1980
Progress Report

James Valley Agricultural Research & Extension Ctr.
Redfield, S. D. 57469

Agricultural Experiment Station • South Dakota State University • Brookings, South Dakota 57007

1980 REDFIELD PROGRESS REPORTS

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PR80-1

1979 WEATHER

JAMES VALLEY AGRICULTURAL RESEARCH
AND EXTENSION CENTER

The weather for 1979 was favorable for crop production in South Dakota. The growing season (April-September) precipitation average for the State was 13.82 inches while the 30 year normal for this period is 14.03 inches. Growing season precipitation at the Center during 1979 was 14.20 inches which was 0.26 inches below normal for the Center area; however, above normal precipitation during July and August had a positive impact on row crop production.

1979 PRECIPITATION
(Inches)

Month	1979	Long Term Average	Deviation From Average
January	1.06	0.44	+0.62
February	0.30	0.56	-0.26
March	2.31	0.83	+1.48
April	2.57	1.94	+0.63
May	1.67	2.67	-1.00
June	2.57	3.49	-0.92
July	3.92	2.45	+1.47
August	3.47	2.29	+1.18
September	Trace	1.62	-1.62
October	1.59	1.29	+0.30
November	0.49	0.59	-0.10
December	0.10	0.46	-0.36

Temperatures for the growing season averaged 1.9°F below normal which reduced the water requirements of the crops. September was the only month with above average temperatures.

1979 TEMPERATURE
(°F)

Month	Maximum	Minimum	Average	Long Term Average	Deviation From Average
January	8.6	-10.0	0.7	12.6	-11.9
February	13.2	- 9.8	1.7	16.5	-14.8
March	34.2	16.3	25.3	30.0	- 4.7
April	51.9	32.6	42.3	45.7	- 3.4
May	66.0**	39.8	52.9**	57.4	- 4.5
June	78.5	52.5	65.5	67.2	-1.7
July	85.2	60.3	72.8	73.5	-0.7
August	80.2**	56.0**	68.1**	71.6	-3.5
September	80.5	46.8	63.6	61.4	+2.2
October	60.5	30.3	45.4	48.9	-3.5
November	38.9	18.8	28.8	32.3	-3.5
December	37.1	11.8	24.5	18.7	+5.8

** One or more days of missing records

The relatively cool growing season can also be illustrated by a compilation of the growing degree days for the growing season. Growing degree days are a measure of the climatic energy available for crop production. The growing degree days for 1979 were approximately 16% below normal which would tend to cause yield reductions where climatic energy is a limiting crop production factor as in the case of irrigated cropland.

1979 GROWING SEASON GROWING DEGREE DAYS

Month	1979	Long Term Average	Deviation From Average
April	111.5	158.2	-46.7
May	263.7	356.0	-92.3
June	479.5	573.0	-93.5
July	680.5	794.6	-114.1
August	532.5	729.8	-197.3
September	478.5	435.4	+43.1
October	171.0	227.5	-56.5

Evaporation pan data can also be used to describe the climatic demands on a crop. There was less pan evaporation at the Center for 1979 than 1978 with the months of May and July accounting for most of the difference.

1979 GROWING SEASON OPEN PAN EVAPORATION
(Inches)

Month	1979	1978
May	5.86	9.22
June	7.03	6.58
July	5.12	11.01
August	4.91	5.28
September	5.93	3.16
Total	28.85	35.25

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PR80-2

DRY EDIBLE BEANS

Albert Dittman and Darrell DeBoer

Four varieties of navy beans were planted in a silt loam on June 14, 1979, at approximately 42,000 plants/acre. Soil samples collected in mid May indicated the presence of 120 lbs of nitrate nitrogen in the top two feet and another 100 lbs of nitrogen in the two to three foot zone. Phosphorus and potassium levels in the top six inches were 50 and 850 lbs/ac, respectively. No fertilizer was applied. Available water holding capacity of the soil was 3.9 inches in the top two feet and 6.9 inches in the top three feet. The beans were cultivated twice and some hand weeding was necessary in the rows since no herbicide was used. There was a trace of blight with minor or no injury to the plant.

The following table shows the irrigated and dryland yields based on a hand harvested sample area of two 30 foot rows. The moisture content of the harvest yield was 8.5%

YIELD, LB/AC

VARIETY	DRYLAND	IRRIGATED
1. Snowflake	3900	3300
2. Fleetwood	3360	3100
3. Snowbound	3710	3540
4. Upland	3470	3130

Dryland yields were greater than irrigated yields for all varieties. Soil water was adequate for the dryland beans during the entire growing season. The beans were irrigated on July 11, August 7 and August 23 with 1.1, 1.4 and 0.4 inches, respectively. Rainfalls of 0.8 and 1.5 inches occurred immediately after the first two irrigations which appear to have caused an excess soil water condition in the irrigated beans and a subsequent yield reduction.

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PR80-3

1979 PERFORMANCE TRIALS OF WINTER WHEAT, CORN, GRAIN SORGHUM AND SOYBEANS

J. J. Bonnemann and G. W. Erion

Performance trials with winter wheat, corn, grain sorghum and soybeans were seeded at the Research Center for 1979 harvest. The winter wheat trials were lost to severe winterkill.

All trials were seeded on May 21. Performance trials of hybrid corn were seeded on both irrigated and dryland portions of the Center. Custom built 31-cell cone seeders mounted above standard flexi-planter units with double-disc openers were used for seeding all row crops. The corn and grain sorghum trials were seeded in 36-inch row spacings. The soybeans seeded at the Center were in 30-inch row spacings.

The seedbed of the dryland corn and the soybean trials were quite satisfactory. The irrigated corn and grain sorghum trial seedbeds were adjacent and the seedbed was rather lumpy. Emergence of the dryland corn and soybeans was quite uniform. Emergence of the irrigated grain sorghum was uneven and weeds became an early problem that set the plants back the rest of the crop year. Recommended herbicides and insecticides were banded at seeding. Between the row weeds were the most serious problem.

Fertilizer was applied to the corn and sorghum trials at the rate of 80-40-0 prior to land preparations. No fertilizer was applied to the soybean field as soil tests indicated adequate amounts of P and K were present. The fields were double-disced twice and harrowed before seeding.

The grain sorghum trial was irrigated twice; the corn and soybeans once during the season.

Plant populations were quite good in all trials but the grain sorghum. Weed competition was the major cause of the reduction. Populations of the irrigated corn trial were intended to be 20, - and 24,000 plants per acre. The actual populations in mid-August were 19,130 and 22,280. The dryland trial was seeded for 12,000 plants per acre; the actual mid-August count was 11,725. Grain sorghum stands were intended to be 4-5 per foot; however final stands wer approximately 2 per foot.

Two populations were seeded in the irrigated corn trials to determine if one might be better than the other. No statistical difference was found favoring one over the other so the average of four replications is reported. The soybean and dryland corn trial results are also the average of four replications. The grain sorghum yields are the average of three replications.

The grain sorghum trial was harvested on October 3, the same day as the soybeans. The irrigated corn was harvested on October 29. Rainfall and snow prevented harvesting of the dryland corn trial until November 6.

Grain sorghum yields ranged from only 2,635 down to 1,085 pounds per acre. The test weights varied from 51 to 58 lb/B, indicating wide variation in quality. Because of the early stress the progress of the plot was delayed throughout the season and heading dates ranged from August 3 to September 2. Normally heading would begin about July 20 and the very late would be finished heading by August 10. The warm, dry September without a killing frost was very beneficial and permitted plants to continue growth and produce some grain.

The soybean trial yields were not as high as could be expected for irrigated trials. The mean yield of the trial was 32.3 B/A. The yields ranged from 37.3 down to 28.1 B/A in 1979. Cultivations were delayed because of wet field conditions during June and weeds between the row caused problems early in the year that were not overcome. Yields in 1979 were less than in 1978 when the trial was not irrigated. Abnormal climatic conditions also played a role.

The corn yields were good to excellent in the dryland trial. The irrigated yields were good but not up to their anticipated potential yields. Several possibilities could be discussed as sources for yield reductions but no documentation can be provided to pinpoint a specific cause. Dryland corn yields ranged from 110 to 38 B/A; the trial mean being 88.3 B/A. Irrigated corn yields ranged from 121 to 62 B/A; the trial mean at 89.5 B/A. Moisture content averaged less than 20 percent in both trials. Stalk breakage was a problem for some dryland entries.

Current years data are presented. Additional data on the trials will be found in the Performance Trial Publication for all these crops available from the SDSU Agricultural Experiment Station or your County Extension Agent.

Table 1. 1979 corn performance trials area C1 (dry), Redfield, SD

Brand and Variety	Type and Cross	Yield B/A	Pct. Root Lodged	Pct. Stalk Lodged	Pct. Ears Dropped	Percent Moisture	Performance Score Rating
Curry SC-1422	M 2X	109.9	0.0	25.2	0.0	20.3	4
Sokota TS58	M 2X	107.8	0.0	8.3	0.0	18.4	1
Northrup King PX49	M 2X	105.6	0.0	9.3	0.0	19.7	2
Western KN55	M 2X	104.4	0.0	6.6	0.0	20.1	3
Sokota TS62A	M 2X	98.8	0.0	11.8	0.0	18.2	7
Pride 4488	M 2X	98.4	0.0	0.0	0.0	19.2	5
Cenex 3123	E 3X	97.4	0.0	8.0	0.0	17.7	6
Trojan TXS102	M 2X	97.4	0.0	16.2	0.0	19.7	11
Cenex 3018	E 3X	96.5	0.0	12.5	0.0	16.8	9
Cenex 2111	E 2X	96.4	0.0	13.3	0.0	18.2	10
Payco SX637	E 2X	95.8	0.0	8.1	0.0	16.7	8
Curry SC-1444	M 2X	95.1	0.0	16.7	0.0	18.3	17
Sokota SS67	L M2X	95.0	0.0	11.0	0.0	19.4	13
Cenex 2119	E 2X	93.3	0.0	11.3	0.0	16.4	12
Curry SC-1424	M 2X	92.3	0.0	6.8	0.0	17.5	14
Acco UC3002	M 2X	92.1	0.0	9.0	0.0	19.6	19
Acco UC1905	M 2X	92.1	0.0	16.4	0.0	17.0	21
Asgrow RX58	E M2X	91.9	0.0	32.2	0.0	19.1	35
DeKalb XL-23	E 2X	91.9	0.0	19.0	0.0	19.1	26
Payco SX756	M M2X	91.8	0.0	5.1	0.0	20.8	20
De Kalb XL-15	E 2X	91.7	0.0	6.6	0.0	17.1	15
Sokota TS44	E 2X	91.5	0.0	6.9	0.0	18.4	18
Pride R-328	E 3X	90.8	0.0	23.0	0.0	18.5	31
TCP Farm TF106A	M 2X	90.1	0.0	3.4	0.0	16.7	16
Trojan T 1008	M 2X	88.9	0.0	7.0	0.0	18.2	22
Payco SX680	E 2X	88.5	0.0	6.8	0.0	18.9	23
Top Farm TF100	M 2X	88.1	0.0	7.4	0.0	18.2	24
Trojan TXS94	E 2X	87.6	0.0	5.4	0.0	18.6	25
Top Farm TF396	E 3X	86.8	0.0	10.0	0.0	16.8	28
Funks G-4195	E 3X	86.1	0.0	32.8	0.0	16.7	41
Jacques JX107	E 2X	85.9	0.0	4.3	0.0	18.4	29
SDAES Check 4	M 2X	85.6	0.0	6.6	0.0	19.1	32
Acco UC2951	M 2X	85.5	0.0	2.6	0.0	17.5	27
Northrup King PX37	M 2X	85.4	0.0	3.5	0.0	18.9	30
Curry SC-1400	E 2X	85.4	0.0	9.2	0.0	18.0	33
Payco SX844	L 2X	85.0	0.0	4.3	0.0	19.5	34
Trojan T 1058	M 2X	84.9	0.0	10.0	0.0	21.2	38
SDAES Check 5	M 4X	84.4	0.0	9.0	0.0	18.5	36
Pride 4417	M 2X	82.9	0.0	7.6	0.0	17.8	37
Top Farm TF97	M 2X	82.8	0.0	14.0	0.0	18.3	40
Acco U322	E 3X	82.2	0.0	10.0	0.0	17.7	39
Funks G-4180	E 3X	78.1	0.0	6.4	0.0	17.8	42
De Kalb XL-25A	M 2X	77.7	0.0	5.8	0.0	18.5	43
Jacques JX52	E 2X	74.9	0.0	6.2	0.0	18.6	44
Western KX475	M 3X	71.4	0.0	15.4	0.0	18.0	45
SDAES Check 8	E 2X	68.5	0.0	9.7	0.0	16.4	46
Funks G-4085	E 3X	64.8	0.0	18.6	0.0	16.4	47
SDAES Check 6	E 3X	38.5	0.0	7.7	0.0	16.8	48
Means		88.3		10.6		18.3	
LSD (.05)		17.6			C.V. - 14.3%		

