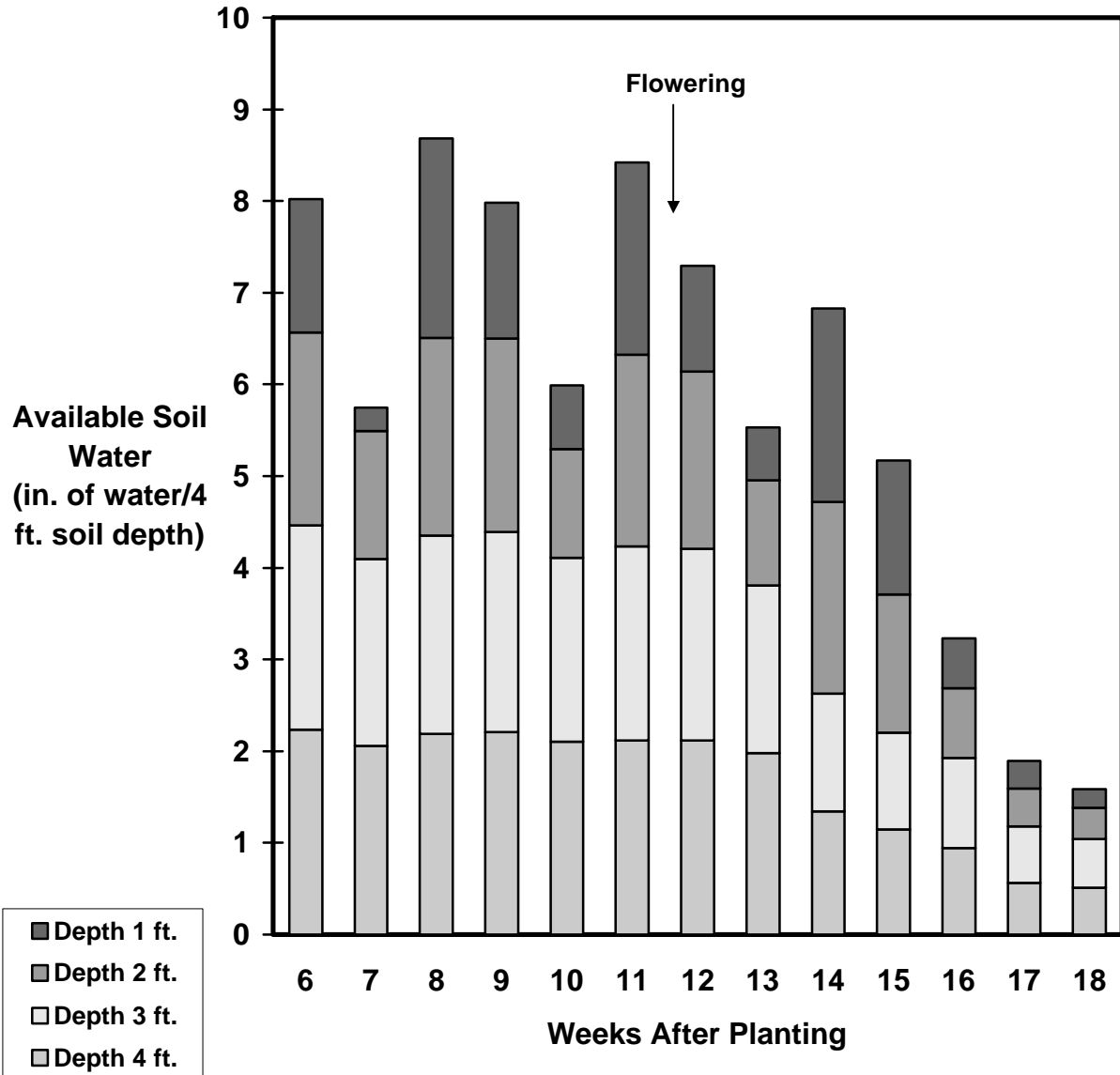


Fig. 5. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 5.32 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2000. \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									
												In	Plants/A	%	Lb/Bu	Bu/A	%				
												(1000 X)									
PIONEER	84G62	9	82	2126	119	M/ML	48	50.3	0	62	146	111									
DEKALB	X918	10	79	2030	117	M/ML	54	48.8	0	61	139	105									
DEKALB	DK-47	9	76	1936	115	M	46	49.6	0	62	137	104									
NC+	6B50	9	78	1999	117	M	48	53.1	0	61	134	102									
(Check)	399 X 2737	8	82	2126	120	M/ML	46	49.6	0	61	132	100									
DEKALB	DK-54	10	79	2030	117	M/ML	53	47.6	0	61	132	100									
MYCOGEN	3694	9	76	1936	115	M/ML	47	43.8	0	62	131	99									
NOVARTIS SEEDS	KS 585	8	76	1936	114	M	45	45.7	0	62	130	98									
TRIUMPH	TR 461	9	77	1968	115	M	51	48.8	0	62	127	96									
ASGROW	A459	9	80	2060	118	M	51	47.6	0	62	127	96									
DEKALB	DK-53	10	79	2030	118	M/ML	56	46.9	0	61	125	95									
ASGROW	Missile	10	84	2197	123	ML	49	42.6	0	60	133	101									
NC+	6B70	10	83	2126	123	ML/M	47	46.5	0	62	132	100									
MYCOGEN	3696	9	84	2197	125	ML	45	44.1	0	60	130	98									
ASGROW	A571	10	87	2285	129	ML	50	45.3	0	58	125	95									
Average		9	80	2065	119	M	49	47.4	0	61	132										
LSD 0.20												3.0									

\1 Planted May 23; Harvested: October 21.

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, 1998-2000.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A459	--	111	127	119	--	--	99	96	98	--
CARGILL	833	124	113	--	119	--	103	101	--	102	--
DEKALB	DK-47	115	113	137	125	122	96	101	104	103	100
DEKALB	DK-53	--	108	125	117	--	--	96	95	96	--
DEKALB	DK-56	133	102	--	118	--	111	91	--	101	--
MYCOGEN	1506	123	111	--	117	--	102	99	--	101	--
MYCOGEN	3696	--	114	130	122	--	--	102	98	100	--
NC+	6B70	--	119	132	126	--	--	106	100	103	--
NK BRAND	KS 585	--	115	130	123	--	---	103	98	101	--
NK BRAND	KS 73-J6	127	113	--	120	--	105	101	--	103	--
PIONEER	84G62	140	119	146	133	--	116	106	111	109	--
(Check)	399 X 2737	111	106	132	119	116	92	95	100	98	96
Average		120	112	132	122	121					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2000

COOPERATORS: Plainsman Agri-Search Foundation, 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 Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 52,300 Seed/A. PLANTED: May 24. HARVESTED: September 15.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 67 F.

PEST CONTROL: Preemergence Herbicides: Atrazine 1.0 Lb/A. Post Emergence Herbicides: Buctril 16 oz/A, Atrazine 0.5 Lb/A, Banvel 2 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.18	187	4	2	7
June	1.37	652	15	0	37
July	3.17	868	26	3	68
August	0.44	927	29	8	99
September	0.15	394	11	4	114
Total	5.31	3028	85	17	114

\1 Growing season from May 24 (planting) to September 15 (harvest).
 \2 GDD: Growing Degree Days for sorghum.
 \3 DAP: Days After Planting.

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

COMMENTS: Planted in marginal soil moisture. Weed control was good. Below normal precipitation for the growing season with a dry May and June and a very dry August and September. No greenbug infestation. Forage yields were good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.5	1.7	5	4.0	407	0.2	3.3
8"-24"				4				
Comment	Alka	VLo	Hi	Mod	Lo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	20	2	0
Applied	60/6	20	0	0

Yield Goal: 10 Ton/A.
Actual Yield: 11 Ton/A.

