Progress Report 1979

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

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE UNIVERSITY

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PR79-1

1978 WEATHER

JAMES VALLEY AGRICULTURAL RESEARCH AND EXTENSION CENTER

Climate conditions are shown in the Table. Although the precipitation amounts during the spring months was adequate due to preceeding fall precipitation. The lack of moisture during July caused some stress to occurr during the heading of small grains. Precipitation throughout the remainder of the growing season was below normal, but occured at sufficient intervals to maintain crop growth. The absence of long periods of high temperatures with accompanying high velocity winds contributed to good production on long season crops. This is evident in the moderate amount of evaporation which occurred durring the summer months. The number of frost free days was normal for this area.

Table 1. Precipitation, Temperature and Evaporation Dat for the James Valley Research Center.

Month	Precip inches	Departure	Temp (°F)	Departure	Evap open pan
Jan	0.00	-0.35	-3.0	-13.2	----
Feb	0.36	0.0	6.2	-11.7	----
March	0.54	-0.93	25.9	- 2.4	----
April	2.08	-1.11	44.0	+ 0.2	2.87*
May	5.42	+2.89	58.3	+ 1.2	1.55&
June	2.42	-2.43	66.3	- 0.5	7.21
July	1.85	-0.64	71.2	- 1.1	6.53
Aug	2.27	+0.14	71.8	+ 1.0	7.32
Sept	0.64	-0.98	67.0	+ 6.5	7.66
Oct	0.14	-1.08	46.9	- 1.8	5.05
Nov	0.74	+0.15	26.8	- 5.5	----
Dec	0.21	-0.18	13.8	- 5.1	----
Total	16.67	-4.52		-32.4	38.19

*Evap from April 8
&Records May 1-16 lost in fire.
Last Frost: May 2 (32°F)
First Frast: Oct 7 (24°F)
Frsot free days 158

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PR79-2

CROPPING SEQUENCES FOLLOWING SUNFLOWERS

J. F. Giles and Q. S. Kingsley

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 10 Harvested: July 26
Corn, May 26 Harvested: Oct 19
Fertilizer: None, residual from 1977 Sunflower planting
Replications: Four Soil preparations: Disk and field cultivated
Herbicide: Small grain, 1 pt 2,4-D amine June 5 corn, Lasso-Bladex tank mix, broadcast May 26
Insecticide: Corn, Dyfonate 5 lbs/A banded
Plant Population: Corn, 21,100 plants per acre
Wheat, 1½ bu/A; Oats, 2bu/A;
Barley, 1 3/4bu/A
Cultivations: Corn, 2
Soil type: Beotia-Great Bend-Harmony
Rainfall: May 10 to July 26 - 8.33 inches for small grain
May 26 to Oct 19 - 10.77 inches for corn

RESULTS:

Table 1. Cropping Sequences Following Sunflowers, Redfield, 1978

Crop	Test Weight	Yield Bu/A
Corn (Northrup King NK418)		45.7
Barley (Prilar)	43.0	57.9
Oats (Spear)	33.5	60.8
Wheat (W.S. 1809)	61.0	23.1

DISCUSSION:

The 1978 crops were not fertilized and any fertility available was residual left from the 1977 sunflower crop. Emphasis was placed on how well other crops would produce following a sunflower planting. The residual fertility may have been low for the corn as shown by the low yield, in what was otherwise a good corn year.

Subsoil moisture was adequate during the germination period and early part of the growing season, which resulted in small grain yields that are satisfactory. Wheat yield was reduced by infestation of Hessian fly.

Weeds were not a problem in any of the crops.

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PR79-3

EFFECT OF NITROGEN ON IRRIGATED CORN

1978

Ron Gelderman and Paul Carson

Introduction

The use of the nitrate-nitrogen test for predicting crop nitrogen needs is fairly well established for small grains in South Dakota. However, for long season crops, such as corn, more calibration data is needed, especially for the higher yield goals. The objective of this experiment along with others throughout the state is to refine nitrogen fertilizer recommendations for corn based on the nitrate-nitrogen test.