Table 2. Corn performance trial, area C1 (Irr), Redfield, SD

Brand and Variety	Type and Cross	Yield B/A	Pct. Root Lodged	Pct. Stalk Lodged	Pct. Ears Dropped	Percent Moisture	Performance Score Rating
SDAES EX 108	M 2X	120.8	0.0	2.7	0.0	32.1	1
Curry SC-1424	M 2X	104.2	0.0	1.9	0.0	18.4	2
P-A-G SX397	M 2X	102.1	0.0	5.1	0.0	22.1	9
SDAES Check 2	L 2X	101.3	0.0	3.8	0.0	21.5	10
Top Farm TF106A	M 2X	100.4	0.0	3.5	0.0	17.3	4
De Kalb XL-25A	M 2X	100.3	0.0	1.9	0.0	19.5	7
Western KX-56	M 3X	100.1	0.0	4.2	0.0	17.8	5
Pride 4488	M 2X	99.6	0.0	1.0	0.0	22.3	14
Asgrow RX40	E M2X	99.5	0.0	3.2	0.0	16.3	3
RBA Super 4+	M 3X	99.5	0.0	4.1	0.0	28.6	36
Curry SC-1444	M 2X	99.3	0.0	5.2	0.0	18.0	8
Mc Curdy 76-96	M 2X	98.8	0.0	6.5	0.0	19.8	17
Curry SC-1422	M 2X	98.6	0.0	2.8	0.0	22.2	19
Mc Curdy MSX46	M 2X	98.4	0.0	1.0	0.0	19.1	11
RBA 104	M 2X	98.3	0.0	2.3	0.0	21.2	18
Cenex 2119	E 2X	98.3	0.0	3.9	0.0	15.9	6
Sokota TS60	M 2X	97.8	0.0	4.0	0.0	19.1	15
Sokota TX62A	M 2X	97.6	0.0	6.8	0.0	17.9	16
Northrup King PX49	M 2X	97.6	0.0	1.9	0.0	18.9	12
Disco SX-24	M 2X	96.1	0.0	3.8	0.0	21.0	23
De Kalb XL-15	E 2X	95.7	0.0	1.4	0.0	16.8	13
Payco SX844	L 2X	94.9	0.0	2.1	0.0	21.8	29
Payco SX779	M 2X	94.3	0.0	2.1	0.0	20.0	24
Payco SX756	M M2X	94.1	0.0	5.3	0.0	21.2	35
Cargill 838	E M2X	94.1	0.0	2.7	0.0	17.1	20
Cenex 2157	M 2X	94.1	0.0	4.7	0.0	19.2	25
Acco UC3002	M 2X	94.0	0.0	2.4	0.0	21.5	33
Acco UC1905	E 2X	93.3	0.0	6.2	0.0	18.0	26
Cenex 3134	M 2X	92.9	0.0	5.0	0.0	18.0	27
Payco SX637	E 2X	92.9	0.0	3.3	0.0	15.7	21
P-A-G SX249	M M2X	92.6	0.0	2.0	0.0	23.4	41
Mc Curdy 77-74	E 2X	92.3	0.0	3.3	0.0	16.2	22
Jacques JX107	E 2X	92.1	0.0	2.0	0.0	19.2	32
Sokota T558	M 2X	92.0	0.0	3.8	0.0	18.3	31
Pride 3320	E 2X	91.9	0.0	3.0	0.0	17.5	28
P-A-G SX189	E M2X	91.9	0.0	2.8	0.0	19.1	34
Mc Curdy MSX37	E 2X	91.1	0.0	6.8	0.0	15.8	30
Acco UC2951	M 2X	90.3	0.0	3.0	0.0	19.0	39
Northrup King PX37	M 2X	90.0	0.0	0.5	0.0	20.1	40
P-A-G SX177	E M2X	89.9	0.0	3.8	0.0	16.9	37
Northrup King PX24	E 2X	89.7	0.0	3.3	0.0	17.1	38
Trojan TXS 102	M 2X	89.4	0.0	2.0	0.0	21.3	43
Cargill 872	M M2X	89.4	0.0	3.6	0.0	21.5	44
Mc Curdy 77-49	M 2X	88.8	0.0	3.5	0.0	22.1	50
Sokota SS67	L M2X	88.4	0.0	4.0	0.0	22.8	51
RBA 96	M 3X	88.1	0.0	4.9	0.0	16.7	42
Payco SX775	M 2X	87.4	0.0	2.4	0.0	19.9	46
De Kalb XL-23	E 2X	87.4	0.0	4.2	0.0	19.9	49
Mc Curdy MSX44A	M 2X	87.4	0.0	4.0	0.0	23.4	56
Disco SX-16AA	M 2X	86.6	0.0	7.8	0.0	17.4	48
Trojan T 1008	M 2X	86.4	0.0	3.0	0.0	18.6	47
Wilson 1016	E 2X	86.0	0.0	2.0	0.0	21.2	53
Top Farm TF103	M 2X	85.5	0.0	2.1	0.0	17.5	45
Jacques JX52	E 2X	84.4	0.0	5.8	0.0	18.7	55
Funks C-4195	E 3X	83.6	0.0	4.3	0.0	16.7	52
Funks C-4141A	M M2X	83.2	0.0	3.9	0.0	17.1	54
Trojan T 1058	M 2X	81.2	0.0	5.2	0.0	23.9	61
Asgrow RX544	M M2X	81.0	0.0	4.4	0.0	21.9	59
Top Farm TF100	M 2X	80.9	0.0	2.4	0.0	19.4	57
Cargill 832	E M2X	79.3	0.0	10.0	0.0	17.4	58
Pride 2269	E 2X	78.6	0.0	12.6	0.0	18.1	65
Cenex 2111	E 2X	78.5	0.0	3.7	0.0	19.1	60
P-A-G 547	M 3X	78.4	0.0	3.4	0.0	22.6	66
Top Farm TF97	M 2X	77.0	0.0	6.4	0.0	18.1	62
Western KX-35	M 2X	76.0	0.0	1.4	0.0	18.7	63
Acco UC1151	E 2X	75.5	0.0	5.2	0.0	16.7	64
Funks G-4224	M M2X	75.0	0.0	4.2	0.0	19.4	67
RBA 94	M 2X	72.5	0.0	2.5	0.0	18.7	68
Funks G-4180	E 3X	66.4	0.0	0.5	0.0	18.4	70
Acco U322	E 3X	66.2	0.0	1.5	0.0	17.0	69
SDAES Check 5	M 4X	62.4	0.0	4.2	0.0	18.9	72
Mc Curdy 76-10	E 2X	62.1	0.0	3.1	0.0	16.0	71
Means		89.5	0.0	3.7	0.0	19.5	
LSD (.05)		13.5		C.V.	10.9%		

Table 3. 1979 Grain Sorghum Performance Trials, Redfield (irrigated).

Brand & Variety	Yield, lb/A	Test Wt. lb/B	Height, inches	Percent Moisture	Date Headed
Northrup King NK 180	2635	58	48	35.+	8/12
Western WS-103	2450	55	46	35.+	8/15
Northrup King Brand 2018	2340	53	47	35.+	8/13
Trojan M548G	2260	54	47	35.+	8/19
Frontier 385R	2205	55	42	35.+	8/16
Disco 184	2160	52	47	35.+	8/13
Pride P508GB	2145	57	46	35.+	8/13
Growers GSA1060	2090	55	47	35.+	8/14
Western WS-206	2075	52	47	35.+	8/21
Cenex 333	2050	54	48	35.+	8/25
Asgrow Corral	2000	51	48	35.+	8/29
Warner W-564T	1970	53	46	35.+	8/22
Disco 194R	1960	51	48	35.+	8/18
Cenex 310T	1920	53	48	35.+	8/19
DeKalb A-28+	1885	55	43	35.+	8/14
Asgrow Dorado E	1845	54	45	35.+	8/15
YW GBT503	1820	55	38	35.+	8/16
ACCO R 920	1805	55	47	35.+	8/9
ACCO R 980	1780	55	42	35.+	8/17
ACCO R 1014	1730	56	45	35.+	8/17
Trojan M518G	1685	52	43	35.+	8/15
Cenex 228T	1645	54	45	35.+	8/21
DeKalb B-38+	1635	53	44	35.+	8/20
Growers GSA1100	1635	52	48	35.+	8/25
Northrup King Brand 2030	1595	52	42	35.+	8/31
Disco 186R	1555	55	44	35.+	8/20
Cargill 20	1520	52	37	35.+	8/18
Asgrow Bug-Off E	1485	53	46	35.+	8/26
Warner W-545T	1460	52	42	35.+	8/20
Cenex 300T	1455	54	50	35.+	8/23
Disco 198R	1410	51	48	35.+	8/23
Disco 196R	1390	52	49	35.+	8/27
ACCO GR1018	1300	50	45	35.+	8/23
SDAES SD 106	1250	56	42	30.5	8/5
SDAES SD 104	1245	58	39	34.5	8/3
Frontier 395R	1090	53	43	35.+	9/2
Cenex 322T	1090	52	47	35.+	8/24
ACCO X6353	1085	50	41	35.+	9/1
Means	1755	54	45	35.+	8/19
LSD (.05)	620		C.V. - % = 21.8		

Table 4. 1979 Soybean Performance Trial, James Valley Research & Extension Center, Redfield, SD