Available Soil Water
Dryland Forage Sorghum, Walsh, 2000

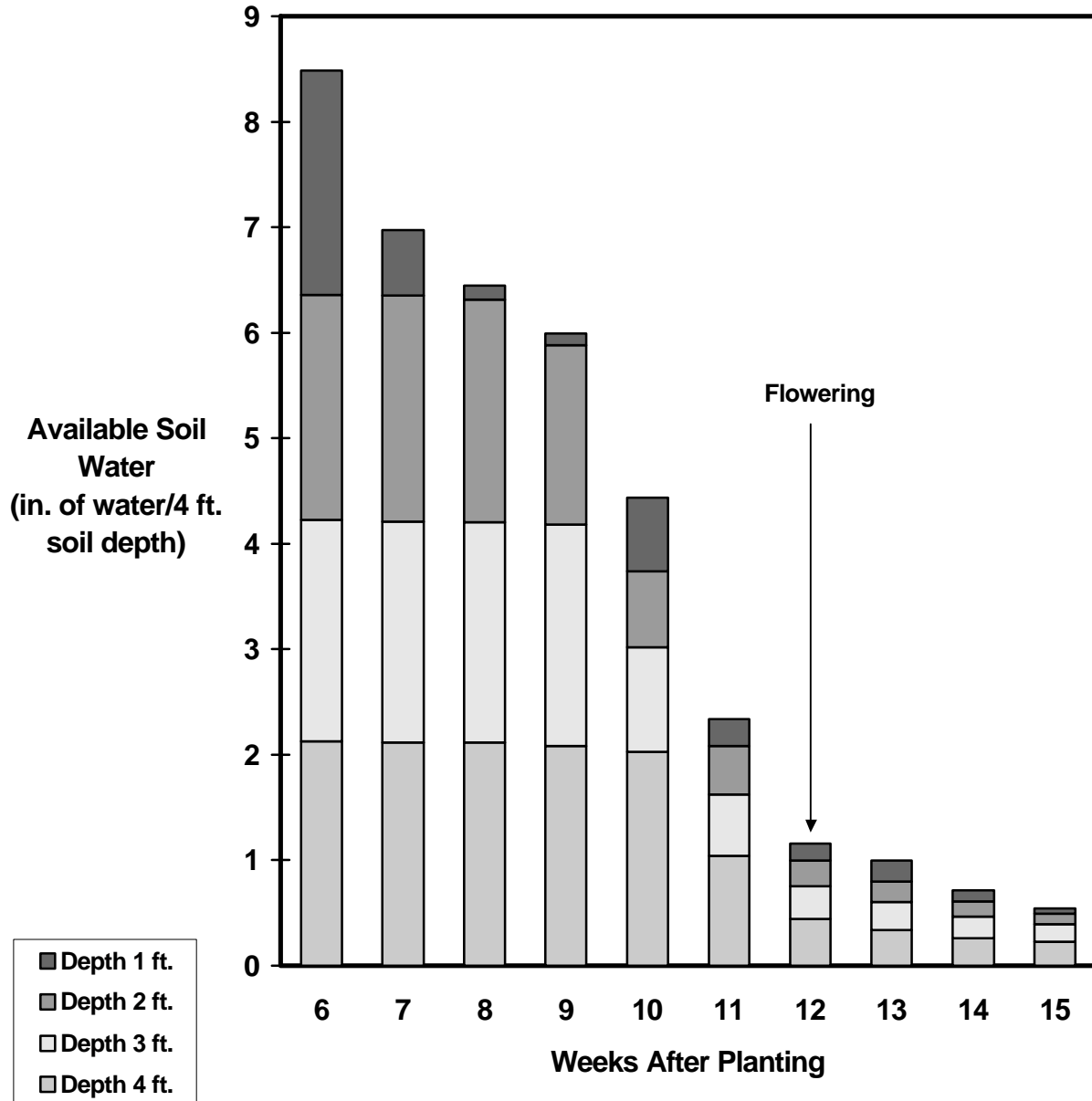


Fig. 6. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 5.31 in. Any increase in available soil water between weeks is from rain.

Table 12.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2000. \1

Brand	Hybrid	Forage Type \2	Days			Harvest Density	Plant Ht.	Stage \3			Forage Yield	Yield % of Test Average
			Days to Emerge	to 50% Bloom	Harvest			at Harvest	Stem Sugar	Plants Lodged		
				Plants/A (1000 X)	In.	%	%	Tons/A	%			
BUFFALO BRAND	Canex BMR 208	FS	9	83	32.9	61	HD	7	10	12.2	111	
BUFFALO BRAND	Canex	FS	11	86	26.7	73	SD	16	0	12.1	110	
BUFFALO BRAND	Canex II	FS	10	85	31.4	74	SD	16	0	11.7	106	
(Check)	NB 305F	FS	12	87	30.6	72	SD	14	0	11.0	100	
BUFFALO BRAND	Grazex BMR 737	SS	9	81	31.4	80	HD	12	3	12.1	110	
BUFFALO BRAND	Buffalo Brand	SS	9	82	28.7	93	HD	15	3	12.1	110	
BUFFALO BRAND	Grazex II	SS	10	80	29.8	83	MT	10	5	11.8	107	
BUFFALO BRAND	Grazex II W	SS	9	78	32.9	91	MT	10	8	10.6	96	
BUFFALO BRAND	Grazex BMR 116	SS	10	85	30.6	75	HD	14	0	10.3	94	
BUFFALO BRAND	Grazex BMR 727	SS	9	85	35.2	78	HD	10	2	9.2	84	
TRIUMPH	1514 Bt	Corn	8	79	19.8	76	SD	11	0	7.6	69	
Average		SS	10	83	30.0	78	HD	12	3	11.0		
LSD 0.20										1.23		

\1 Planted: May 24; Harvested: September 15.

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

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

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

Table 13.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 1998-2000.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
ASGROW	XP BMR 1	17.1	12.9	--	15.0	--	96	91	--	94	--
BUFFALO BRAND	Canex	17.1	15.7	12.1	13.9	15.0	96	111	110	111	106
BUFFALO BRAND	Canex II	18.8	10.9	11.7	11.3	13.8	105	77	106	92	96
BUFFALO BRAND	Buffalo Brand	16.9	15.7	12.1	13.9	14.9	95	111	110	111	105
BUFFALO BRAND	Grazex II	18.8	13.4	11.8	12.6	14.7	106	95	107	101	103
BUFFALO BRAND	Grazex II W	18.1	14.5	10.6	12.6	14.4	101	103	96	100	100
BUFFALO BRAND	Canex BMR 208	17.1	10.3	12.2	11.3	13.2	97	73	111	92	94
BUFFALO BRAND	Grazex BMR 737	18.1	15.6	12.1	13.9	15.3	102	111	110	111	108
CARGILL	X18347	20.2	11.1	--	15.7	--	114	79	--	97	--
DEKALB	FS-5	20.0	15.1	--	17.6	--	112	107	--	110	73
DEKALB	ST-6E	18.7	13.0	--	15.9	--	106	92	--	99	--
DEKALB	SX-8	18.9	14.7	--	16.8	--	107	104	--	106	--
(Check)	NB 305F	18.1	15.1	15.1	11.0	16.1	102	107	100	104	103
(Check)	Corn	12.4	10.2	10.2	7.6	10.9	70	72	69	71	70
Average		17.7	14.1	11.0	12.6	14.3					

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

Table 14.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2000.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	ADF	TDN	P	Ca	Net Energy		
										Main.	Gain	Lact.
				In	-----%-----					----MCal/lb-----		
BUFFALO BRAND	Canex BMR 208	FS	76	57	8.0	36.9	62.3	0.12	0.35	0.55	0.30	0.53
BUFFALO BRAND	Canex II	FS	77	64	7.8	37.9	61.4	0.13	0.29	0.54	0.29	0.52
BUFFALO BRAND	Canex	FS	78	61	7.6	33.7	65.2	0.12	0.29	0.59	0.34	0.58
(Check)	NB 305F	FS	85	63	6.6	35.3	63.7	0.12	0.31	0.57	0.32	0.56
BUFFALO BRAND	Grazex II W	SS	70	64	9.9	41.8	57.8	0.16	0.36	0.49	0.23	0.46
BUFFALO BRAND	Buffalo Brand	SS	74	65	9.8	38.9	60.4	0.12	0.33	0.52	0.27	0.50
BUFFALO BRAND	Grazex II	SS	72	62	9.3	38.3	61.0	0.13	0.36	0.53	0.28	0.51
BUFFALO BRAND	Grazex BMR 116	SS	78	58	8.9	35.0	64.0	0.16	0.31	0.57	0.32	0.56
BUFFALO BRAND	Grazex BMR 737	SS	75	64	7.6	36.4	62.7	0.12	0.34	0.55	0.31	0.54
BUFFALO BRAND	Grazex BMR 727	SS	78	63	7.0	36.6	62.6	0.12	0.30	0.55	0.30	0.54
TRIUMPH	TR 1415A Bt	Corn	75	79	11.3	35.3	63.7	0.17	0.39	0.57	0.32	0.56
Average		SS	76	64	8.5	36.9	62.3	0.13	0.33	0.55	0.30	0.53

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

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, ADF, Acid Detergent Fiber; TDN, Total Digestible Nutrients; P, Phosphorus; Ca, Calcium;

Net Energy: Maintenance, Gain, Lactation.

Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2000

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3200 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 24. HARVESTED: September 20.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 65 F.

IRRIGATION: Three furrow irrigations: July 13, July 31 and August 25, total applied 17.7 acre-in./A.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: None. CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Below normal precipitation for the growing season with a dry May and June and a very dry August and September. 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	0.18	212	5	2	8
June	1.37	652	15	0	38
July	3.17	868	26	3	69
August	0.44	927	29	8	100
September	0.15	514	15	4	120
Total	5.31	3173	90	17	120

\1 Growing season from May 24 (planting) to September 20 (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	0.6	2.1	14	2.6	467	0.1	3.6
8"-24"				20				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	125/6	20	0.75	0

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

Actual Yield: 22 Ton/A.