Procedure

1. The experiment was established at the James Valley Research and Extension Center near Redfield, SD, on a Beotia silt loam. Beotia soils are nearly black, deep, friable, well-drained silty clay loams occuring on very slight slopes. These soils were developed from calcarious lake-deposited sediments. The results of soil tests performed on samples taken from the experimental site are shown in Table 1. In general, all tests are considered very high. The nitrate-nitrogen test for 120 bushel/acre corn would be considered high for the four foot depth. Medium would be the rating for the amount of nitrate-nitrogen in the two foot profile.

2. The nitrogen fertilizer used in this experiment was ammonium nitrate (34-0-0). The rates used were 30, 60, 90, 120 and 150 lbs nitrogen/A. It was spread on the soil surface by hand when the plants were two to four inches in height. An application of 0-46-0 at the rate of 40 lbs/acre of P_2O_5 was broadcast on all plots to insure that phosphorus was not a limiting factor.

3. Cultural Practices:
   Planted: May 23, 1978
   Harvested: October 16, 1978
   Variety: Western KX55
   Herbicide: two pounds Lasso + 1.6 pounds Bladex as a liquid broadcast pre-emergence.
   Insecticide: 5 lbs Difonate
   Plant Population: 36 rows planted at 24,000; harvested at 19,300.
   Irrigation: Gravity furrow - three inches applied each on July 19 and August 10.
   Cultivations: Two

4. The treatments were arranged in a randomized complete block design with four replications.

5. Plant leaf samples were taken on August 3, 1978 at pollination. The leaf opposite and below the top ear was taken, dried and analyzed for total nitrogen. The four replications were combined for each treatment before analysis.

6. The plots were harvested by hand with ear mid-section samples being taken for moisture determination.

7. The moisture for the 1978 growing season was generally below normal. The rainfall and amount of irrigation water applied are reported in Table 2.

Results

The effect of nitrogen fertilizer on yield, percent moisture of the ear corn, population, number of ears and percent leaf nitrogen are listed in Table 3. The only significant differences occured in the quantity of yields measured in bushels per acre and bushel per acre per one thousand stalks. The 30 pound rate of nitrogen application increased the yield by 20 bu/acre over the check. This was considered to be significantly greater at the 0.05 confidence level using Duncan's mutiple range test. The higher rates of application produced yields that were not significantly greater than the 30 pound treatment.

The results of this experiment support the nitrogen recommendation as they currently are being made by the South Dakota State Soil Testing Lab. The highest yield at this location was 120 bu/acre. The recommendation is determined in the following way: 120 bu x 1.3 lbs N/bu = 156 lbs - 141 lbs N/4' = 15 lbs N/Acre. The recommendation would have been 15 lbs of N/Acre and the response here would have been somewhere between 0 and 30 pounds of added N/Acre.

The percent leaf nitrogen increased as rate of nitrogen increased. The nitrogen sufficiency level for corn is 2.75%. However, it would appear that at this site 2.50% N is adequate. Luxury consumption of nitrogen seems to have taken place because the percent leaf N increased without a corresponding yield increase.

Table 1. Soil Tests (before experiment established).

NO_3-N lbs/A 4'	NO_3-N lbs/A 2'	O.M. %	P lbs/A	K lbs/A	pH	Salts mmho/cm
141	97	2.9	84	640	7.6	0.6

Table 2. Irrigation Water and Precipitation Received. Nitrogen-Corn Experiment, Redfield, SD. 1978.

MONTH	May	June	July	Aug.	Sept.	Growing Season
Irrigation Water			3.00	3.00		
Precipitation	5.42	2.42	1.85	2.27	0.64	12.60
Total	5.42	2.42	4.85	5.27	0.64	18.60

Table 3. The Effect of Added Nitrogen on Corn, Yields, Population, Number of Ears, Percent Leaf Nitrogen and Grain Moisture.