Identification of Entries[1]			1979 Field Data			Average Yield in Bu/acre	
			Maturity Date	Plant Height	100 seed wgt.	1979	1978-79
Standard Varieties			(mo.-day)	(inches)	(grams)		
Entry	Days to Mature[2]	Maturity Group[3]					
Evans	- 3	0	9-14	34	15.3	31.5	33.6
Swift	0	0	9-16	34	15.5	32.7	33.8
Steele	+ 3	I	9-22	35	15.0	29.2	32.9
Hodgson 78	+ 5	I	9-23	30	16.5	32.4	36.1
Vickery	+ 9	II	9-25	35	13.8	37.3	
Weber (I.C.)	+ 7	I	9-26	34	13.0	36.8	
Coles	+ 10	II	9-26	35	15.3	30.9	35.8
Corsoy 79	+ 9	II	9-26	33	14.6	34.7	
Corsoy	+ 9	II	9-27	34	14.3	32.8	38.2
Harcor	+ 10	II	9-28	34	13.4	34.1	39.1
Hark	+ 10	II	9-28	36	14.4	30.3	33.9
Nebsoy	+ 13	II	10-3	36	14.7	34.4	
Wells II	+ 9	II	10-3	34	13.8	28.1	34.4
Amcor	+ 16	II	10-5	37	14.6	33.7	
Amsoy 71	+ 15	II	10-5	38	16.0	29.4	32.2
Sloan	+ 14	II	10-6	36	14.4	33.0	37.3
U 11532	+ 15	II	10-7	37	13.0	31.1	
Century	+ 17	II	10-8	35	15.5	33.9	
Proprietary Entries:							
Brand	Entry	b					
Peterson Variety	0877	0	9-17	29	15.0	29.0	
~~Northrup~~ King	Multi 31(B)	0	9-18	33	15.7	31.3	
Hy-Vigor	Ex. 2110	II	9-20	30	14.4	29.7	
ACCO	101	I	9-21	34	14.7	32.2	
Schettler	TC 137	I	9-23	30	15.5	30.2	
Jacques	J88	I	9-23	31	15.7	28.7	
Hy-Vigor	Ex. 4110	I	9-25	31	15.9	32.3	
Northrup King	Multi 42(B)	I	9-25	30	16.7	31.0	35.2
Peterson Variety	1677	I	9-25	32	12.8	33.1	
Peterson Brand	3100 (B)	II	9-25	37	14.2	34.7	37.8
Pfizer	PGI CB151 (B)	I	9-25	34	15.1	32.3	
Peterson Brand	1980 (B)	I	9-25	34	14.3	33.5	
Northrup King	S 1346	I	9-26	32	16.6	34.9	
Pfizer	PGI CX155	I-II	9-26	34	14.9	32.8	34.4
Hi-Vigor	Ex. 707	II	9-28	36	15.3	32.1	
SRF	250	II	10-4	35	13.0	34.0	

Mean, B/A - 32.3
LSD (.05) - 4.4
C.V.-% - 9.8

1 - Listed in order of 1979 maturity
2 - Expected relative maturity at this site compared to Swift when not exposed to a killing frost
3a- Maturity Group from USDA classification: 0 = early, I = early to midseason, II = mid-season to late at Redfield
3b- Information supplied by the company
(B) - blend
(I.C.) - good tolerance to iron chlorosis

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PR80-4

SPRING WHEAT BREEDING

D. L. Keim, G. W. Buchenau, and K. M. Sellers

Hessian fly hit the nursery shortly after heading. Fly numbers were quite high put appeared to have little effect on grain yield or test weight (Table 1). No lines showed resistance, although some lines had consistently lower infestation levels.

In the Advanced Yield Trial (AYT), several SD lines performed well (Table 1). For two years SD 2845 ranked first in yield at this station. SD 2845 is a selection from the cross Butte/James 'sib'. SD 2868 was reselected for purity from SD 2845. Leaf rust infection was quite high on some susceptible lines but resistance is quite good in most promising selections.

In the selection nursery, 2,080 plots (5 acres) of breeding lines (F_2 - F_8) were grown for evaluation and selection. This nursery is a duplicate of the nursery grown at Brookings. Several lines were selected and advanced in the program based on the performance at both locations.

Table 1. 1979 Advanced Yield Trial - Redfield

Name	Entry No.	Grain Yield 1979	Grain Yield 78-79	Test Weight	Heading Date	Plant Height	Leaf Rust	Hessian Fly Plants Infested	Hessian Fly Fly/100 Plants
		-bu/A-		-lb/bu-		-inches-		%	
SD2845	21	35.7*	37.5	62	6/26	31.5	T	25.0	60
Len	28	35.5*	--	61	6/30	27.6	T	16.7	30
SD2835	15	34.7*	--	62	6/28	31.0	6MR	33.3	98
Olaf	2	34.7*	29.0	61	6/30	27.6	T/5R	26.7	63
SD2846	23	34.6*	32.8	62	6/25	31.8	60S	13.3	27
Butte	5	34.1*	35.5	63	6/28	29.6	T	41.7	192
SD2700	10	33.9*	31.8	62	6/28	28.9	T/5R	25.0	48
SD2868	8	33.7*	--	62	6/26	29.3	T	15.0	48
SD2708	9	33.6*	30.4	59	6/29	25.4	22MR	21.7	58
MN70170	29	33.0*	--	59	7/1	25.5	43MS	23.3	43
Era	3	32.7*	27.6	59	7/1	27.1	TMR	15.0	35
Eureka	27	32.4*	29.0	60	6/30	32.3	8MR	6.7	17
SD2827	12	32.0*	--	60	6/28	28.0	TMR	36.7	112
SD2838	19	31.8*	29.4	59	7/1	33.0	T	33.3	85
SD2869	24	31.3	--	63	6/25	30.9	60S	21.7	60
SD2847	25	30.9	29.8	58	6/29	25.6	17MR	5.0	7
SD2837	18	30.8	--	63	6/28	30.8	9MR	26.7	85
NK5511	30	30.6	--	60	6/28	27.5	4MR	23.3	42
SD2016	6	30.6	30.4	58	7/1	26.2	60MS	16.7	38
SD2870	17	30.5	--	62	6/28	30.3	TR	11.7	20
SD2843	20	30.2	29.4	59	6/29	31.9	TMR	25.0	93
SD2355	9	29.9	26.8	60	7/1	29.5	28MR	31.7	58
Protor	4	29.9	--	59	6/27	25.9	27MR	10.0	17
James	26	29.4	30.0	60	6/26	28.5	6R	26.7	108
Waldron	1	29.4	25.9	59	6/28	31.2	33MR	26.7	63
SD2329	8	29.3	29.2	60	6/30	29.1	22MR	31.7	100
SD2828	13	28.7	--	50	7/1	32.5	T	26.7	63
SD2830	14	28.6	--	59	6/27	26.0	80S	10.0	23
SD2836	16	28.1	--	62	6/29	31.3	T	21.7	58
SD2256	7	27.5	29.5	59	7/1	34.8	12MR	35.0	85
Average		31.6		60.4	6/29	29.4		22.8	61.2
C.V.		6.9%			3.0%	4.0%			
Bayes LSD		4.06							

Planted: 5/9/79 3 Replications, 5' x 14.5' harvested area

* Yield values followed by an asterisk are not significantly different from the highest value.

Table 2. 1979 Preliminary Yield Trial - Redfield

Name	Entry No.	Grain Yield	Test Weight	Heading Date	Plant Height	Leaf Rust
		-bu/A-	-lb/bu-		-inches-	
SD2861	16	35.9*	59	6/26	27	T
SD2853	8	35.8*	60	6/26	30	T
SD2854	9	35.7*	58	6/30	31	TMR
Olaf	2	34.2*	61	7/1	28	T
Butte	5	33.9*	62	6/26	30	T
SD2851	7	33.1*	61	6/27	30	T
Era	3	33.0*	58	7/1	27	T
Protor	4	32.9*	60	6/26	25	12MR
SD2860	15	32.3*	61	6/29	29	T
SD2852	6	32.1*	62	6/25	30	TMR
Eureka	24	31.8*	59	7/1	32	TMR
SD2856	11	30.9*	60	6/25	24	5MR
SD2862	17	30.6*	60	7/1	33	0
SD2866	21	30.3	62	6/26	30	TMR
SD2857	12	30.1	60	6/25	24	5R
SD2867	22	29.1	62	6/26	26	TMR
SD2864	19	29.0	61	7/1	30	T
SD2859	14	28.8	61	6/25	24	5MS
Waldren	1	28.4	59	6/30	32	15MR
SD2865	20	27.7	62	7/1	27	0
James	23	27.6	60	6/25	29	5MR
DK49S	25	27.2	59	6/30	24	T/10MR
SD2855	10	26.6	61	6/26	29	TMR
SD2863	18	26.2	62	6/29	26	T
SD2858	13	24.3	58	6/25	24	8MR
Average		30.7	60.4	6/28	28.0	
C.V.		10.1%				
Bayes LSD		5.58				

Planted: 5/9/79 3 Replications, 5' x 14.5' harvested area

* Yield values followed by an asterisk are not significantly different from the highest value.

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PR80-5

GRASS -- ALFALFA VARIETY TEST

J. G. Ross, T. J. Heilman and G. L. Holborn

Introduction

The objective of this experiment was to obtain information on the relative yielding capacity of varieties of adapted species under irrigation with and without a mixture of alfalfa and under an intensive cutting program. The particular interests in this experiment are the comparative yields of SD 101 creeping foxtail with Garrison and SD 5 bromegrass with Lincoln.

Materials and Methods

The following grasses were seeded at 10 lbs. of pure live seed (pls) per acre and in mixture with alfalfa, at 8 lbs. pls of grass seed and 8 lbs. pls of Iroquois alfalfa seed, on August 20, 1974 in four replicates of 8' x 20' plots in rows 6 inches apart.

Garrison and SD 101 creeping foxtail
Lincoln and SD 5 bromegrass
Oahe and Slate intermediate wheatgrass
Nordstern orchardgrass
Commercial reed canarygrass

In the fall of 1974, this experiment was irrigated to obtain a good established stand. No winter injury on the alfalfa was noted the next spring.

In April, 1979, 100 lbs. of nitrogen (N) as ammonium nitrate was applied only to the grass plots. The first cutting was made June 19. The second cut was made on July 21. Irrigations were made as follows: 1.00 inch May 20, 1.00 inch June 10, because of unavailability no water was applied after the first cutting.

The plots were harvested with a 2-foot flail-type mower, the forage weighed, moisture samples taken and reported as dry weight.

Results and Discussion

Yields were obtained in 1979 for 2 cuttings, and the averages of these are shown in Table 1. Differences were found between grass with alfalfa and grass alone for the second cutting and for total yield. For the first cutting there was no significant difference in yield between grass-alfalfa and grass alone. This probably resulted from the optimum nitrogen fertility supplied to the grass. For the second cutting grass-alfalfa was significantly greater in yield over grass alone. No nitrogen fertilizer was applied after first cut. The addition of nitrogen by alfalfa and the ability of the alfalfa root system to use deep subsoil moisture during mid-summer were responsible for the greater yield of grass-alfalfa in the second cutting and also for total yield.

Differences between different species of grasses were found. Orchardgrass yielded better than all other species because it did not winterkill the previous winter. The yield, however, was only significantly greater than on other species - reed canarygrass. Smooth bromegrass, creeping foxtail, and intermediate wheatgrass yields were approximately the same.

Lincoln smooth bromegrass yielded slightly more than Rebound in the first cutting, but Rebound yielded slightly more in the second cutting. Although neither cutting difference was significant, the characteristic of greater regrowth during warm weather in Rebound was evident. If optimum moisture and nitrogenwere present a greater difference in favor of Rebound would probably have occurred.

There was little difference in yield between Retain and Garrison creeping foxtail in either first or second cutting. Retain did have a higher total yield than Garrison, but the difference was not significant. Most importantly, the selection of Retain for seed retention and away from shattering present in Garrison did not adversely affect forage yield.

Slate intermediate wheatgrass produced slightly more forage than Oahe in the first cutting, but the yields of these two varieties were about the same in the second cutting. There were no significant differences in either cutting or in total yield.

Table 1. Redfield Irrigation Grass-legume

Experiment, 1979. four replicates, rows seeded 6" apart.

	Grass-alfalfa			Grass alone		
	6/19 cutting	7/21 cutting	Total	6/19 cutting	7/21 cutting	Total
			Tons/acre*			
Smooth bromegrass						
Rebound	2.30a	1.28a	3.58a	2.27ab	.77ab	3.04ab
Lincoln	2.45a	1.30a	3.75a	2.51a	.62ab	3.13ab
Creeping foxtail						
Retain	2.58a	1.25a	3.83a	2.41a	.66ab	3.06ab
Garrison	2.55a	1.27a	3.82a	2.67a	.47b	3.15ab
Intermediate wheatgrass						
Oahe	2.53a	1.42a	3.95a	2.22ab	.66ab	2.88ab
Slate	2.51a	1.30a	3.81a	2.57a	.65ab	3.21ab
Reed canarygrass						
Commercial	2.44a	1.45a	3.89a	1.74b	.73ab	2.47b
Orchardgrass						
Nordstern	2.52a	1.49a	4.01a	2.64a	.85a	3.49a
Means**	2.49	1.35**	3.83**	2.38	.68**	3.05**

* Yields followed by different letters differ significantly.