Available Soil Water
Irrigated Forage Sorghum, Walsh, 2000

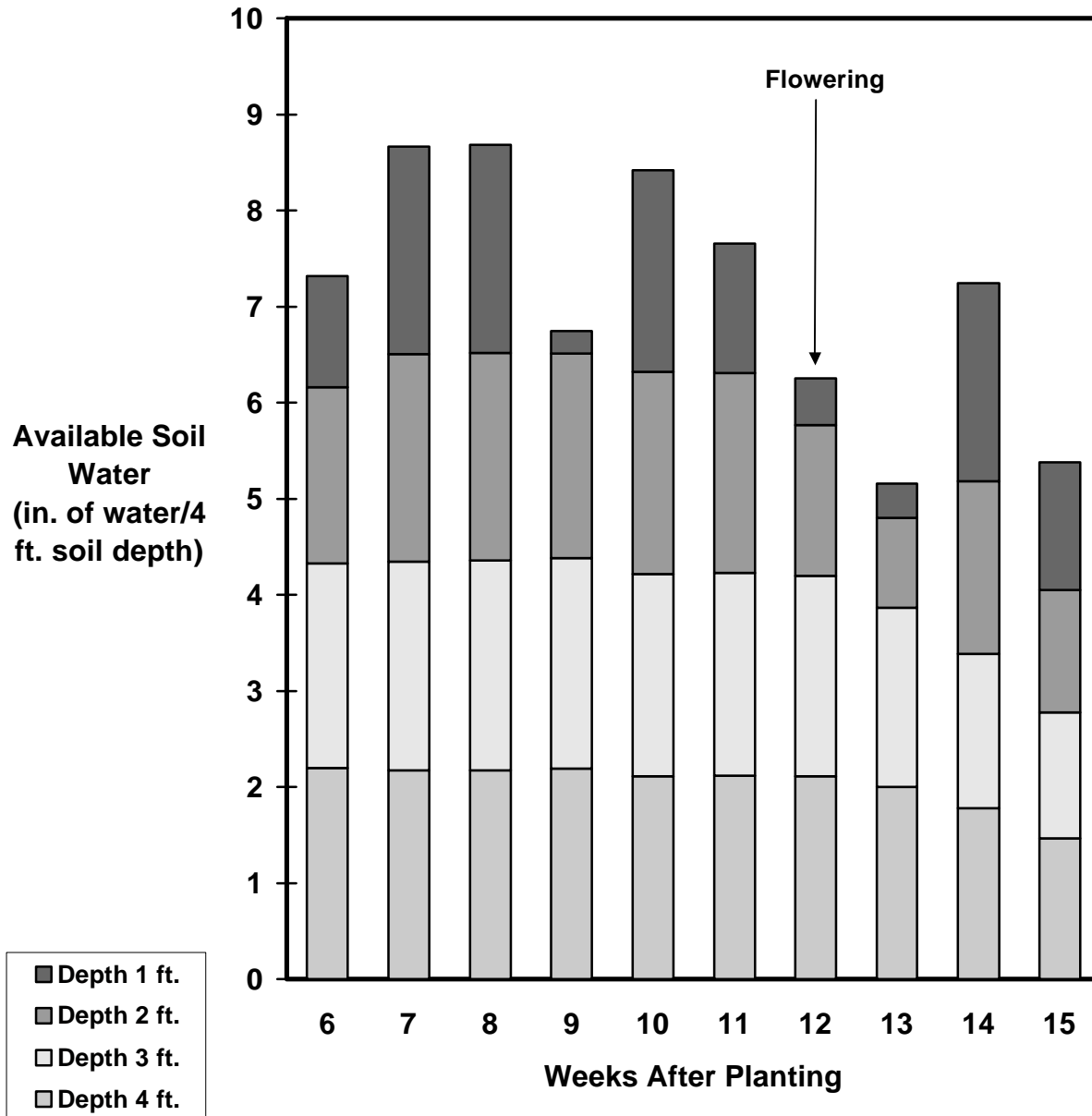


Fig. 7. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 5.31 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2000. \1

Brand	Hybrid	Forage Type \2	Days			Stage \3				Yield %	
			Days to Emerge	to 50% Bloom	Harvest Density	Plant Ht.	at Harvest	Stem Sugar	Plants Ldg.	Forage Yield	of Test Average
			Plants/A (1000 X)			In.	%		Tons/A	%	
KAYSTAR	Forari IV	FS	9	83	47.2	79	HD	6	3	26.3	122
GOLDEN HARVEST	Si-Gro H-45	FS	9	77	56.9	66	MT	5	0	25.7	119
BUFFALO BRAND	Canex	FS	11	80	40.7	87	HD	14	0	24.5	113
BUFFALO BRAND	Canex II	FS	10	81	47.6	94	HD	17	0	24.0	111
GARRISON & TOWNSEND (Check)	SG-BMR 100 NB 305F	FS	8	84	53.8	95	HD	7	7	22.9	106
RICHARDSON	Dairy Master BMR	FS	11	82	44.5	97	HD	14	0	22.9	106
BUFFALO BRAND	Canex BMR 208	FS	9	84	43.8	93	HD	8	0	22.0	102
BUFFALO BRAND	Canex BMR 208	FS	9	79	50.0	85	HD	7	0	20.5	95
GOLDEN HARVEST	Si-Gro EX 47	FS	9	79	45.7	87	HD	11	0	19.0	88
GOLDEN HARVEST	Re-Gro H-22B	SS	9	77	51.5	68	MT	8	0	25.6	119
GOLDEN HARVEST	Re-Gro EX 33	SS	10	81	48.8	96	MT	14	0	23.9	111
GARRISON & TOWNSEND	SG-BMR 201	SS	9	82	54.6	97	HD	7	15	21.5	100
BUFFALO BRAND	Grazex BMR 727	SS	9	79	53.4	89	MT	7	0	21.0	97
GARRISON & TOWNSEND	SG-BMR 301	SS	10	115	51.1	120	PM	11	0	20.9	97
BUFFALO BRAND	Grazex II	SS	9	74	51.9	103	MT	14	0	20.6	95
BUFFALO BRAND	Grazex BMR 116	SS	10	81	41.8	97	HD	11	0	20.6	95
BUFFALO BRAND	Buffalo Brand	SS	9	76	49.2	109	MT	13	0	17.8	82
BUFFALO BRAND	Grazex BMR 737	SS	8	76	50.7	98	MT	12	0	17.6	81
BUFFALO BRAND	Grazex II W	SS	9	73	51.1	109	MT	9	0	17.4	81
TRIUMPH	1514 Bt	Corn	7	75	29.0	96	SD	8	0	17.4	81
Average		SS	9	81	48.2	93	HD	10	1	21.6	
LSD 0.20										1.51	

\1 Planted May 23; Harvested: September 20.

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

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

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

Table 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1999-2000.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
ASGROW	XP BMR 1	22.5	18.3	--	20.4	--	107	98	--	103	--
BUFFALO BRAND	Canex	17.5	18.5	24.5	21.5	20.2	83	99	113	106	98
BUFFALO BRAND	Canex II	19.7	15.3	24.0	19.7	19.7	94	82	111	97	96
BUFFALO BRAND	Buffalo Brand	21.8	18.3	17.8	18.1	19.3	104	98	82	90	95
BUFFALO BRAND	Grazex II	20.7	18.9	20.6	19.8	20.1	99	101	95	98	98
BUFFALO BRAND	Grazex II W	21.6	19.1	17.4	18.3	19.4	103	102	81	92	95
BUFFALO BRAND	BMR-FS	21.2	16.1	20.5	18.3	19.3	101	86	95	91	94
BUFFALO BRAND	BMR-SS	19.9	17.3	17.6	17.5	18.3	95	93	81	87	90
CARGILL	X18347	20.2	19.6	--	19.9	--	96	105	--	101	--
DEKALB	FS-5	21.7	19.5	--	20.6	--	103	104	--	104	--
DEKALB	FS-25E	25.0	22.6	--	23.8	--	119	121	--	120	--
DEKALB	FS-22	22.2	19.4	--	20.8	--	106	104	--	105	--
RICHARDSON	Dairy Master BMR	--	17.6	22.0	19.8	--	--	94	102	98	--
(Check)	NB 305F	18.7	17.9	22.9	20.4	19.8	89	96	106	101	97
(Check)	Corn	15.1	20.1	17.4	18.8	17.5	72	107	81	94	87
Average		21.0	18.7	21.6	20.2	20.4					

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

Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2000.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	ADF	TDN	P	Ca	<u>Net Energy</u>		
										Main.	Gain	Lact.
				In	-----%-----					-----MCal/lb-----		
GOLDEN HARVEST	SI-Gro H-45	FS	72	48	10.9	40.3	59.2	0.16	0.32	0.51	0.25	0.48
BUFFALO BRAND	Canex	FS	72	67	10.5	42.4	57.3	0.14	0.37	0.48	0.23	0.45
RICHARDSON	Dairy Master BMR	FS	77	74	9.9	38.9	60.5	0.15	0.39	0.52	0.27	0.50
GARRISON & TOWNSEND	SG-BMR 100	FS	79	81	9.9	42.6	57.1	0.11	0.37	0.48	0.22	0.45
BUFFALO BRAND	Canex BMR 208	FS	72	60	9.7	37.1	62.0	0.16	0.37	0.55	0.30	0.53
(Check)	NB 305F	FS	75	69	9.5	35.9	63.2	0.12	0.32	0.56	0.31	0.55
BUFFALO BRAND	Canex II	FS	74	73	9.1	41.7	57.9	0.14	0.38	0.49	0.24	0.46
GOLDEN HARVEST	SI-Gro EX 47	FS	73	65	9.1	39.5	59.9	0.16	0.37	0.52	0.26	0.37
KAYSTAR	Forari IV	FS	78	66	9.0	46.9	53.2	0.13	0.30	0.43	0.17	0.38
BUFFALO BRAND	Buffalo Brand	SS	68	74	12.8	53.6	47.0	0.15	0.38	0.35	0.08	0.28
BUFFALO BRAND	Grazex II W	SS	65	71	12.3	48.7	51.5	0.18	0.40	0.41	0.14	0.35
BUFFALO BRAND	Grazex BMR 116	SS	71	68	12.1	39.6	59.8	0.15	0.41	0.52	0.26	0.49
BUFFALO BRAND	Grazex II	SS	67	71	11.2	51.8	48.7	0.14	0.35	0.37	0.10	0.31
GARRISON & TOWNSEND	SG-BMR 201	SS	74	75	11.0	36.7	62.5	0.15	0.35	0.55	0.30	0.53
GOLDEN HARVEST	Re-Gro EX 33	SS	71	70	10.8	40.7	58.8	0.18	0.36	0.50	0.25	0.47
GOLDEN HARVEST	Re-Gro H-22B	SS	70	64	10.4	39.1	60.3	0.13	0.39	0.52	0.27	0.50
BUFFALO BRAND	Grazex BMR 737	SS	70	66	10.3	39.7	59.7	0.16	0.32	0.52	0.26	0.49
BUFFALO BRAND	Grazex BMR 727	SS	72	67	10.0	40.1	59.3	0.13	0.35	0.51	0.26	0.48
GARRISON & TOWNSEND	SG-BMR 301	SS	107	93	8.0	45.3	54.6	0.09	0.34	0.45	0.19	0.34
TRIUMPH	TR 1415A Bt	Corn	71	91	13.3	39.0	60.3	0.20	0.36	0.52	0.27	0.50
Average		FS	74	71	10.5	42.0	57.6	0.15	0.36	0.49	0.23	0.45

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

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; ADF, Acid Detergent Fiber; TDN, Total Digestible Nutrients; P, Phosphorus; Ca, Calcium;

Net Energy: Maintenance, Gain, Lactation.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2000

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, 32' long. **SEEDING DENSITY:** 96,800 Seed/A. **PLANTED:** May 19. **HARVESTED:** September 13.