	Yield* Bu/A	Yield/ 1000 stalks Bu/A	Moisture Percent	Population Stalks/A	Ears/A	Leaf N %
0	88 a	4.86 a	29.8	18,695	16,970	2.2
30	108 b	5.53 ab	26.4	19,602	19,330	2.5
60	112 b	5.78 ab	29.2	19,420	19,058	2.8
90	115 b	5.94 b	26.7	19,330	19,330	2.8
120	127 b	6.45 b	25.5	19,693	19,692	2.9
150	112 b	5.85 ab	27.7	19,329	19,148	3.0
Ave.	111	5.72	27.5	19,345	18,921	2.7
Dun.	.05	.05	ns	ns	ns	---
CV %	15.2	14.2	10.0	5.2	7.4	---

* Any numbers in a column followed by the same letter are not significantly different from each other.

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PR79-4

PRODUCTION OF NAVY BEAN VARIETIES UNDER DRYLAND CONDITIONS

Joseph F. Giles and Robert A. Sanders

Navy beans are grown principally in Michigan, Minnesota and North Dakota, but there is an increasing interest in the yield potential of South Dakota. The objective of this study was to determine the yield of five varieties of navy beans available for local production under dryland conitions.

Procedure

The land was in barley in 1977 and was fall plowed, tandem disked, treated with Tolban (1 lb/A) and tandem disked again to incorporate the herbicide. The beans were planted June 6 at 40 lbs of seed per acre in 30 inch rows. No fertilizer was applied, as a soil test indicated adequate levels of plant nutrients were available. Although weed control was adequate, the beans were cultivated on June 21. Seed yield samples were taken September 11 by hand harvesting 40 feet of row.

Results and Discussion

The yields obtained from the five navy bean varieties are shown in Table 1. The early varieties were higher yielding than the later varieties. This is probably due to the lack of precipitation during the later part of the growing season. Due to the wide variability of harvest samples within each variety. There was no statistical significance between the varieties although the yields differ greatly.

Table 1. Yield of Navy Beans Under Dryland Conditions.

Variety	Yield lbs/A
Seafarer	1037
Snowflake	1001
Upland	896
Fleetwood	834
Snow Bunting	790

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PR79-5

OAT FORAGE AND GRAIN TRIALS

Joseph F Giles and Robert A Sanders

Many farmers and ranchers in central South Dakota are interested in growing oats as a forage or hay crop as well as a grain crop. The objectives of this research were: (1) To find the best forage yielding oat variety, (2) Determine any differences in protein content of the forage, (3) Evaluate the comparative yields of the oat varieties in both forage and grain production.

Procedure

The trials were planted April 27 on dryland corn stubble which previously had been tandem disked and harrowed. Seeds were sowed at a rate of 2 bushels per acre with a conventional grain drill having double disk furrow openers spaced at 7 inches. No fertilizer was applied as soil tests for N, P, and K showed adequate nutrients available. On June 5 a ground application of 2,4-d (amine) at 1 pint/A was made for weed control. Oatlage samples were taken with a self propelled swather, forage weighed and a moisture sample taken, when the varieties were in the dough stage of growth. Protein analysis was made on the oven dry material. Grain was harvested August 3 with a self propelled combine having a straight cutting attachment. All yields are averages of four replications.

Results and Discussion

Forage and grain yield data for the nineteen oat varieties are given in table 1. A lack of moisture during the heading period of early varieties may have reduced the yield some. No significant difference was found in the forage production of the oat varieties. However, as found in previous research, a lower yield resulted in early maturing varieties when harvest was delayed from milk stage to dough stage.

The protein values shown are percentages on a moisture free basis. There is no significance differance in the percent protein of the varieties. The values are comparable to other reported values.

The only significant differances occured in the grain yield of the varieties. The yield of Noble oats was significantly greater than the five least yielding varieties at the 0.01 confidence level using Duncan multiple range test.

A comparison of the grain yielding capacity with the amount of forage harvest showed no significant correlation. Thus, based on this one year of research, it would seem that a grower should make a selection based on the grain producing capability of an oat variiety.