** Comparable means for grass-alfalfa and grass alone differed significantly.

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PR80-6

THE IRRIGATION OF SOYBEANS FOR MAXIMUM YIELD AND WATER USE EFFICIENCY

L. O. Fine and John McLeod

The eight recognized reproductive stages of the soybean plant, used in the 1978 experiment with the same objective, are continued to be used in 1979. However, because of the considerable available water capacity per unit depth of our soils, several growth stages were combined, as the time intervals of the 1978 experiment were not great enough to allow water exhaustion before the crop had gone through parts of two reproductive stages.

Five stages were recognized in the 1979 experiment, as follows:

(1) Planting to first bloom. Rainfall was adequate; no irrigations made.

(2) Full bloom thru beginning pod

(3) Full pod thru beginning seed

(4) Full seed thru beginning maturity

(5) Maturity

Five replications were used in 1979; six different water management schemes were set up so as to provide adequate soil water or a stress in as many different combinations as possible. One treatment was left without irrigation throughout the season. The six water management regimes, the dates each was irrigated, and the final bean yields at standard 12% moisture content are given in the following table. Each irrigation was approximately 2 inches of water; no runoff was permitted. Beans were planted in 21-inch rows, cultivated once and furrow irrigated. Hodgson variety was planted on May 18.

Treatment NO.	Dates Irrigated	Stages of desired stress of soil water	Stages of desired ade-quacy of soil water	Yield bu/A (Ave)
1	None	All except(1)	None except (1)	61.0
2	7/23	(3),(4),(5)	(1),(2)	61.6
3	7/23, 8/6 8/27, 9/11	None	All	59.6
4	8/6, 8/27	(2),(5)	(1),(3),(4)	60.7
5	8/27	(2),(3),(5)	(1),(4)	62.4
6	8/6	(2),(4),(5)	(1),(3)	63.6

Under the rainfall conditions of 1979, and with the beginning season soil water storage, adequate natural precipitation and stored soil water was present to allow optimum or near optimum moisture conditions. If any yield benefits occurred, irrigation in early August was the most effective.

Studies on yield components, leaf water potential and osmotic stress in leaves are being made in conjunction with this experiment. This work is not yet completed and will be included in the final report.

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PR80-7

WATER MANAGEMENT ON CORN

Darrell DeBoer and Albert Dittman

The objective of the field experiment was to evaluate the yield response of corn to four levels of irrigation water ranging from dryland conditions to full irrigation. The corn was planted on May 16 and cultivated on June 15 and July 10. Soil samples collected in mid May indicated the presence of 120 lbs of nitrate nitrogen in the top two feet and another 100 lbs of nitrogen in the two to three foot zone. Phosphorus and potassium levels in the top six inches were 50 and 850 lbs/ac, respectively. Eighty pounds of anhydrous ammonia was injected on July 10. Four, 30 foot rows were machine harvested from each plot on October 19 with a harvest population of approximately 19,000 plants/acre. Rodent damage was a problem in some of the plots.

Above average rainfall during July and August made it impossible to maintain the four planned levels of irrigation management. The crop was only irrigated once on August 7 with a two and a four inch application depth which resulted in irrigation water application variables of 0, 2 and 4 inches. The average corn yield was 105 bu/ac with no differences caused by the irrigation variable.

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PR80-8

SUNFLOWER STUDIES IN SOUTH DAKOTA

Q. S. Kingsley

There were four sunflower sites located in the Northeast one-fourth of the state. The area covered is north of Highway 14 and west to the Missouri River, and a fifth site in Clay County. The specific sites were located at or near Highmore, Ken Sutton ranch 28 miles west of Onida, Redfield, Watertown and Beresford plantings are located on Research Stations near towns mentioned. Sunflower work, crop sequences and insect studies will be continued on these locations in 1980.

Sunflower yields taken on the Redfield Research Station in 1979 were about equal to those of 1978. There was some bird damage, but most of it was by sparrows. Root and stem weevil damage was of minor importance, which may be due to rapid growth and larger stems of the sunflower plants. The sunflower head moth was not a problem early in the year on any of these sites. Where the moth occurred was after the sunflower pollination was near completion. The larvae then worked its way into the receptacle portion of the head, causing little damage to the seed. This insect could be a problem in 1980 if winds and temperatures are right and they blow in from the south.

The maintenance of weed free conditions on farmland, when in the sunflower program, is a necessity because weeds are alternate hosts of insects and diseases. In 1979, there were many fields severely infected with phoma, a disease which blackens the stalk and shuts off the flow of nutrients to the head. Another disease, Alternaria, produces spots on the stalk and then elongates to destroy the fibrous tissue which weakens the stalk. This disease may also attack the leaves. These two funguses are soil borne and occur naturally in the soils of South Dakota.

Care must be taken in fall tillage that the soil is not worked up too finely. In so doing, the land may blow or wash because sunflowers have a tendency to loosen the soil. The chopping or working of the stalks does increase the mortality of insects overwintering in the stalks or roots by exposure to the weather.

SUNFLOWER VARIETY TRIALS

Q. S. Kingsley

OBJECTIVE: To test various sunflower varieties grown in the state for yield and percent oil.

CROP YEAR HISTORY:

Planted: May 22 Harvested: Oct. 5
Variety: Various Fertilizer: 80-20-0
Replications: 4 Soil Preparation: Chisel & Disk
Herbicide: Tolban, 1 qt/A or 1/2#/A
Plant Population: Irrigated 19,000/A, Dryland 16,000/A, 36 inch rows
Cultivations: One
Soil Type: Beotia-Great Bend-Harmony
Rainfall: May 22 to Oct. 5, 11.2 inches
Irrigated: 6 inches
First Killing Frost: October 1

RESULTS:

Sunflower Varieties Observation Trial 1979

Oil Seed Variety	Redfield Irrigated #/A	% Oil
Interstate 241	1646	39.4
Interstate 893	1924	39.4
Interstate 897	1604	37.4
Interstate 907	2031	38.1
Interstate 8944	1582	37.1
Western Seed SK70	1839	37.6
Western Seed SD76	1518	39.6
Interstate 894	1775	37.8
Cal/West 903	1753	38.1
Sigco 449	1988	37.7
Sigco 450	1668	41.1
Sigco 890	1454	40.0
4 Winds 1100E	1561	37.5
4 Winds 1100D	1518	39.3
Master Farmer 600	1689	37.6
RBA 100R	1518	38.5
Dahlgren 164	1753	36.5
Jacques 801	1518	39.9
Jacques 401	1668	38.1
PAG SF101	1839	41.6
NK Sunbred 212	1604	41.1
Sun-Hi 304A	1753	41.1
Sun-Hi S-325	1689	38.8
Sun-Hi S-331	1668	39.0
Sun-Hi S345	1518	38.9
Golden Harvest 30	1689	40.8
Acco 31	1710	39.5
Acco 34	1433	37.9
Cal/West 8904	1069	39.7
Cal/West 421	1497	41.8
Averages	1649	39.0
LSD (.05)	250	
CV	11.7	

All yields corrected to 10% moisture.

Table 1. National Sunflower Variety Trials, Redfield, 1979.

Oil Seed Variety	Redfield Irrigated		Redfield Dryland	
	#/A	% Oil	#/A	% Oil
Hybrid 903	1557	36.4	1117	34.9
Sheyenne 898	1717	39.7	1718	41.7
Master Farmer 700	2031	40.6	1804	37.3
Dahlgren 704	1721	39.4	1825	37.8
Sheyenne 893	2106	39.6	1975	40.3
Jacques 501	1604	38.7	1610	38.1
Dahlgren 844	1871	39.9	1610	38.8
Cenex 897	1653	39.5	1825	38.5
4 Winds 900	1931	38.6	1975	39.6
Interstate 7775	1700	34.2	1675	36.9
Cal/West 034	1867	37.9	1524	38.4
Cargill 204	1796	37.0	1697	38.9
Sunbred 265	1824	40.6	2083	38.3
Sun-Hi S301A	1642	40.4	1610	39.5
Sigco 894A	1621	37.7	1439	38.2
RBA 300G	1803	40.6	1739	38.5
4 Winds 1100C	1664	39.1	1761	41.1
Sigco 241A	1846	39.7	1589	40.2
RBA 400D	1589	37.4	1653	39.2
Cenex 907	1828	39.0	1610	38.8
Sun-Hi S304	1807	39.1	1739	40.3
Cargill 205	1614	37.9	1288	39.4
Interstate 3107	1721	40.2	1675	41.8
Hysun 101	1786	38.3	1739	40.2
Golden Harvest 20	1792	39.5	1653	39.3
Hybrid 894	1657	37.6	1589	40.5
Sunbred 254	1796	37.5	1782	38.6
Jacques 701	1546	39.1	1396	38.8
Golden Harvest 10	1668	38.7	1739	38.6
Master Farmer 800	1674	36.6	1482	39.0
Averages	1748	38.7	1664	39.1
LSD (.05)	251		264	
CV	11.2		12.4	

All yields corrected to 10% moisture.

DISCUSSION:

With the continued improvement in hybrid sunflowers and the experience gained from past years, the crop should fit in well with present crop rotations. There are many varieties that react differently to irrigation than dryland plantings. The one major change is the increased plant height that occurs when irrigated.

The effect of six inches of additional water on the irrigated sunflower varieties did not increase the yields enough to offset the cost.

Grasshoppers were the major pest on sunflowers at pollinating time and also during the remainder of the growing period.

There were two (2) variety studies conducted in 1979. One was in cooperation with the Sunflower Association of America, Table 1, and the other was an observation study, Table 2, to look at other varieties. The observation study will not be continued in 1980.

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PR80-9

CROPPING SEQUENCES FOLLOWING SUNFLOWERS

Q. S. Kingsley and A. Dittman

OBJECTIVE: What effect do sunflowers have on succeeding crops of corn, barley, oats and spring wheat when planted in a cropping sequence?

CROP YEAR HISTORY:

Planted: Small grain, May 8 Harvested: Sept. 24
Corn, May 21 Harvested: Oct. 23
Fertilizer: None, residual from 1978 sunflower planting.
Replications: Four (4) Soil Preparation: Chisel plow & disk
Herbicide: Corn, Lasso-Bladex tank mix, broadcast
Insecticide: Corn, Counter, 8.6 lbs/A banded
Plant Population: Corn, 16,000 plants per acre
Wheat, 1 Bu/A; Oats, 2-1/2 Bu/A;
Barley, 1 Bu/A
Cultivations: Corn, 2
Soil Type: Beotia-Great Bend-Harmony
Rainfall: May 8 to Sept. 24 - 11.6 inches for small grain
May 21 to Oct. 23 - 11.4 inches for corn

RESULTS:

Table Cropping Sequences Following Sunflowers, Redfield, 1979

Crop	3 yr. avg. 77-79 Bu/A	1979 Bu/A	1979 Test Weight
Corn	56.3	64.4	
Barley	46.6	31.8	48.0
Oats	53.1	38.5	32.0
Wheat	25.7	23.9	58.0

DISCUSSION:

The 1979 crops were not fertilized and any fertility available was residual left from the 1978 sunflower crop. Emphasis was placed on how well other crops would produce following a sunflower planting.

Sunflowers leave the soil in a friable condition and this may be one of the reasons for fair yields.

When sunflowers precede corn, the stalks interfere during cultivation time. They have a tendency to plug the cultivator which results in tearing out part of the corn in the corn row.

A small grain crop before and after either sunflowers or corn is better. The two (2) main reasons are deterioration of the stalks and a small grain crop is removed early enough that a fall tillage may be performed to kill weeds and save moisture.