EMERGENCE DATE: 7 days after planting. **SOIL TEMP:** 60 °F.

IRRIGATION: Four furrow irrigations: May 22, July 1, August 1, August 17 total applied 18 acre-in/A.

PEST CONTROL: PrePlant Herbicide: Roundup 1 lb. AI/A. Preemergence Herbicides: Bifenox 2 lbs. AI/A. Insecticide: None.

CULTURAL PRACTICES: Previous crop: watermelons. Field Preparation: disc 2X, roller-pack 2X, field cultivator, float. Cultivation: 2X.

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

COMMENTS: Cloddy soil conditions resulting in not as good a stand as expected. Hot, dry summer. Adequate supply of irrigation water. No lodging. Greenbugs were not a problem. Forage yields were very good.

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	0.22	101	7	2	12
June	0.60	618	20	0	42
July	1.25	793	27	11	73
August	1.36	751	29	6	104
September	0.22	278	13	1	117
Total	3.65	2541	96	20	117

\1 Growing season from May 19 (planting) to September 13 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Table 18.-Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2000. \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	%	
BUFFALO BRAND	Buffalo Brand	SS	76	53.5	122	HD	9	42	42.2	123	
BUFFALO BRAND	Grazex BMR 727	SS	82	55.5	104	SD	10	36	38.5	112	
GARRISON & TOWNSEND	SG-BMR-201	SS	82	56.0	102	ED	9	33	37.0	108	
BUFFALO BRAND	Grazex IIW	SS	71	54.0	111	HD	10	45	36.6	107	
GARRISON & TOWNSEND	SG-BMR-301	SS	Veg	53.0	113	Veg	7	23	36.4	106	
BUFFALO BRAND	Grazex II	SS	74	54.0	106	HD	10	37	34.9	102	
BUFFALO BRAND	Canex II	FS	84	54.0	104	ED	12	34	34.6	101	
BUFFALO BRAND	Canex	FS	79	52.5	96	SD	12	33	34.1	100	
BUFFALO BRAND	Grazex BMR 737	SS	76	55.5	102	HD	8	36	33.5	98	
GARRISON & TOWNSEND	SG-BMR-100	FS	83	50.0	101	SD	5	31	32.6	95	
BUFFALO BRAND	Grazex BMR 116	SS	83	49.5	104	SD	7	33	32.6	95	
MYCOGEN (Check)	2725	Corn	69	30.0	81	HD	7	41	31.1	91	
	NB 305F	FS	87	57.0	108	SD	12	29	29.4	86	
BUFFALO BRAND	Canex BMR 208	FS	80	52.0	91	HD	3	34	26.0	76	
Average		FS	73	51.9	103	SD	9	35	34.2		
LSD 0.20									3.08		

\1 Planted May 19,1999; Harvested: September 13, 2000.

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

\3 Plant Population per acre on June 20, 2000.

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

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

Table 19.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Rocky Ford, 1998-2000.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1998	1999	2000	2-Year Avg	3-Year Avg	1998	1999	2000	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
ASGROW	XP BMR 1	30.4	27.8	--	29.1	---	96	91	--	94	---
BUFFALO BRAND	Buffalo Brand	38.0	33.5	42.2	37.9	37.9	120	110	123	117	118
BUFFALO BRAND	Canex	29.9	29.9	34.1	32.0	31.3	95	99	100	100	98
BUFFALO BRAND	Canex II	24.7	29.1	34.6	31.8	29.5	78	96	101	99	92
BUFFALO BRAND	Canex BMR 208	24.0	29.7	26.0	27.8	26.5	76	98	76	87	83
BUFFALO BRAND	Grazex II	32.9	29.3	34.9	32.1	32.4	104	97	102	100	101
BUFFALO BRAND	Grazex II W	35.0	29.7	36.6	33.2	33.8	111	98	107	103	105
BUFFALO BRAND	Grazex BMR 737	28.6	26.1	33.5	29.8	29.4	90	86	98	92	91
DEKALB	SX-8	40.3	43.9	--	42.1	--	128	145	--	137	--
DEKALB	ST-6E	35.7	35.1	--	35.4	--	113	116	--	115	--
DEKALB	FS-5	34.4	34.8	--	34.6	--	109	115	--	112	--
DEKALB	FS-25E	34.0	34.4	--	34.2	--	108	113	--	111	--
(Check)	NB 305F	28.7	24.7	29.4	27.1	27.6	91	82	86	84	86
(Check)	Corn	23.9	23.5	31.1	27.3	26.2	76	78	91	85	82
Average		31.6	30.3	34.2	32.3	32.0					

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

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

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

Materials and Methods

The five row spacing widths we tested were, 1, 2, 3, 4, and 5 ft. We used a six-row cone planter with 12 in. row spacing. We plugged the seed spouts as needed to provide the proper row spacings. The grain sorghum hybrid used was CARGILL 606 and the seeding rate for all row spacings was 40,000 Seeds/A. Weed control was achieved by broad-spectrum pre-emergence herbicide (Atrazine 1.0 Lb/A) and a post emergence broadleaf weed herbicide mixture (Buctril 16 Oz/A, Atrazine 0.5 Lb/A, Banvel 2 Oz/A). The treatments were not cultivated. The plots were 12 ft. by 500 ft, with two replications. We harvested the plots with a self-propelled combine equipped with a straight head and wide plastic sorghum fingers. Only treatment rows adjacent to identically treated rows were recorded for harvest.

Results and Discussion

In this dry year (5.86 in., 43% below average rainfall for the growing season, May through September), we found that 3 ft. wide row spacing produced the highest yield (Fig. 8). In our previous two studies, one wet year (18.32 in., 78% above average) and one near normal year (9.68 in., 94% of average), we found that the narrowest row spacing (1 ft.) produced the highest yields (Fig. 9). One of the reasons attributed to the higher yield with the narrow row spacing was weed suppression, the narrowest row spacings (1 ft. and 2 ft.) closed their canopies early and suppressed grassy weeds; the wider row spacings did not. Weed suppression was evident this dry year, but not as pronounced as in the wet and near normal years. In this dry year, the moderately wide row spacing (3 ft.) did provide late-season soil moisture and produced the highest yield; however, there was no difference in yield between the 1, 2 or 3 ft. row spacings (CI 95%). Therefore, narrow row spacing (1 ft.) is recommended for wet, normal or dry years in Southeastern Colorado.

There are two disadvantages to narrow row spacing: cultivation and lodging. Wider row spacings allow weed cultivation between rows, but with narrow row spacing weed suppression occurs with canopy closure, making supplemental weed control less critical. Plant lodging is more problematic with narrow rows. Row crop headers are designed to pick up lodged plants in wider rows. Plastic sorghum fingers are beneficial

for picking up lodged plants in narrow rows, but there are not as effective as row crop heads. Furthermore, there tends to be less lodging with narrow rows because of the close proximity to adjacent standing plants helping prop up their lodged neighbors.

Literature Cited

Larson, K.J., F.C. Schweissing, D.L. Thompson. 2000. Sorghum hybrid performance tests in Colorado, 1999. Technical Report TR00-1. AES, Dept. of Soil and Crop Sciences, CSU, 47p.

Larson, K.J., F.C. Schweissing, D.L. Thompson. 1999. Sorghum hybrid performance tests in Colorado, 1998. Technical Report TR99-4. AES, Dept. of Soil and Crop Sciences, CSU. 51p.