Table 1. Grain and Forage Yields of 19 Varieties of Oats grown Under Dryland Conditions at Redfield.

	Grain		Forage	
Variety	Yield	Test Weight	Dry Matter	Protein 1/
	bu/a	lb/bu	T/A	%
Noble	122.7*	35	5.33	10.06
Bates	122.5*	35	4.65	10.20
Wright	119.8*	35	5.14	10.58
Otee	119.5*	36	4.99	10.38
Minn.73231	116.2*	33	5.21	9.44
Lang	113.7*	34	4.74	9.45
Stout	110.7*	34	4.17	10.01
SD9095	110.6*	33	4.92	10.13
Burnett	108.3*	33	4.40	10.14
Spear	107.5*	35	4.91	10.45
Minn.71211	105.0*	34	4.87	10.63
Lyon	102.3*	31	5.42	9.77
Chief	97.6*	33	4.96	11.08
Froker	96.5*	35	4.84	10.18
Dal	87.5	33	5.16	11.37
Nodaway	81.9	36	3.98	10.18
Garland	79.7	33	4.33	10.71
Wisc X-2456-2	68.0	26	4.75	10.53
Multiline E	66.5	34	3.67	10.06
Average	101.9		4.76	10.28

C.V. = 11.8%

1/ Moisture Free Basis

* The entries with an asterisk are not significantly lower than the highest yielding entry (LSD .01 = 28.54 bu/A)

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PR79-6

1978 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 1978 harvest. The winter wheat trials were abandoned because of severe winterkill.

Performance trials of hybrid corn were seeded on both dryland and irrigated portions of the Center. Both trials were seeded on May 24. Custom built 31-cell cone seeders mounted above standard flexi-planter units with double-disc openers were used for seeding all row crops. A grain sorghum trial was seeded on the irrigated area on the same date using the same row spacing, 36 inches. Soybeans were seeded at the Center on May 26 in 30-inch row spacings.

The seedbeds for all crops were dry at seeding and quite lumpy. Two heavy rainstorms passed over the farm within 4-5 days after seeding and severe crusting occurred causing uneven emergence. Many kernels that germinated were unable to break the soil crust. An effort was made to break the crust with a rotary hoe but it was delayed too long by wet field conditions to be completely effective. Stand losses were most serious in the irrigated corn and grain sorghum trials. REcommended herbicides and insecticides were banded over the row at time of seeding. The fertilizer was applied as anhydrous ammonia in late June. The dryland corn trial received 100 lbs. of material per acre and the irrigated corn and grain sorghum received 160 lbs. per acre. No fertilizer was applied to the soybeans. Soil samples taken indicated adequate levels of P and K were present in the soil.

A total of 6 inches of irrigation water was applied to the corn and grain sorghum during two irrigations in late July and mid-August. The soybean trial was not irrigated as planned due to a break in a supply line. All trials were cultivated twice.

Plant populations were down in the irrigated corn and grain sorghum trials. Soil crusting was the most serious cause of stand loss, though some mechanical damage also occurred. Plant populations of the corn trials were intended to be about 18,000 and 22,000 plants per acre. Actual standa in mid-August were 13,760 and 16,495 plants per acre. The dryland corn was not as seriously affected as the population in mid-August was just shy of the desired 10,000 plant per acre original goal. The grain sorghum trial was seeded at the rate of 6 seeds per running foot but final stands were just slightly better than half of that or about 70,000 plants per acre.

Two populations were seeded in the irrigated corn trials to determine if one might be better than the other. No statistical difference was found so only the average yield of six replications is given. The soybean and dryland corn trial results are the average of six replications. Yields in the grain sorghum report are the average of three replications.

Grain sorghum was harvested on September 28 at the Center. The soybeans were taken on October 11. Corn trials were harvested on October 25 and 26 for the dryland and irrigated trials, respectively.