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PR80-10

FERTILIZING SUNFLOWERS

Q. S. Kingsley

OBJECTIVE: Determine the most favorable fertility level for sunflower production.

CROP YEAR HISTORY:

Planted: May 22 Harvested: Oct. 5
Variety: Interstate 894 Replications: Four (4)
Plant Population: Irrigated 19,000/A, Dryland 16,000/A in 36-inch rows.
Fertility: 40-0-0; 0-20-0; 20-20-0; 40-20-0; 80-20-0 (all starter)
Herbicide: Tolban, 1 qt/A or 1/2 lb/A
Insecticide: None used in 1979.
Cultivations: One
Rainfall: May 22 to Oct. 5 - 11.2 inches
Irrigation: 6 inches
First Killing Frost: Oct. 1
Soil Type: Beotia-Great Bend-Harmony

RESULTS:

Table . Fertility Levels for Sunflower Production, Redfield, 1979.

Treatment Lbs/A $N-P_2O_5-K_2O$	Irrigated Yield #/A	Irrigated % Oil	Dryland Yield #/A	Dryland % Oil
40-0-0	1461	38.7	1499	41.0
0-20-0	1394	38.3	1647	41.2
20-20-0	1413	37.6	1353	39.7
40-20-0	1441	38.3	1606	39.8
80-20-0	1457	38.1	1499	39.4
LSD (.05)	172.2		227.6	
CV	10.9		13.5	

All yields corrected to 10% moisture.

DISCUSSION:

This experiment was planted May 22 when the soil temperature and moisture were adequate for rapid germination. A preplant weed control using Tolban disked in a 1 quart per acre or 1/2 pound actual ingredient. The fertilizer was applied at planting time 2 inches below and 2 inches to the side of the seed. No insecticide was applied on the sunflower plants.

The effect of various fertility amounts on sunflower yield in 1979 was very erratic. Where 20 pounds of phosphorus is added to nitrogen in the irrigated study, no response resulted. Whereas in the dryland study, 20 pounds of phosphorus by itself produced the highest yield.

Available nitrates in the soil, at planting time, were high. There were 270 pounds in the 4-foot profile of the irrigated field and 200 pounds in the dryland field. It would be anticipated that yields could be in the 2500 pound level with that much fertility available. Vegetatively, the plants were well developed until a soil borne fungus (phoma) infected the plants. The head development ceased and yields were reduced considerably.

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PR80-11

PERFORMANCE OF HERBICIDES IN CORN, SOYBEANS AND SUNFLOWERS

W. E. Arnold and L. J. Wrage

Herbicide demonstration plots are the final steps in the herbicide evaluation program. Treatments include herbicides that are labeled and are available to growers. The side-by-side comparisons show the strengths and weaknesses of the various treatments. Rates and application methods for each treatment are based on results obtained in previous years' screening tests.

Methods

Preplant and preemergence herbicides were applied on the corn, soybean and sunflower plots on May 18 and 19. A plot sprayer using 20 gpa water and 40 psi pressure was used. Preplant treatments were incorporated immediately with two tandem diskings set to cut 5-6 inches deep (except Lasso and Dual treatments incorporated 3-4 inches) and harrowed. Plots were planted in 30 inch rows. Preemergence treatments were surface applied immediately after planting. No rainfall was received the first week and 1.3 inches of rainfall fell the second week after planting. Post-emergence corn herbicide treatments were applied June 13 and June 26. Post-emergence soybean treatments were applied June 26.

Broadleaved weed pressure was heavy; grass weed pressure was moderate. Broad leaved weed species included Kochia, Russian thistle, lambsquarters and redroot pigweed. Annual grasses present included green and yellow foxtail. The plots were not cultivated.

Results

The performance of corn, soybean and sunflower herbicide treatments is presented in the following tables. Percent weed control evaluations are based on the average of two visual estimates for annual grasses and broadleaves per plot. A 2-year average is also included.

Weed control varied considerably, ranging from excellent to poor. Several herbicides used alone provided excellent control of one weed group but fair to poor control of the other weed group.

Seven corn herbicide treatments (Table 1) provided over 90% control of both grasses and broadleaves. All but one of these treatments was a combination of two herbicides.

Five soybean herbicide treatments (Table 2) provided over 90% control of both grasses and broadleaves. These treatments included Sencor or Lexone or Amiben used in combination or as an overlay with an effective grass control herbicide.

Four sunflower herbicide treatments provided over 90% control of both grasses and broadleaves. Prowl, Lasso and Dual are not presently labeled for use in sunflowers but may be approved in the future.

The 2-year averages provided a measure of consistency over a range of conditions.

Table 1. Corn Herbicide Demonstration Plots

		Percent Weed Control			
		7/10/79		2-Yr Avg	
Treatment	lb/A a.i.	Gr	Bdlf	Gr	Bdlf
PREPLANT INCORPORATED					
Check	—	0	0	0	0
Eradicane	4	96	78	92	64
Sutan+	4	94	30	77	40
Sutan+ +atrazine	4+1	92	93	85	92
Sutan+ +Bladex	4+1½	96	95	88	90
Sutan+ +atrazine+Bladex	4+½+1	96	97	—	—
Lasso	3½	93	72	90	56
Dual	3	95	60	92	60
atrazine	2½	82	98	77	96
PREEMERGENCE					
atrazine	2½	55	93	32	94
Bladex	3	78	75	59	78
Lasso	3	95	80	88	60
Dual	2½	92	68	91	49
Prowl	2	92	92	66	81
Ramrod/Bexton/Propachlor	5	94	65	86	48
Lasso+atrazine	2+1	90	92	78	90
Lasso+Bladex	2+1½	94	86	82	83
Dual+atrazine	2+1	91	90	84	91
Prowl+atrazine	1½+1	88	94	64	92
Prowl+Bladex	1½+1½	86	92	68	86
Propachlor+atrazine	4+1	93	92	84	88
Propachlor+Bladex	4+1½	76	85	—	—
POST-EMERGENCE					
atrazine+oil	1½+1	70	96	45	95
Bladex+wetting agent	1½+½[illegible]	70	89	—	—
PREEMERGENCE & POST					
Propachlor&2,4-D	4&½	70	72	—	—
Propachlor&Banvel	4&¼	80	92	—	—
Check	—	0	0	0	0

Gr=Grass
Bdlf=Broadleaf

Table 2. Soybean Herbicide Demonstration Plots

Treatment	lb/A a.i.	Percent Weed Control 7/10/79 Gr	Bdlf	2-Yr Avg Gr	Bdlf
PREPLANT INCORPORATED					
Check	—	0	0	0	0
Treflan	3/4	92	84	92	84
Tolban	1	90	84	92	86
Prowl	1¼	94	72	92	74
Vernam	2½	92	65	91	58
Treflan+Sencor/Lexone	3/4+3/8	94	98	94	94
PREPLANT INCORPORATED & PRE					
Treflan&Sencor/Lexone	3/4&1/2	97	99	96	98
PREEMERGENCE					
Amiben	3	92	95	90	95
Lasso	3	92	84	91	67
Dual	2½	90	70	—	—
Lasso+Amiben	2+2	99	96	96	97
Lasso+Lorox	2+1	93	80	90	72
Lasso+Modown	2+1½	80	96	85	83
Lasso+Sencor/Lexone	2+½	94	98	93	97
Dual+Sencor/Lexone	2+½	76	85	—	—
Prowl+Sencor/Lexone	1+½	65	92	—	—
PREEMERGENCE & POST					
Lasso&Basagran	2&1	81	89	82	80
Lasso&Dyanap	2&2¼	82	55	—	—
Check	—	0	0	0	0

Gr=Grass
Bdlf=Broadleaf

Table 3. Sunflower Herbicide Demonstration Plots

Treatment	lb/A a.i.	Percent Weed Control Gr	Bdlf
PREPLANT INCORPORATED			
Check	—	0	0
Prowl	1¼	96	98
Treflan	3/4	86	87
Tolban	1	83	89
Cobex	½	84	86
Eptam	3	95	94
Treflan+Amiben	3/4+2	97	97
PREEMERGENCE			
Amiben	3	94	94
Lasso	3	88	80
Dual	2½	80	72

Gr=Grass
Bdlf=Broadleaf

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PR80-12

HERBICIDE EVALUATIONS ON SUNFLOWERS

W. E. Arnold, M. A. Wrucke, S. R. Gylling, and J. A. Holmdal

Research plots were established to evaluate herbicide treatments for weed control in sunflowers at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. Nine herbicides were included at various application rates and combinations giving a total of 25 different treatments. Four replications of 10' x 40' plots were arranged in a randomized complete block design. "Sunhi" sunflowers were planted in 36" rows May 22. Preplant incorporated herbicide treatments were applied to a dry soil surface May 22 and incorporated immediately. Weather conditions at the time of application were: air temperature 50°F, relative humidity 75%, clear sky, wind 2-4 mph, soil surface dry, soil moisture (2" depth) moist, and soil temperature (2" depth) 58°F. Preemergence herbicide treatments were applied to a dry soil surface May 22. Weather conditions at the time of application were: air temperature 57°F, relative humidity 64%, clear sky, wind 7-9 mph, soil surface dry, soil moisture (2" depth) moist, and soil temperature (2" depth) 56°F. The 2-3 leaf treatments were applied June 12. Weather conditions at the time of application were: air temperature 84°F, relative humidity 68%, clear sky, wind 4-8 mph, leaf surface dry, soil moisture (2" depth) dry, and soil temperature (2" depth) 74°F. At the time of treatment, green foxtail was at the 3-leaf growth stage, kochia was 1/2-3/4" tall and Russian thistle was approximately 1½" tall. Preplant incorporated and preemergence treatments were applied with a tractor mounted sprayer (3 MPH, 32 PSI, 10' swath, and 20 GPA) and the 2-3 leaf growth stage treatments were applied with a bicycle sprayer (2 MPH, 32 PSI, 10' swath, and 20 GPA). Total rainfall for the 1st and 2nd weeks after application were: preplant incorporated and preemergence 0.00", 1.44"; 2-3 leaf growth stage 0.54", 1.48". The soil is a silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, 7.4 pH, and is well drained. Weed evaluations were made June 28. The results are shown in the table.