Dryland Grain Sorghum Row Spacing Walsh, 2000

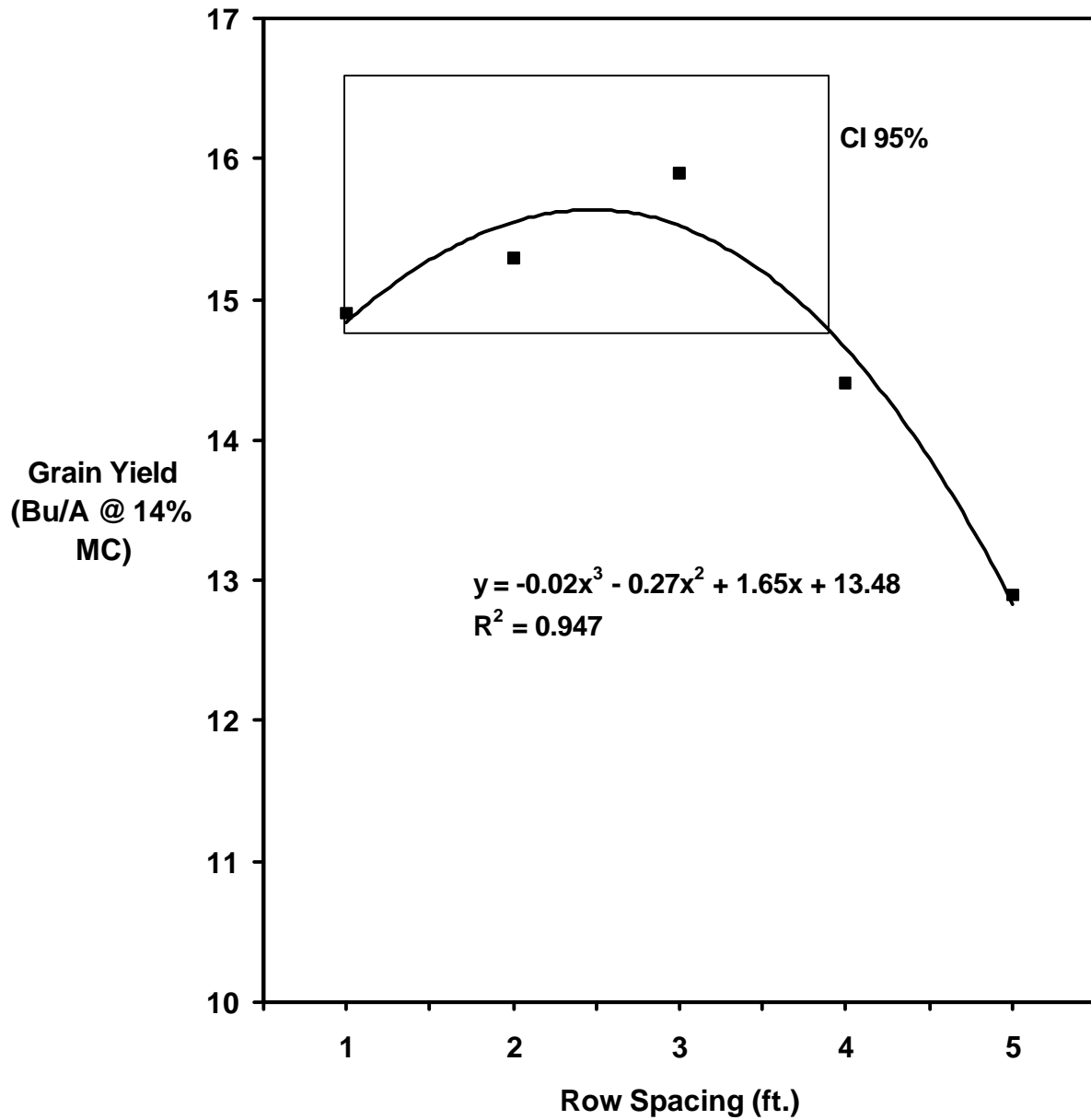


Fig. 8. Row spacing on dryland grain sorghum at Walsh. The five row spacings tested were: 1 ft., 2 ft., 3 ft., 4 ft. and 5 ft. CARGILL 606 was planted at 40,000 Seeds/A.

Dryland Grain Sorghum Row Spacing Walsh, 1998 and 1999

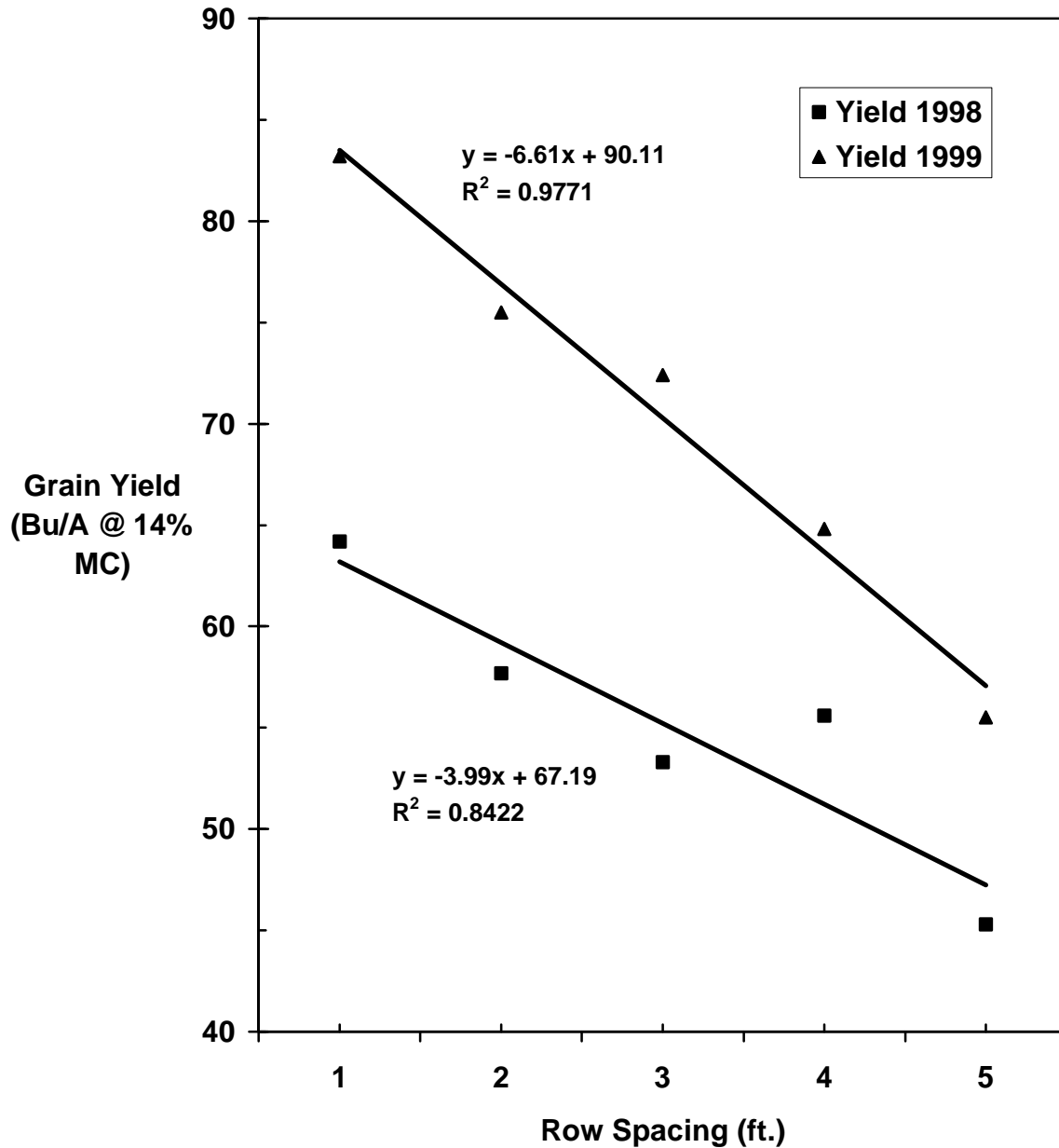


Fig. 9. Row spacing on dryland grain sorghum at Walsh for 1998 and 1999. The five row spacings tested were: 1 ft., 2 ft., 3 ft., 4 ft., and 5 ft. CARGILL 627 was planted at 40,000 Seeds/A.

Dryland Grain Sorghum Seeding Rate Study Kevin Larson and Dennis Thompson

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

Materials and Methods

The eight seeding rates we tested were 1, 2, 3, 4, 5, 6, 7 and 8 Lb/A, which corresponds to 12,300 to 98,000 Seeds/A at 12,300 Seed/A increments. We planted with a four-row cone planter on 30 in. row spacing. The grain sorghum hybrid was CARGILL 606. We fertilized the site with 60 Lb N/A as anhydrous and seedrow applied 5 Gal 10-34-0/A. Weed control was achieved with pre and post emergence herbicides (pre, Atrazine 1.0 Lb/A; post, Buctril 16 Oz/A Atrazine 0.5 Lb/A, Banvel 2 Oz/A) and cultivation. We harvested the study with a self-propelled combine equipped with a digital scale.

Results and Discussion

For this dry year, the highest yielding seeding rate was 3 Lb/A, which corresponds to 36,800 Seeds/A and 27,200 Plants/A (Fig. 10). There was no significant difference in grain yield between about 2.25 Lb/A (27,700 Seeds/A) to 4.25 Lb/A (52,300 Seeds/A) seeding rates (CI 95%). In the two previous years of this study, one with abundant and one with near normal rainfall, yields increased linearly to the highest seeding rate 112,000 Seeds/A (57,000 Plants/A) for the wet year, or peaked around 76,000 Seeds/A (34,000 Plants/A) for the near normal year (Larson, Schweissing, Thompson, 1999 and 2000). Summarizing the last three years of this study with rainfall varying from marginal, near normal to abundant, suggests that seeding rate is dependent on seasonal rainfall. Since the optimum seeding rate varies with rainfall, making an accurate dryland seeding rate recommendation would necessitate predicting the weather. Nonetheless, a general seeding rate recommendation for dryland grain sorghum may be presented, if we favor drier conditions, which is a rational bias considering that moisture is the limiting factor for dryland production. Across the wide-ranging rainfall experienced during the last three years of this study, at least 90% of the maximum yield can be realized with a plant density of 27,000 Plants/A.

Literature Cited

Larson, K.J., F.C. Schweissing, D. L. Thompson. 2000. Sorghum hybrid performance tests in Colorado, 1999. Technical Report TR00-1. AES, Dept. of Soil and Crop Sciences, CSU. 47p.

Larson, K.J., F.C. Schweissing, D. L. Thompson. 1999. Sorghum hybrid performance tests in Colorado, 1998. Technical Report TR99-4. AES, Dept. of Soil and Crop Sciences, CSU. 51p.