Grain sorghum yields ranged from 5195 down to 3380 pounds per acre. These are not much better than the 1977 yields. However, the stand was poorer than desired and cooler temperatures during July and August delayed heading, pollination and plant size. Grain moisture at the time of first-frost was quite high but the nice fall with above normal temperatures in September and no killing frost until early October permitted the plants to continue growth and produce grain of good quality.

The soybean trials were initially begun to determine the possibilities of the crop under irrigation in that area. Yields have not been bad despite the shortage of water in 1976 and 1977 that prevented planned irrigations and the pipeline break of 1978 that stopped irrigation. Yields in 1978 were from 30 to 44 B/A. Wells has the best standability of the varieties included in the trial.

The corn yields were good to excellent for dryland and under their potential in the irrigated trials. Though reduced stands permit larger plants and ears they cannot make up for higher populations entirely. Dryland yields ranged from 103.2 down to 66.7 B/A. Both moisture content and stalk breakage were low. The irrigated trial yields ranged from 136.0 to a low of 87.9 B/A. Moisture was down in most entries but stalk breakage was becoming a problem at harvest.

Data for only 1978 is presented in most trials.

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 Office.

Table 1. 1978 Dryland Corn Performance Trial, Area C1, Redfield.

Brand & Variety	Type of Cross	Yield, B/A	% Stalks Broken	Percent Moisture	Performance Score
Curry SC-1422	2X	103.2	5.1	15.9	1
Sokota SS-67	M2X	101.8	1.1	16.8	2
Trojan TXS 102	2X	98.9	1.0	18.0	4
Northrup-King PX 49	2X	97.9	0.9	18.6	5
P-A-G SX 177	M2X	97.8	1.9	14.5	3
Sokota TS-64	2X	96.4	0.0	18.9	6
ACCO UC 3002	2X	95.3	1.0	18.0	7
Top Farm SX 100	2X	90.7	1.9	15.8	8
Northrup-King PX 45	2X	90.4	0.9	18.3	9
Payco SX 844	2X	89.1	0.0	19.0	13
Northrup-King PX 37	2X	89.1	0.0	17.6	10
Western KX-55	2X	88.9	1.1	19.2	15
Western KX-60	2X	88.2	1.0	18.8	16
Pride 4417	2X	87.8	1.1	16.5	12
SDAES Check #4	2X	87.5	0.0	16.0	11
Pride R-328	3X	86.9	1.0	16.3	14
SDAES Check #5	4X	86.4	1.0	17.0	18
Payco SX 775	2X	85.6	2.1	16.4	22
Trojan TXS 99	2X	85.2	2.2	14.7	17
Sokota TS-62	2X	84.8	1.0	17.1	24
Curry SC-1451	2X	84.3	0.0	17.5	26
Cenex 2111	2X	84.2	1.0	14.4	20
Pride 4488	2X	84.2	0.0	17.3	25
Cenex 3015	3X	84.1	2.1	14.2	21
Asgrow RX 40	2X	83.6	0.0	13.7	19
Top Farm SX 97	2X	83.5	1.9	14.3	23
Sokota TS-44	2X	81.6	0.0	14.6	27
Western KX-35	2X	81.0	0.0	15.6	28
P-A-G SX 189	M2X	80.7	0.0	18.4	33
Cargill 838	M2X	80.4	3.9	14.9	31
Payco SX 680	2X	80.1	0.0	15.3	30
Top Farm SX 103	2X	80.1	0.0	14.4	29
Sokota SS-51	M2X	79.2	1.0	14.9	32
Cargill 430	3X	78.2	1.0	17.3	38
Trojan TX 99A	3X	78.2	1.1	14.7	34
ACCO UC 1901	2X	78.0	2.2	14.4	35
Northrup-King PX 34	2X	77.7	1.0	17.4	41
Asgrow RX 2222	2X	77.2	2.1	14.3	36
P-A-G SX 210	M2X	77.0	0.0	16.8	40
ACCO UC 2301	2X	76.9	5.7	15.2	43
SDAES Check #8	2X	76.4	2.2	13.4	37
Pride 2269	2X	76.1	3.9	13.7	39
Payco SX 737	2X	75.3	4.0	15.6	45
Cargill 810	M2X	74.4	2.0	12.7	42
Funks G-4171	3X	73.7	1.1	13.5	44
Asgrow RX 37	3X	71.3	1.0	13.9	46
Funks G-4195	3X	70.5	2.1	13.9	47
Funks G-4085	3X	68.4	0.0	13.3	48
Cenex 2004	2X	66.7	3.1	12.8	49
Means		83.6	1.4	16.4	
LSD (.05)		11.5		CV - % = 9.9	