Table . Herbicide evaluation on sunflowers. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	Growth Stage	% Weed Control				
			Grft	Rrpw	KOCZ	Colq	Ruth
Bas 90520 H	0.50	Post	49	21	20	21	0
Basf Crop Oil	1 qt/A	Post					
Bas 90520 H	1.00	Post	98	0	11	15	0
Basf Crop Oil	1 qt/A	Post					
Alachlor	2.00	Pre	62	61	54	53	3
Alachlor	2.50	Pre	25	52	26	22	0
Alachlor	3.00	Pre	35	67	48	41	3
Chloramben	1.33	Pre	77	94	92	93	98
Alachlor	2.00	Pre					
Metolachlor	2.00	PPI	61	16	11	13	0
Metolachlor	3.00	PPI	79	28	36	23	3
Metolachlor	3.00	Pre	70	16	7	0	0
Chloramben	2.00	PPI	76	82	78	79	93
Metolachlor	2.00	PPI					
Chloramben	2.00	Pre	94	93	92	91	97
Metolachlor	2.00	Pre					
Metolachlor	2.00	PPI	93	75	34	66	7
EPTC	2.00	PPI					
Chloramben	2.00	PPI	90	77	76	71	98
Profluralin	0.75	PPI					
Chloramben	2.00	PPI	91	95	91	94	97
Profluralin	1.00	PPI					
Pendimethalin	1.25	PPI	71	64	26	33	22
Pendimethalin	1.50	PPI	92	47	57	66	0
Chloramben	2.00	PPI	91	83	86	90	92
Pendimethalin	1.25	PPI					
Chloramben	2.00	Pre	97	97	95	98	99
Pendimethalin	1.25	PPI					
Chloramben	2.00	PPI	91	91	88	91	97
Pendimethalin	1.50	PPI					
Chloramben	2.00	Pre	95	97	95	98	98
Pendimethalin	1.50	PPI					
Diclofop	0.75	Post	77	16	7	7	3
Diclofop	1.00	Post	87	21	23	21	0
Diclofop	2.00	Post	98	0	0	0	0
Weedy Check	0.0		0	0	0	0	0
Handweeded Check	0.0	Post	97	95	96	97	98
LSD (.05)			32	35	33	31	12

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PR80-13

KOCHIA CONTROL IN BARLEY AND OATS

W. E. Arnold, M. A. Wrucke, S. R. Gylling, and J. A. Holmdal

Research plots were established to evaluate herbicide treatments in barley and oats at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. Five herbicides were included at various rates and combinations giving a total of 11 treatments. Four replications of 20' x 10' plots were arranged in a randomized complete block design. Primus II barley and Lang oats were planted in 6" rows May 5. Post plant incorporated herbicide treatments were sprayed May 5, and incorporated immediately by double dragging. Weather conditions during application were: air temperature 60°F, relative humidity 61%, partly cloudy sky, wind 9-11 mph, soil surface dry, soil moisture (2" depth) moist, and soil temperature (2" depth) 60°F. The 1-3 leaf treatments were applied May 31. Weather conditions during application were: air temperature 69°F, relative humidity 52%, clear sky, wind 2-4 mph, leaf surface dry, soil moisture (2" depth) wet, and soil temperature (2" depth) 55°F. Kochia height at time of treatment was 1/4-2inches. The 4-5 leaf treatments were applied June 4. Weather conditions during application were: air temperature 61°F, relative humidity 63%, clear sky, wind 0-1 mph, leaf surface dry, soil moisture (2" depth) moist, and soil temperature (2" depth) 64°F. Kochia height at time of treatment was 3-4 inches. Post plant incorporated treatments were applied with a tractor mounted sprayer (3 mph, 32 PSI, 10' swath, and 20 GPA). The 1-3 leaf applications were made with a bicycle sprayer (3 mph, 32 PSI, 10' swath, and 20 GPA). The 4-5 leaf treatments were applied using another bicycle sprayer (2 mph, 32 PSI, 10' swath, and 20 GPA). Total rainfall for the 1st and 2nd weeks after application were: postplant incorporated 0.50", 0.30"; 1-3 leaf 0.33", 0.23"; and 4-5 leaf 0.31", 0.54". The soil is silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, 7.4 pH, and is well-drained. All plots sprayed with bromoxynil had 99% control initially and was evaluated August 1 for second growth. The results are shown in the table. An extremely heavy population of kochia infested this experiment. Propanil reduced the stand of barley more when applied at the 2- to 3- leaf growth stage of barley than when applied at the 4- to 5- leaf growth stage. However, propanil injury reduced the stand of oats more when applied at the 4- to 5- leaf growth stage than when applied at the 2- to 3- leaf growth stage. The best control of kochia was obtained at the 2- to 3- leaf growth stage. Treflan did not effectively control kochia when applied at the dosage of .75 lb/acre postplant incorporated. Although no injury to oats was observed with treflan, the oat yield was very low.

Diclofop severely injured the oats and these plots were not harvested for yield. Diclofop caused some leafy discoloration on barley but these plots yielded well. The combination of propanil and MCPA gave good control of kochia when applied at the 2- to 3- leaf growth stage. Some injury was observed on both the oats and barley at both stages of growth

Table . Kochia control in barley and oats. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	Growth Stage	% Control KOCZ	Barley Strd %	Barley Inj %	Barley Yld (bu/A)	Oats Strd %	Oats Inj %	Oats Yld (bu/A)
Propanil	1.00	1-3L	76	2	17	39.5	0	10	29.5
Propanil	1.00	4-5L	50	20	0	29.8	12	0	18.1
Propanil	1.50	1-3L	84	12	32	44.2	2	22	33.9
Propanil	1.50	4-5L	55	27	0	33.9	17	0	22.2
Trifluralin	0.75	Popi	10	0	0	29.0	0	0	14.0
Diclofop Bromoxynil	0.75 0.50	1-3L 1-3L	92	5	22	43.0	82	40	0
Diclofop Bromoxynil	1.00 0.50	1-3L 1-3L	91	7	17	42.7	90	42	0
Diclofop + surfactant Bromoxynil	 0.75 0.50	 1-3L 1-3L	88	7	12	47.5	90	37	0
MCPA amine[1] Propanil	0.50 1.50	1-3L 1-3L	93	12	35	40.4	7	17	30.3
MCPA amine Propanil	0.50 1.50	4-5L 4-5L	73	30	0	37.4	22	0	23.9
Weedy Check	0.0		0	0	0	21.9	0	0	12.0
LSD (.05)			16	8	9	10.4	10	6	6

[1] Dimethylamine

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PR80-14

WEED CONTROL IN SPRING WHEAT

W. E. Arnold, M. A. Wrucke,
S. R. Gylling and J. A. Holmdal

Research plots were established to evaluate weed control in spring wheat at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. Nine herbicides were used at different rates and growth stages giving a total of 23 treatments. Four replications of 10' x 40' plots were arranged in randomized complete block design. "Protor" wheat was planted May 5 in 7" rows. Preemergence treatments were applied May 5 using a tractor mounted sprayer (3 mph, 32 PSI, 10' swath, and 20 GPA). Weather conditions during application were: air temperature, 50°F; relative humidity, 70%; partly cloudy sky, wind 9-10 mph; soil surface dry; soil moisture (2" depth) moist; and soil temperature (2" depth), 50°F. The 3-leaf treatments were applied May 31, using a bicycle sprayer (3 mph, 32 PSI, 10' swath, and 20 GPA). Weather conditions during application were: air temperature, 57°F; relative humidity, 68%; partly cloudy sky; wind, 2 mph; leaf mositure dry; soil moisutre (2" depth) wet; and soil temperature (2" depth), 67°F. Weed heights at time of treatment were: kochia 3/4" and Russian thistle 1". The 4-leaf treatments were applied June 5. Weather conditions during application were: air temperature, 54°F; relative humidity, 74%; clear sky; wind, 3-5 mph; leaf moisture dry; soil moisture (2" depth) moist; and soil temperature (2" depth), 54°F. Weed heights at time of treatments were: kochia 3-4" and Russian thistle 3-5". The 5-leaf treatments were applied June 9. Weather conditions during application were: air temperature, 68°F; relative humidity, 58%; clear sky; wind 3-6 mph; leaf moisture dry; soil moisture (2" depth) dry; and soil temperature (2" depth), 52°F. Weed heights at time of treatment were: kochia 3-4" and Russian thistle 3-5". The 4-leaf and 5-leaf treatments were applied with bicycle sprayer (2 mph, 32 PSI, 10' swath, and 20 GPA). Total rainfall for the 1st and 2nd weeks after application were: preemergence 0.05", 0.30"; 3-leaf 0.33", 0.23"; 4-leaf 0.23", 0.54"; 5-leaf 0.35", 1.74". The soil is a silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, pH 7.4, and is well-drained. The plots were evaluated for weed control June 29 and August 2. The results are shown in the table. This experiment had a heavy population of common lambsquarter, kochia and Russian thistle. Russian thistle had not completely emerged by May 31 when the 3-leaf application was made. Mecoprop ester, MCPA ester and MCPA amine did not effectively control Russian thistle. Mecoprop ester was more effective than MCPA ester, MCPA amine or 2, 4-D amine for control of kochia. Dicamba significantly reduced wheat yield when applied preemergence. Low rates of dicamba applied at the 2-leaf stage did not effectively control kochia or Russian thistle.

Table . Weed control in spring wheat. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	Growth Stage	Percent Control 6-29-79 KOCZ	Percent Control 6-29-79 Ruth	Percent Control 8-2-79 KOCZ	Percent Control 8-2-79 Ruth	Yld (bu/A)	Tswt (lb/bu)
Mecoprop ester[1]	0.25	3-lf	57	3	89	29	45.8	60.2
Mecoprop ester	0.50	3-lf	91	3	96	22	45.5	60.7
Mecoprop ester	0.75	3-lf	97	3	97	52	49.4	61.2
MCPA ester[1]	0.50	3-lf	54	15	79	37	43.4	59.8
MCPA ester	0.75	3-lf	67	23	88	66	44.7	61.0
MCPA amine[2]	0.50	3-lf	32	3	49	38	40.0	59.6
MCPA amine	0.75	3-lf	36	18	72	54	47.6	60.9
2,4-D ester[3]	0.50	5-lf	91	97	91	94	48.3	61.1
2,4-D amine[2]	0.50	5-lf	46	83	77	91	47.8	60.8
Mecoprop ester	0.25	5-lf	96	97	97	98	47.4	61.5
2,4-D ester	0.25	5-lf						
Mecoprop ester	0.25	3-lf	90	15	92	42	46.1	60.8
MCPA ester	0.25	3-lf						
Dicamba	0.13	Pre	83	76	91	90	45.8	60.7
Dicamba	0.25	Pre	98	97	97	95	39.5	60.6
Dicamba	0.50	Pre	97	97	97	98	31.8	60.2
Dicamba	0.09	3-lf	18	35	27	56	40.5	60.1
Dicamba	0.13	3-lf	37	59	64	82	42.3	61.0
Dicamba	0.25	3-lf	69	81	87	89	47.4	61.5
2,4-D amine	0.25	4-lf	95	96	96	97	45.3	61.0
Dicamba	0.06	4-lf						
Dicamba	0.13	4-lf	91	92	96	91	47.5	61.5
2,4-D amine	0.50	4-lf	41	73	73	87	43.3	60.9
Dicamba	0.09	4-lf	89	93	95	98	46.3	62.1
Weedy Check	0.0		0	0	0	0	33.4	57.9
LSD (.05)			25	22	17	26	6.0	1.0

[1] Isooctyl ester

[2] Dimethylamine

[3] Propylene glycol butyl ether ester

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PR80-15

EVALUATION OF K1-497-0479 FOR WEED CONTROL IN OATS

W. E. Arnold, M. A. Wrucke,
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Research plots were established to evaluate K1-497-0479 for broad leaf weed control in oats at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. K1-497-0479 and Formula 40 were used at 3 rates giving a total of 7 treatments. Four replications of 10' x 40' plots were arranged in a randomized complete block design. The treatments were applied at the 3-4 leaf stage June 15, 1979 with a bicycle sprayer (2 MPH, 32 PSI, 10' swath, and 20 GPA). Weather conditions at the time of application were: air temperature, 62°F; relative humidity, 67%; partly cloudy sky; wind 4-6 mph; leaf surface moist; soil (2" depth) moist; and soil temperature (2" depth), 62°F. Weed height at time of application were: Russian thistle 4-5" and wild sunflower 6-7" tall. Total rainfall for the 1st and 2nd weeks after application were: 1.86", 0.16", respectively. The soil is a silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, 7.4 pH, and is well drained. Weed evaluations were made July 3. The data is shown in the table. Polymerized 2, 4-D was not effective in controlling sunflower or Russian thistle. One-quarter pound 2, 4-D amine controlled these weeds equally as well as 1.0 of 2, 4-D polymer.