Dryland Grain Sorghum Seeding Rate Walsh, 2000

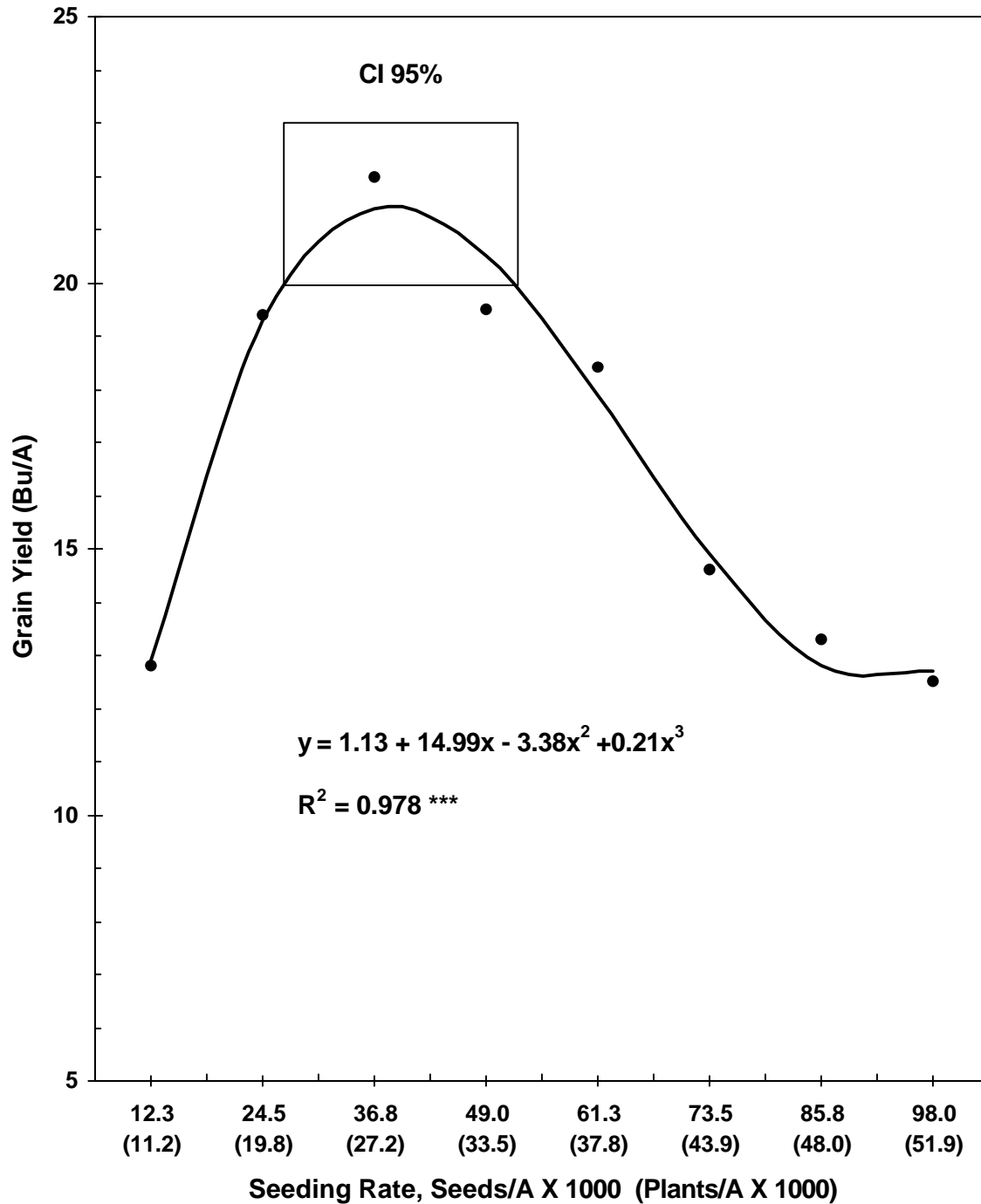


Fig. 10. Dryland grain sorghum seeding rate at Walsh. The eight seeding rates tested were 1 to 8 Lb/A at 1 Lb/A increments (12,300 Seeds/A to 98,000 Seeds/A at 12,300 Seeds/A increments) using CARGILL 606.

Limited Furrow and Sprinkler Irrigation Grain Sorghum Seeding Rate Study Kevin Larson, Dennis Thompson, Calvin Thompson, Deborah Harn

Seeding rate recommendations vary with amount of applied water. The optimum seeding rate for limited irrigation grain sorghum is not well studied. For this study, limited furrow irrigation is defined as receiving a pre-irrigation (if winter moisture is lacking) and one in-season irrigation at flowering, and limited sprinkler irrigation is defined as similar amount of water used for furrow irrigation but applied with a sprinkler. Typically, the amount of water applied ranges from 6 in./A (if only the in-season irrigation is needed) to 12 in./A (if both the pre-irrigation and the in-season irrigation are needed).

Materials and Methods

We tested four seeding rates under limited furrow irrigation 62, 98, 116, and 125 X 1000 Seeds/A, and five seeding rate under limited sprinkler irrigation 66, 90, 102, 126, and 138 X 1000 Seeds/A. This resulted in 36.2, 53.6, 62.4, and 67.2 X 1000 Plants/A for furrow irrigation and 40.4, 52.0, 57.6, 69.0, and 74.4 X 1000 Plants/A for sprinkler irrigation. Two hybrids were used in this study CARGILL 627 and MYCOGEN M3838. We used a complete block design with two replications for this study. The soil test recommendation for a 110 Bu/A yield goal for the sprinkler was 33 Lb N/A, 40 Lb P₂O₅/A and 2 Lb Zn/A; for the furrow, the recommendation was 100 Lb N/A, 40 Lb P₂O₅ and 2 Lb Zn/A. We applied 125 Lb N/A, 20 Lb P₂O₅/A and 0.75 Lb Zn/A to both sites. The sprinkler site was planted on June 3 and the furrow site on June 8. The furrow site received one in-season irrigation on August 12 of 7.4 in./A of water. The sprinkler site received 7.0 in./A of applied water. We controlled weeds at the sprinkler site with a pre-emergence application of LandMaster 54 Oz/A and a postemergence mixture of Atrazine 1.0 Lb/A, COC 1 Qt/A, and Banvel 2 Oz/A. For the furrow site, we controlled weeds with a pre-emergence application of Atrazine 1.0 Lb/A. We cultivated both site once. Plant densities were taken prior to harvest. We harvested the plots on October 19 and 20 with a self-propelled combine equipped with a four-row crop head. Grain yields were adjusted 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 7 Lb/A or 55,000 to 100,000 Seeds/A. Currently, there is no grain sorghum seeding rate recommendation distinction between limited furrow irrigation and limited sprinkler irrigation.

In this study, the highest yielding seeding rate for limited furrow irrigation was the lowest seeding rate tested 62,000 Seeds/A (36,200 Plants/A) (Fig. 11); however, the highest yielding seeding rate for limited sprinkler irrigation was about 115,000 Seeds/A (65,000 Plants/A) (Fig. 12). Both hybrids reacted similarly under both irrigation regimes. Therefore, we suggest that limited irrigation grain sorghum seeding rate recommendations be based on irrigation method: 60,000 Seeds/A (36,000 Plants/A) for limited furrow irrigation and 115,000 Seeds/A (65,000 Plants/A) for limited sprinkler irrigation.

**Grain Sorghum Seeding Rate
Limited Furrow Irrigation, Walsh, 2000**

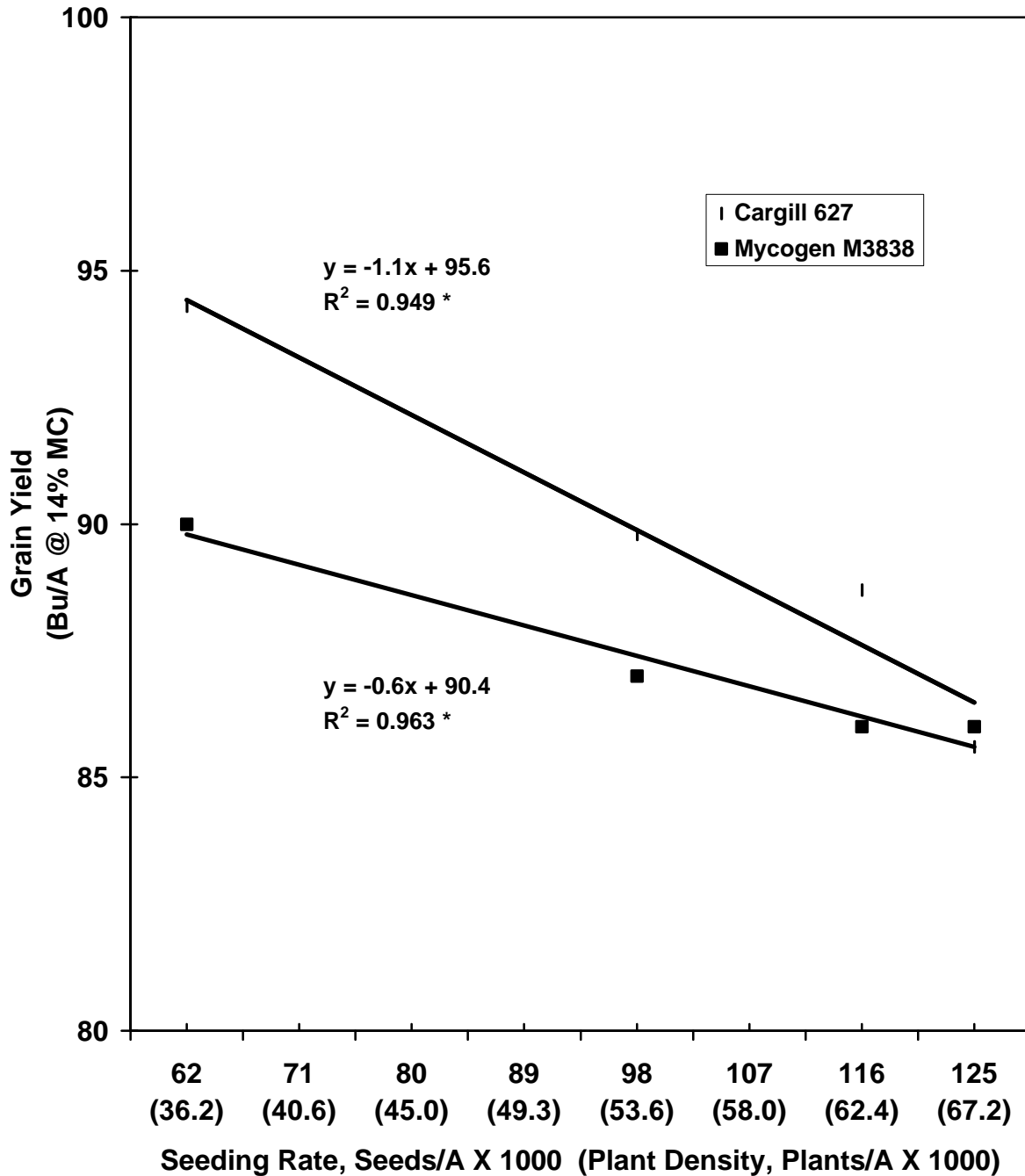


Fig. 11. Seeding rate and harvest density on limited furrow irrigation grain sorghum at Walsh. Four seeding rates were tested: 62, 98, 116, and 125 Seeds/A X 1000. Two hybrids were grown: CARGILL 627 and MYCOGEN M3838.

Grain Sorghum Seeding Rate Limited Sprinkler Irrigation, Walsh, 2000

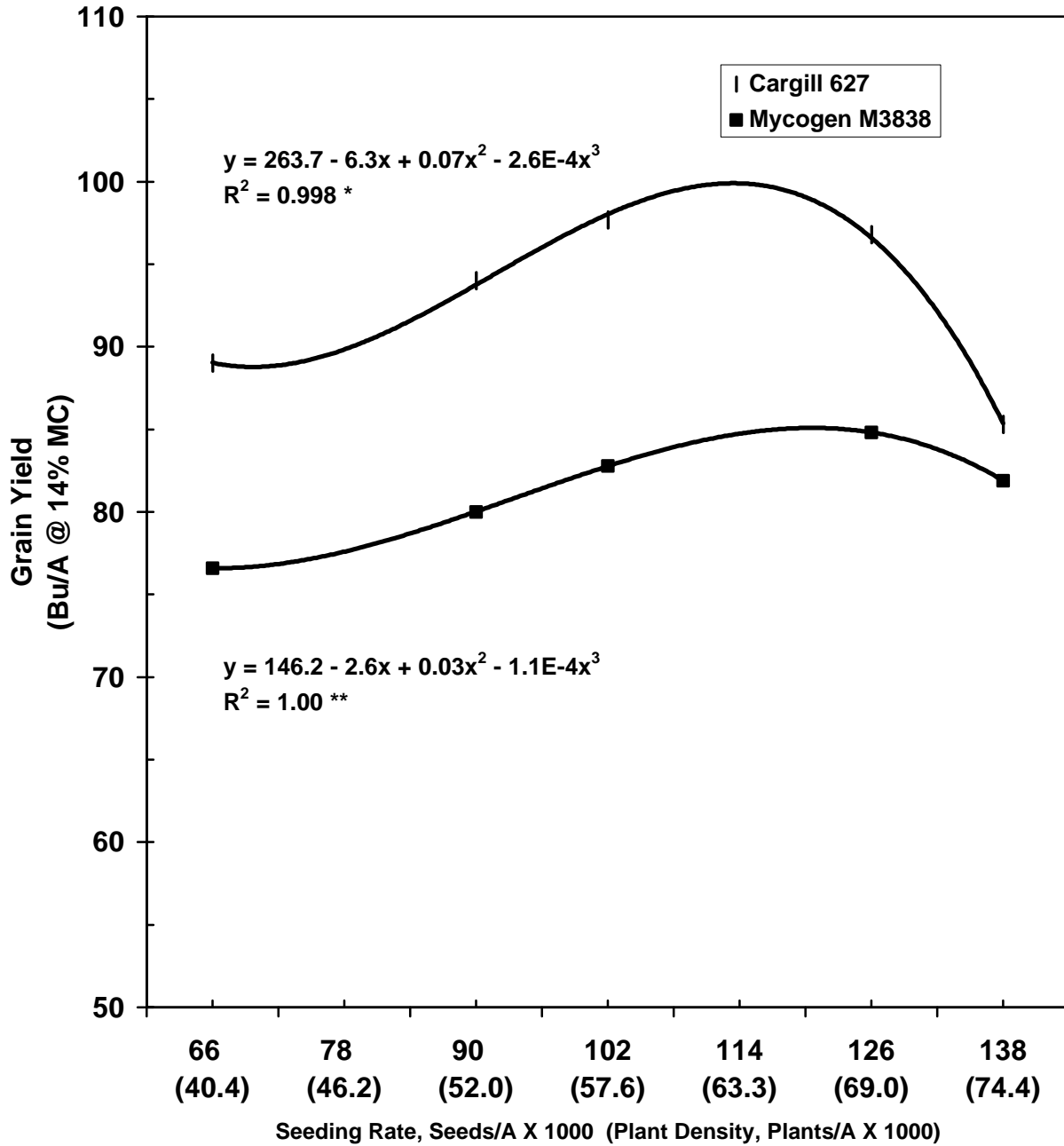


Fig. 12. Seeding rate and harvest density for limited sprinkler irrigation grain sorghum at Walsh. Five seeding rates were tested 66, 90, 102, 126 and 138 Seeds/A X 1000. Two hybrids were grown CARGILL 627 and MYCOGEN M3838.

Seedrow P and N on Dryland Grain Sorghum Kevin Larson and Calvin Thompson

Banding P fertilizer with the seed at planting (seedrow placement) has proven to be a very effective P fertilizing method for dryland grain sorghum in the high lime, high alkaline soils of Southeastern Colorado. For these alkaline soils, the P fertilizer of choice for seedrow placement is liquid 10-34-0. The most common seedrow P rate for dryland grain sorghum is 5 Gal/A of 10-34-0 which contains 20 Lb P_2O_5 and 6 Lb N/A. High rates of seedrow N are reported to cause N salt toxicity that lowers germination (Mortvedt, 1976). Nonetheless, a moderate, nontoxic level of seedrow N may increase yields. We tested low seedrow P rates with added N to determine if the additional N would maintain high grain sorghum yields. This is the third year of this continuing study.

Materials and Methods

We tested eight rates of poly ammoniated phosphate (10-34-0) fertilizer banded with the grain sorghum seed on 30 in. row spacing in an alkaline Silty Clay Loam soil. The eight rates were 0, 0.75, 1.25, 2.5, 5.0, 7.5, 10.0 and 12.5 gallons of 10-34-0/A, corresponding to 0, 2.5, 5, 10, 20, 30, 40, 50 Lb P_2O_5 /A. In addition we added 6 Lb/N (28-0-0) to the four lowest P rates, making a total of 12 treatments. The fertilizer was applied with a squeeze pump at 13.7 Gal/A and all fertilizer rates were diluted with water to their appropriate levels. Prior to planting, the soil was sampled at eight random locations at 0 to 8 in. (surface) and 8 to 24 in. (subsurface) depths. The soil was sent to Colorado State University Soil Testing Lab for analysis. Their soil test recommendation for a 50 Bu/A yield goal was banding 20 Lb P_2O_5 /A; and no N was recommend. The grain sorghum hybrid was DEKALB DK-28E sown at 43,500 Seed/A on June 30. We harvested the 10 ft. by 50 ft. plots on October 27 with a self-propelled combine with a four-row crop header. Grain yields were corrected to 14% seed moisture content.

Results and Discussion

The seedrow applied 10 Lb P_2O_5 , 6 Lb N/A rate produced the highest dryland grain sorghum yield, 30 Bu/A (Fig. 13). This seedrow 10 Lb P_2O_5 /A rate was one-half the recommended banded rate. All treatments that received added N to the 6 Lb/A level produced more yield than their non-N-added counterparts. The 95% confidence interval for the optimum seedrow rate ranged from 10 to 20 Lb P_2O_5 /A as 10-34-0; it also included 2.5, 5, 10 Lb P_2O_5 /A when N was added to the 6 Lb/A level. The low P rates of 2.5 and 5 Lb P_2O_5 /A yielded as much as the 10 to 20 Lb P_2O_5 /A rates when N was added to the 6 Lb/A level to these low P rates.

The efficacy of low P seedrow rate with added N to the 6 Lb/A level obtained this year is quite similar to the results from the previous two years of this study, even though the rainfall during these years ranged from 57% to 178% of normal. Apparently low P rates are effective, at least in the short term. Our results from the last three years of this study found that, even with widely varying amounts of rainfall for the growing seasons, the low seedrow P (10-34-0) rates, as low as one-sixteenth the recommended

banded P rate, can be used to produce grain yields as high as those from soil test recommend banded P rates when N is added to the 6 Lb N/A level. However, more P is removed with grain than is added from rates below 20 Lb P₂O₅/A level: a 40 Bu/A sorghum grain crop removes about 18 Lb P₂O₅/A (extrapolated from Leonard and Martin, 1963). Since more P is removed with grain than is added with these low P rates, continuous use of these low P rates may eventually reduce yield levels because the available soil P pool in these low P soils will be depleted. The next focus of this study will be to determine how many crops can be sequentially harvested from the same site using this low P rate technology.