Table . Evaluation of K1-497-0479 for weed control in oats. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	% Weed Control	
		Cosf	Ruth
K1-497-0479[1]	0.25	44	22
K1-497-0479	0.50	70	30
K1-497-0479	1.00	78	72
2,4-D amine[2]	0.25	86	64
2,4-D amine	0.50	89	88
2,4-D amine	1.00	96	97
Weedy Check	0.0	0	0
LSD (.05)		17	24

[1] 2,4-D polymer

[2] Alkanolamine

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PR80-16

EVALUATION OF DIFENZOQUAT FOR WILD OAT CONTROL

W. E. Arnold, M. A. Wrucke, S. R. Gylling, and J. A. Holmdal

Research plots were established to evaluate difenzoquat for wild oat control in spring wheat at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. Eight herbicides were applied at different rates, combinations and growth stages giving a total of 10 treatments. Four replications of 10' x 40' plots were arranged in a randomized complete block design. Protor spring wheat was planted in 7-inch row widths May 4. Postplant incorporated treatments were applied May 5 using a tractor mounted sprayer (3 MPH, 32 PSI, 10' swath, 20 GPA) and incorporated immediately. Weather conditions at the time of application were: air temperature 50°F, relative humidity 70%, partly cloudy sky, wind 9-10 mph, soil surface dry, soil moisture (2" depth) moist, and soil temperature (2" depth) 50°F. Barban was applied May 31 using a bicycle sprayer (3 MPH, 32 PSI, 10' swath, 20 GPA). Weather conditions at the time of treatment were: air temperature 65°F, relative humidity 55%, clear sky, wind 0-3 mph, leaf surface wet, soil moisture (2" depth) wet, and soil temperature (2" depth) 62°F. Weed heights at the time of treatment were: kochia 3/4-1½", common lambsquarter 1-1½" and wild oats was in the 3-leaf growth stage. Difenzoquat treatments were applied June 4 using a bicycle sprayer (2 MPH, 32 PSI, 10' swath, 20 GPA). Weather conditions at the time of treatment were: air temperature 66°F, relative humidity 55%, clear sky, wind 3-5 mph, leaf surface dry, soil moisture (2" depth) moist, and soil temperature 69°F. Weed height at the time of treatment were: Kochia 1½-2", and common lambsquarter 2-3" and wild oats was in the 4-6 leaf growth stage. Total rainfall for the 1st and 2nd weeks after application were: postplant incorporated 0.50", 0.30"; 3-4 leaf post-emergence 0.33", 0.23", 5-6 leaf post-emergence 0.31", 0.54". The soil is a silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, 7.4 pH, and is well drained. Crop injury was evaluated June 8 and weed control was evaluated July 9. The results are shown in the table. Difenzoquat gave excellent control of wild oats. MCPA, bromoxynil, dicamba, and 2,4-D ester tank-mixed with difenzoquat controlled common lambsquarter and kochia without reducing the wild oat control provided by difenzoquat. However, 2,4-D alkanolamine tank-mixed with difenzoquat significantly reduced the wild oat control and provided significantly less control of common lambsquarter and kochia than MCPA dimethylamine.

Table . Evaluation of difenzoquat for wild oat control. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	Growth Stage	% Weed Control Wioa	Colq	KOCZ	% Crop Inj
Difenzoquat	1.00	5-lf	97	0	2	10
Difenzoquat MCPA amine[1]	1.00 0.25	5-lf 5-lf	97	99	81	10
Difenzoquat MCPA ester[2]	1.00 0.25	5-lf 5-lf	97	98	80	10
Difenzoquat Bromoxymil	1.00 0.38	5-lf 5-lf	98	99	96	22
Difenzoquat Bromoxymil MCPA amine	1.00 0.25 0.25	5-lf 5-lf 5-lf	98	99	94	17
Difenzoquat 2,4-D amine[3]	1.00 0.25	5-lf 5-lf	73	74	62	10
Difenzoquat 2,4-D ester[4]	1.00 0.25	5-lf 5-lf	98	99	89	10
Barban	0.38	3-lf	77	0	0	0
Triallate	1.00	PoPI	60	0	0	0
Weedy Check	.00		0	0	0	0
LSD (.05)			18	17	15	2.4

1 Diethylamine
2 Isooctyl ester
3 Alkanolamine
4 Propylene glycol butyl ether ester

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PR80-17

EVALUATION OF SD 45328 FOR WILD OATS CONTROL IN SPRING WHEAT

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Research plots were established for evaluating SD 45328 for wild oats control in spring wheat at the James Valley Agricultural Research and Extension Center near Redfield, South Dakota. Herbicides were applied at different rates and growth stages giving a total of 15 different treatments. Four replications of 10' x 40' plots were arranged in a randomized complete block design. "Protor" spring wheat was planted on May 4. The 2-3 leaf treatments were applied May 31. Weather conditions at the time of application were: air temperature 62^{o}F, relative humidity 52%, partly cloudy sky, wind 2-4 mph, leaf surface wet, soil moisture (2" depth) wet, and soil temperature (2" depth) 62^{o}F. Wild oats was in the 2-3 leaf growth stage. The 5-6 leaf treatments were applied June 4 when wild oats had 4-6 leaves. Weather conditions at the time of treatment were: air temperature 74^{o}F, relative humidity 55%, clear sky, wind 3-6 mph, leaf surface moist, soil moisture (2" depth) moist, and soil temperature (2" depth) 69^{o}F. The 2-3 leaf treatments were applied using a bicycle sprayer (3 MPH, 32 PSI, 10' swath, and 20 GPA). The 5-6 leaf treatments were applied using another bicycle sprayer (2 MPH, 32 PSI, 10' swath, and 20 GPA). The soil is a silt loam (6.8% sand, 70.2% silt, 23% clay) with 2.8% organic matter, 7.4 pH, and is well drained. Total rainfall for the 1st and 2nd weeks after application were: 2-3 leaf 0.33", and 0.23", respectively; 5-6 leaf 0.31" and 0.54", respectively. Wild oats control was evaluated July 10 and plant injury was evaluated June 5. The results are shown in the table. SD 45328 provided excellent control of wild oats. Treatment at the 5-6 leaf stage was more effective than treatment at the 2-3 leaf stage. No injury to the crop was observed. SD 45328 provided excellent control of wild oats. Treatment at the 5- to 6- leaf growth stage was more effective than treatment at the 2- to 3- leaf growth stage. No injury to the crop was observed. These plots were not harvested for yield because of an extremely heavy kochia infestation late in the season.

Table . Evaluation of SD 45328 for wild oats control in spring wheat. (Arnold, Wrucke, Gylling, and Holmdal)

Treatment	Rate	Growth Stage	% Control Wioa	% Crop Inj
SD 45328	0.05	2-3L	32	0
SD 45328	0.07	2-3L	35	0
SD 45328	0.10	2-3L	59	0
SD 45328	0.15	2-3L	76	0
SD 45328	0.20	2-3L	82	0
SD 45328	0.40	2-3L	91	0
Barban	0.38	2-3L	66	0
SD 45328	0.05	5-6L	65	0
SD 45328	0.07	5-6L	75	0
SD 45328	0.10	5-6L	81	0
SD 45328	0.15	5-6L	94	0
SD 45328	0.20	5-6L	93	0
SD 45328	0.40	5-6L	98	0
Diclofop	0.75	2-3L	90	30
Weedy Check	0.0		0	0
LSD (.05)			14	0

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PR80-18

FEEDING VALUE OF PRO-SIL TREATED HIGH MOISTURE GROUND EAR CORN WITH TWO GROUPS OF CROSSBRED HEIFERS

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Pro-Sil, an ammonia-molasses-mineral suspension, has been shown to be a highly effective commercial additive for corn silage in studies at SDSU and other midwest universities. When added to corn silage at the time of ensiling, this product stimulates beneficial fermentation and increases the crude protein content of the silage, thereby reducing or eliminating the need for protein supplementation at the time of feeding.

While Pro-Sil has been thoroughly tested with whole plant corn silage, no research has been conducted with ensiled high moisture ear corn (HMEC). Since the crude protein content of HMEC is low compared to the needs of feedlot cattle, research is needed to evaluate economical methods of boosting the level of this critical nutrient.

Thus, the major objective of this initial study was to compare the feedlot performance of cattle fed Pro-Sil treated HMEC or regular HMEC mixed with either a control or a urea-based protein supplement at the time of feeding. Both types of HMEC were ensiled in a plastic Silopress bag to examine the effectiveness of this storage method with HMEC.

The relative performance of exotic and British crossbred yearling heifers was also studied in this trial.

Experimental Procedures

Since a field harvester capable of direct chopping high moisture ear corn was not available, snapped ear corn was picked and stored at the station, with an additional quantity purchased from a local producer. Approximately 40 tons of ear corn containing 20-24% moisture was finally obtained for the study. Once picking was complete, the ear corn was ground in a tub grinder, using a 1 inch screen, and conveyed directly to a large mixing wagon equipped with an electronic scale for recording load weights. Since the ear corn was too dry for direct ensiling, 20 gallons of water was added per ton to increase the final moisture content. About 60% of the high moisture ground ear corn (HMEC) was ensiled after the water addition, while the remainder had Pro-Sil III added at the rate of 65 lb. per ton. This product, containing 85% crude protein, 1.2% sulfur and trace minerals, was applied over the top of each load in addition to the water. All loads were thoroughly mixed prior to ensiling. Samples of each load were taken before and after Pro-Sil and/or water addition.

The ground ear corn was ensiled in an 8 mil thick, white plastic "sausage" bag, 8 feet in diameter, using the Eberhardt Silopress ensiling system. The regular (untreated) HMEC was stored in one end of the bag, with Pro-Sil treated HMEC stored in the other end. A 1 foot thick chopped forage "buffer" was placed between the two types of ensiled HMEC. The bag was sealed shut until the start of the trial in June, 1979.

Seventy-two crossbred yearling heifers averaging about 700 lb. were purchased in May, 1979, from a reputation backgrounder in central South Dakota. The cattle were selected from a group of about 400 head on the basis of large frame size and breed background. One-half of the heifers were British cross (black baldies), while the other half were exotic crossbreds. The exotic crosses were further sorted by visual appraisal into Charolais-cross and Limousin-cross groups. Eighteen head of each exotic breed group were obtained to gain some information on the value of the traditional practice of sorting feeder cattle according to color and apparent breed identity.

Upon arrival at the research feedlot, the cattle were backgrounded on chopped alfalfa-brome hay and whole oats. The level of oats was gradually increased to 10 lb. per head daily. Pro-Sil treated HMEC was slowly substituted for the oats during the last 12 days prior to the start of the trial. High level antibiotic (AS-700 crumbles) was fed for the first 3 weeks after arrival. In addition, the heifers were eartagged, implanted with Synovex-H, 7-way vaccinated, poured with Warbex and dewormed with Tramisol injectable during the pretrial period.

The experiment was initiated on June 26, 1979. The heifers were uniformly allotted into 6 outside lots of 12 head each on the basis of breed cross and shrunk body weight obtained after an 18 hour stand without feed and water. Three of the pens contained the black baldy heifers, while the other 3 pens each received 6 head of Charolais-cross and 6 head of Limousin-cross heifers.

Three basic rations were used in this study: 1) Pro-Sil treated HMEC fed with a control (low-protein) supplement, 2) regular (untreated) HMEC fed with a urea-based protein supplement, and 3) regular HMEC mixed with the control supplement. The latter ration served as the control, to establish whether supplemental protein was indeed necessary for optimum cattle performance. All rations consisted of 96% HMEC and 4% supplement on an as-fed basis. The supplements were gradually increased to the 4% level during the first 5 days of the trial. Chopped alfalfa-brome hay was used to get the cattle on a full-feed of the respective HMEC and supplements, with the hay being slowly withdrawn during the first 8 days. Each ration was fed to one pen of black baldies and one pen of exotic cross heifers.

The supplements were custom mixed at the SDSU feed mill. The urea supplement contained 45% crude protein while the control supplement contained only 7.6% (as-fed basis). In addition, the urea supplement contained 0.65% added sulfur to maintain a nitrogen:sulfur ratio of about 10:1. Otherwise, both supplements contained 3.6% calcium, 4.9% salt, 9% molasses, 300 mg Rumensin and 30,000 I.U. vitamin A per lb.