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

Seedrow P and N on Grain Sorghum Dryland, Walsh 2000

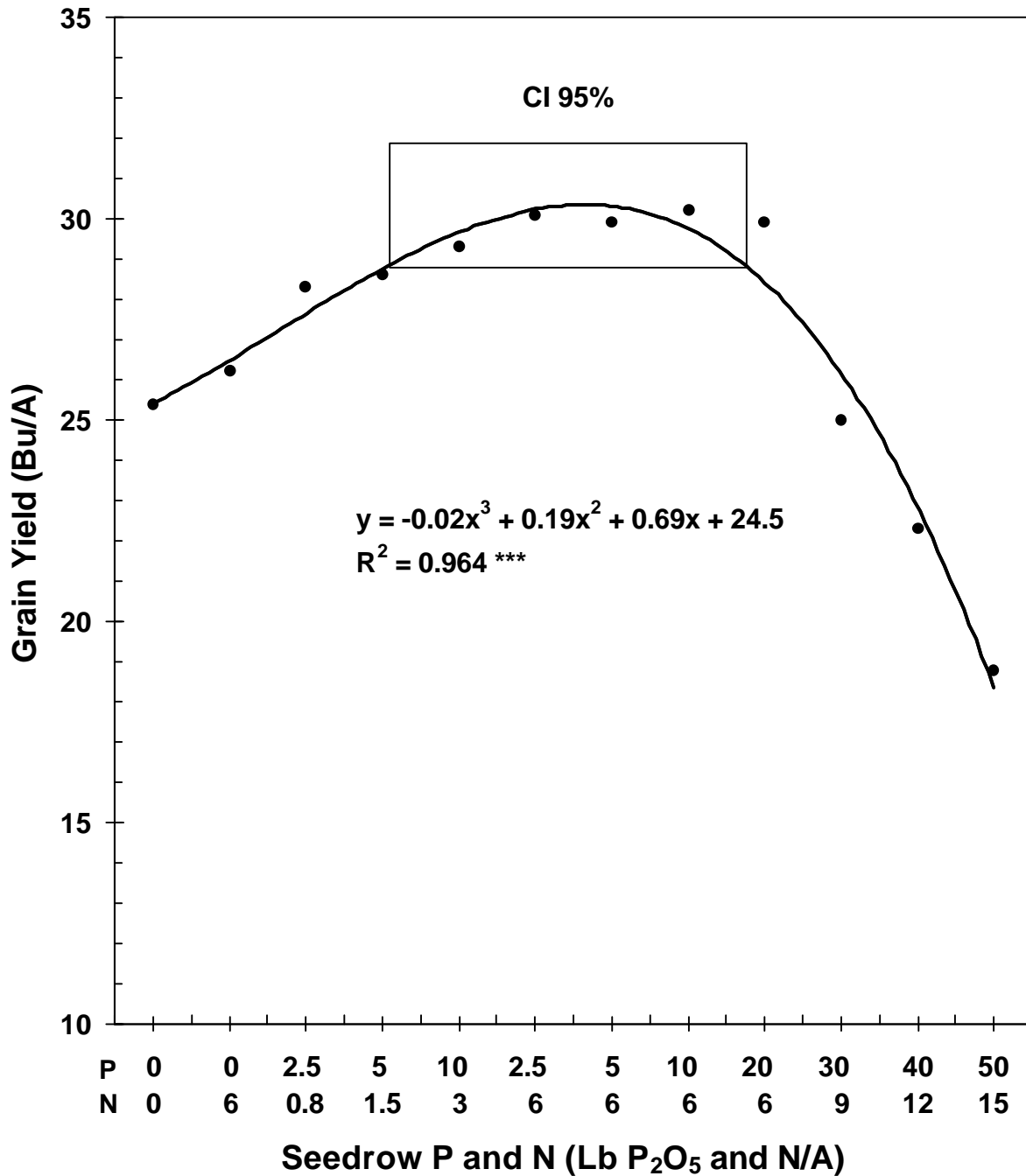


Fig. 13. Seedrow P and N on dryland grain sorghum at Walsh. The P fertilizer was liquid 10-34-0. All treatments with 6 Lb N/A, except 20 Lb P₂O₅, 6 N/A, had liquid 28-0-0 added. The grain sorghum hybrid was CARGILL 606 sown at 40,000 Seeds/A.

Seedrow Zn Rate on Dryland Grain Sorghum and Corn Kevin Larson, Dennis Thompson, Calvin Thompson

Soil test recommendations for Southeastern Colorado typically recommend banding 2 Lb Zn/A to both dryland grain sorghum and corn. Originally this zinc rate study was conducted to determine the optimum zinc rate for dryland grain sorghum, but dryland grain sorghum did not respond to applied zinc in any of these tests. During this period, we also began studies with dryland corn. In a rotation study we substituted corn for grain sorghum and noticed that the corn displayed classic zinc deficiency symptoms: stunted, with whitish areas along both sides of the midrib while the midrib and edges of the leaves remained green. In the rotation study the following year, we added 0.5 Lb Zn/A to the seedrow applied starter fertilizer to both the corn and the grain sorghum. The zinc deficiency symptoms of the corn disappeared and corn yields greatly increased, but the grain sorghum yields remained relatively constant. Because of these results, we decided to include corn in our zinc rate study.

Materials and Methods

The zinc study this year was planted in a wheat-sorghum-fallow site that had been in a continuous sorghum rotation for many years. The surface of the soil was a loamy sandy loam and the subsurface was a sandy clay loam. The soil test recommendation for a 60 Bu/A grain sorghum crop was 19 Lb N/A, 40 Lb P₂O₅/A and 2 Lb Zn/A (if banded). The grower applied 50 Lb N/A and we seedrow applied 0, 0.2, 0.4, 0.6, 0.8 and 1.0 Lb Zn/A as zinc chelate. We planted a grain sorghum hybrid, CARGILL 606, at 40,000 Seeds/A and a corn hybrid, CARGILL 4021 Bt, at 18,000 Seeds/A on June 14. For weed control, the grower applied pre-emergence Roundup 16 Oz/A and post emergence Atrazine 0.75 Lb/A, COC 1.0 Qt/A and Banvel 2.0 Oz/A, and we cultivated one time. We harvested three replications of the 10 ft by 50 ft. plots on October 17 for corn and November 11 for grain sorghum with a self-propelled combine equipped with a digital scale. Sorghum grain yields were adjusted to 14.0% and corn yield to 15.5% seed moisture content. The 0.4 Lb Zn/A treatment was not included in the report because raccoons disproportionately damaged that site area.

Results and Discussion

This year corn yields increased with seedrow applied zinc up to about 0.3 Lb/A (one-sixth of the recommended banded rate); grain sorghum did not respond to applied zinc (Fig. 14). This is the third year that we have tested both corn and grain sorghum in this zinc rate study, and all three years corn responded to seedrow applied zinc with optimum rates ranging from 0.3 to 0.6 Lb Zn/A. In the six years we have tested seedrow applied zinc on grain sorghum, last year was the only year that grain sorghum yields increase with applied zinc. Last year was an exceptionally high rainfall, high yielding year, which suggests that zinc may be required grain sorghum production under high yielding, high moisture conditions. Our results suggest that applied zinc is essential for dryland corn production, but zinc is not needed for dryland grain sorghum production for our area. We will continue our zinc rate studies to determine if zinc is required for irrigated grain sorghum production in our area.

**Seedrow Zn on Dryland Corn and Grain Sorghum
Vilas, 2000**

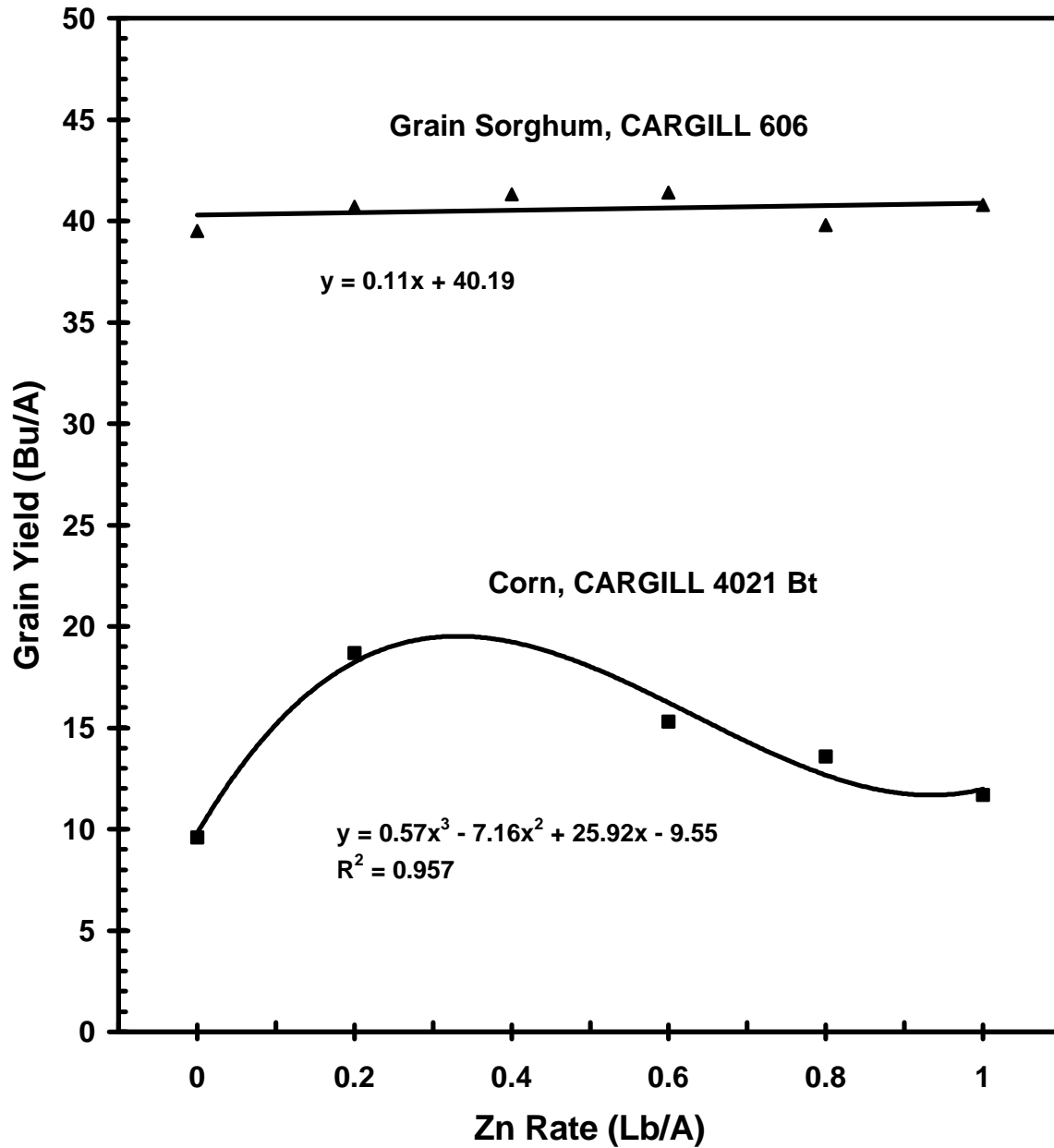


Fig. 14. Seedrow Zn rate on dryland corn and grain sorghum at Vilas. The Zn rates are 0, 0.2, 0.4, 0.6, 0.8, and 1.0 Lb Zn/A as zinc chelate. The grain sorghum hybrid was CARGILL 606 sown at 40,000 Seeds/A and the corn hybrid was CARGILL 4021 Bt sown at 18,000 Seeds/A. Both the corn and grain sorghum were planted on June 14.