Results and Discussion

The comparative feedlot performance of yearling heifers fed Pro-Sil treated or regular (untreated) high moisture ground ear corn (HMEC) is shown in Table 1. The results in this table represent the average performance of 1 pen of

black baldies and 1 pen of exotic cross heifers fed each of the 3 rations for 37 days. The regular HMEC was fed with either a low protein, control supplement or a 45% urea-based protein supplement.

Supplementation of regular HMEC with urea boosted daily gains about 20% (1.99 vs 2.39 lb) and increased feed efficiency 15.7% compared with the control HMEC ration, demonstrating the need and substantial benefit from protein supplementation of HMEC. The urea supplemented HMEC ration contained about 11.4% crude protein, whereas the control ration averaged about 9.3% (dry basis).

The Pro-Sil treated HMEC performed no better than the regular HMEC without urea supplementation, in terms of average daily gain and feed conversion. While daily consumption of the Pro-Sil treated HMEC was over 1 lb. per head less than the regular HMEC, on an as-fed basis, dry matter intakes were very similar due to an unanticipated difference in the moisture contents of the 2 types of ensiled HMEC. Analysis of the samples collected at ensiling time revealed that the Pro-Sil treated HMEC averaged 27.0% moisture, while the untreated HMEC contained 30.8%. This inadvertent difference in moisture contents may have changed the fermentation characteristics of the 2 types of ensiled HMEC, and consequently altered their relative feeding values. Thus, additional research is necessary to closely evaluate the value of Pro-Sil as a nutrient additive for HMEC.

The average crude protein content of the control HMEC was 9.3%, while the Pro-Sil treated HMEC contained over 10.7%, on a dry matter basis. Thus, the application of 65 lbs of Pro-Sil III per ton of HMEC increased the crude protein content of the ensiled material over 1.5%. However, this increase represents an apparent recovery of only about 50% of the crude protein (largely as ammonia) supplied by the Pro-Sil. Whether this recovery rate could be increased by direct application of Pro-Sil to HMEC at a more optimum moisture level remains to be determined.

Further research is currently under way to determine the fermentation characteristics, digestibility and overall feeding value of ensiled high moisture ear and shelled corn treated with ammonia based silage additives, in an attempt to find more economical ways of supplementing the protein needs of feedlot cattle with these feeds.

The Silopress "sausage bag" was found to be a very useful and effective ensiling structure for high moisture ground ear corn. The bags must be located on a clean, well drained site, in order to minimize rodent problems and insure year-round access to the bags with mechanized feeding equipment. The ends should be kept tightly closed between feedings to minimize surface spoilage of the exposed silage. The HMEC was stored for over 8 months in the plastic bag without evidence of bag deterioration.

The relative feedlot performance of the 2 groups of crossbred yearling heifers, averaged across all 3 rations, is shown in Table 2. Very little difference in average daily gain, feed intake or feed efficiency was noted between the black baldies and exotic cross heifers in this short study. It should be noted that both breed groups were selected for large frame size. There was also no material differences in daily gains of the 2 subgroups of exotic crossbreds with the Limousin-cross heifers averaging 2.12 lb and the Charolais-cross heifers gaining 2.09 lb per day.

Table 1. COMPARISON OF CONTROL, UREA SUPPLEMENTED AND PRO-SIL TREATED ENSILED HIGH MOISTURE EAR CORN (37 DAY TRIAL).

Item	HMEC Ration		
	Control	Urea Suppl.	Pro-Sil Treated
No. Heifers	24	24	24
Initial Shrunk Wt., lb.	743.0	742.0	739.6
Final Shrunk Wt., lb.	816.5	830.5	813.8
Avg. Daily Gain, lb.	1.99	2.39	2.00
Avg. Daily Ration, lb. (As-Fed):			
Ensiled HMEC	24.58	24.88	23.52
Supplement	1.03	1.04	0.98
Hay	1.33	1.33	1.33
TOTAL	26.94	27.25	25.83
Lb. Feed/Lb. Gain (As-Fed):			
Ensiled HMEC	12.35	10.41	11.76
Supplement	0.52	0.44	0.49
Hay	0.67	0.56	0.66
TOTAL	13.54	11.41	12.91

Table 2. RELATIVE FEEDLOT PERFORMANCE OF BRITISH AND EXOTIC CROSSBRED YEARLING HEIFERS (37 DAY TRIAL).

Item	British Cross	Exotic Cross
No. Heifers	36	36
Initial Shrunk Wt., lb.	723.7	759.4
Final Shrunk Wt., lb.	803.1	837.4
Avg. Daily Gain, lb.	2.15	2.11
Avg. Daily Ration, lb. (As-Fed):		
Ensiled HMEC	23.97	24.68
Supplement	1.00	1.03
Chopped Hay	1.33	1.33
TOTAL	26.30	27.04
Lb. Feed/Lb. Gain (As-Fed):		
Ensiled HMEC	11.15	11.70
Supplement	0.47	0.49
Chopped Hay	0.62	0.63
TOTAL	12.24	12.82

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EFFECT OF LENGTH OF FEEDING PERIOD ON PERFORMANCE OF BRITISH AND EXOTIC CROSSBRED YEARLING HEIFERS

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Producers very often question the additional length of time they should feed exotic cross cattle as opposed to the feeding period required for the traditional British breeds of cattle. Also implied in this question is the additional amount of feed needed for the exotic cross animal to attain an optimum weight and an acceptable grade. This trial was conducted in an attempt to help answer these basic questions.

Procedure

The heifers used in the growing trial described in the preceding paper were allotted to 6 pens on the basis of shrunk body weight and previous treatment for a finishing period of 47, 61 or 75 days. Three pens of the black baldies. These two groups of cattle are described in the preceding paper. On each of the three slaughter dates one previously assigned pen of exotic-cross and black baldy heifers were taken to a commercial packing house and sold on a grade and yield basis. Carcass data was subsequently collected in the plant.

All of the heifers were fed the same ration which consisted of 5 pounds of coarse-ground barley, 1 pound of the urea-based supplement used in the preceding described experiment and a full feed of whole shelled corn. Heifers were gradually brought up to a full feed of this ration, composed entirely of concentrates. The complete ration was carefully mixed and fed once daily. Sufficient feed was given daily so that the heifers were never without feed. Ample quantities of fresh clean water and trace-mineralized salt were available at all times.

Check weights were taken on all animals when a group went to slaughter to help monitor average daily gains. Only those animals being slaughtered were weighed in the afternoon and again the next morning after an overnight stand without feed and water. This allowed us to calculate shrink which we could then apply to the other treatments and figure average daily gain on an estimated shrunk weight basis.

The economic comparison was made using the following values: feed =$3.20/cwt, carcass prices; choice grade 615 lbs. and up = $1.02/lb., choice 515-614 lbs. = $1.01/lb. good 615 lbs. and up = $.96/lb. and good 515-614 lbs. = $.94/lb. No values were assigned for purchasing and marketing costs, labor or yardage fees.

Results

The results of this study are summarized in Table 1. Average daily gains were similar for the exotic-cross and black baldy heifers in each slaughter group. The animals gained comparatively in all groups throughout the trial. The gains apparently had not peaked when the first group was killed. Feed conversion ranged from 7.0 to 8.5 pounds of feed per pound of gain. The feed conversions were very similar for the exotic-cross and black baldy groups killed on the same day.

Differences in carcass weights (603.8 vs. 556.1) were greatest between the exotic-cross and the black baldy heifers killed in the 47 day kill group, which may have been more a function of the differences in initial weights of these groups, as compared to slaughter groups 2 and 3. The dressing percent between these groups was also the greatest (61.8 vs. 60.2). The exotic-cross cattle in the other kill groups hung up heavier carcasses but the dressing percents were almost identical at 60.3%. The average fat thickness was the same (.31-inches) for the two groups which were killed at 47 days. In the latter two kill groups the black baldy cattle were carrying a considerably higher degree of finish than the exotic-cross heifers (.45 vs. .34 and .53 vs. .37 inches for the 61 and 75 day kill groups, respectively).

The number grading choice was about equal (8 vs. 7) for the exotic-cross and the black baldy heifers in the first kill group. Thereafter the black baldy heifers increased in the number grading choice and the exotic-cross heifers stayed the same. It appears that a longer feeding period would have been required to take the exotic-cross heifers into a greater percentage of choice. The average yield grades of the exotic-cross cattle did not exceed 2.2 indicating that these heifers could have been fed longer to attain a higher degree of finish without jeopardizing yield. However, the black baldy heifers killed in group 3 averaged a 2.9 yield grade, indicating that their weight and age was somewhat optimum for attaining a desirable grade and yield. The feeder should keep in mind that these black baldy heifers were long yearlings and were exceptionally grown out. Black baldies started on high concentrates at a younger age may not reach these weights without a lot of yield grade 4's.

As can be seen from Table 1, carcass value increased with weight and grade. Cost per pound of gain was similar for all groups with the black baldy heifers showing a slight advantage.

Summary

Seventy-two heifers were fed for 47, 61 and 75 days to determine optimum feeding period for exotic-cross and black baldy heifers. Average daily gains and feed conversions of all heifers were similar between treatments. Carcass weight, quality grade and yield grade increased with time on feed. Fat thickness, quality grade and yield grade increased faster for the black baldy heifers. Cost per pound of gain was similar for all treatments.

The optimum weight at which to slaughter these black baldy yearling heifers appeared to be between 1000 and 1050 lbs., both from a quality and economic view point. The optimum weight for slaughtering the exotic-cross heifers was apparently not reached, as the last slaughter group was still gaining rapidly and efficiently, with little increase in condition.

The limited research conducted in this study indicates that a producer feeding mixed lots of cattle needs to be aware of the weight at which different types of cattle reach optimum condition. The feeder has greater flexibility in marketing the larger framed exotic-cross type cattle as compared to the smaller framed English breeds.

Table 1. COMPARISON OF EXOTIC-CROSS AND BLACK BALDY HEIFERS FED FOR 47, 61 and 75 DAYS

Slaughter Group	1		2		3	
Breed	Exotic	B-B	Exotic	B-B	Exotic	B-B
Avg. Beg. Wt. (lb.)	857.8	806.1	845.8	816.8	843.2	810.9
No. Days on Feed	47	47	61	61	75	75
Avg. Final Wt. (lb.)	976.5	924.3	1019.9	1001.7	1055.1	1020.8
ADG (lb.)	2.53	2.51	2.85	3.03	2.83	2.79
AVERAGE DAILY RATION, LB. (As Fed Basis)						
Shelled Corn	15.9	14.2	15.4	15.5	16.2	15.3
Ground Barley	4.7	4.7	4.8	4.8	4.9	4.9
Supplement	1.0	1.0	1.0	1.0	1.0	1.0
TOTAL	21.6	19.0	21.2	21.3	22.1	21.2
Feed Conversion (Lbs./lb. of gain)	8.5	7.9	7.4	7.0	7.8	7.6
CARCASS CHARACTERISTICS						
Avg. Wt. (lb.)	603.8	556.1	614.7	604.2	636.7	616.8
Dressing %	61.8	60.2	60.3	60.3	60.3	60.4
Avg. Fat Thickness (in.)	.31	.31	.34	.45	.37	.53
No. Grading Choice	8	7	8	11	7	10
No. Grading Good	4	5	4	1	5	2
Avg. Yield Grade	2.1	2.2	1.9	2.4	2.2	2.9
ECONOMIC COMPARISON						
Avg. Carcass Value	$595.74	$545.44	$614.70	$606.71	$633.52	$622.97
Avg. Price/lb.	.99	.98	1.00	1.00	1.00	1.01
Total Feed Cost	32.59	30.24	41.61	41.96	53.50	51.34
Feed Cost/lb. of Gain	.27	.26	.24	.23	.25	.25

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