Table 2. 1978 Irrigated Corn Performance Trial, Area C1, Redfield

Brand & Variety	Type of Cross	Yield, B/A	% Stalks Broken	Percent Moisture	Performance Score
McCurdy MSX 37	2X	136.0	6.2	17.3	1
McCurdy 77-48	2X	131.2	3.5	23.0	8
Sokota TS-62	2X	131.2	0.5	20.5	2
Northrup-King PX 37	2X	130.8	1.0	20.7	3
Payco SX 775	2X	130.5	4.7	19.5	5
Disco SX-24	2X	130.3	1.3	22.4	7
Northrup-King PX 49	2X	129.8	4.3	18.9	4
McCurdy 77-49	2X	129.8	0.9	22.1	6
Sokota TS-67	2X	127.2	2.1	21.1	9
McCurdy MXS 44A	2X	125.2	3.0	21.5	11
Pride 4488	2X	124.1	2.0	20.8	12
P-A-G SX 67	2X	123.0	3.7	16.9	10
Sokota TS-64	2X	122.6	8.9	19.5	13
McCurdy MSX 46	2X	122.4	4.3	22.1	18
Payco SX 844	2X	121.4	3.2	23.1	23
RBA 104	3X	121.0	0.5	21.2	14
Sokota SS-67	M2X	120.9	2.5	21.5	21
Pride 5578	2X	120.7	7.0	19.8	22
Curry SC-141	2X	119.9	1.4	20.5	17
Security SS-102	2X	118.7	9.9	19.4	26
Curry SC-1422	2X	118.7	4.0	18.2	16
Wilson 1016	2X	118.6	4.5	20.8	24
Trojan T 1008	2X	118.3	4.1	17.9	19
Northrup-King PX 45	2X	117.9	3.4	20.9	25
SDAES Check #2	2X	117.1	5.2	16.4	20
Asgrow RX 40	2X	115.4	2.7	15.1	15
Trojan TXS 94	2X	115.1	7.1	19.2	27
Top Farm SX 110	2X	114.9	0.9	23.7	35
Northrup-King PX 46	2X	113.6	2.0	21.7	32
SDAES Ex 107	2X	112.7	3.8	20.3	33
P-A-G SX 177	M2X	111.5	5.9	16.2	28
Sokota SS-51	M2X	111.5	2.9	17.8	30
Cargill 430	3X	111.4	2.4	19.5	34
Northrup-King PX 34	2X	111.4	3.1	19.8	36
Cargill 838	M2X	111.0	0.9	17.9	29
ACCO UC 3301	2X	110.9	1.5	22.5	41
Funks G-4224	M2X	110.6	3.0	16.9	31
P-A-G SX 210	M2X	110.4	3.3	20.0	38
Payco SX 737	2X	109.4	5.2	18.5	39
Asgrow RX 55	3X	108.4	7.2	19.8	43
P-A-G SX 189	M2X	107.6	4.1	20.7	47
Top Farm SX 97	2X	107.5	3.5	15.9	37
Top Farm SX 103	2X	107.4	3.4	20.2	44
ACCO UC 3301A	2X	107.1	2.9	22.9	52
Northrup-King PX 26	2X	107.1	8.2	17.2	42
Security SS-97	2X	106.3	7.5	19.2	49
RBA 94+	2X	106.1	1.9	16.5	40
Sokota TS-49	2X	105.9	4.5	18.4	45
Wilson 1400	2X	105.5	2.3	21.8	53
Top Farm SX 106A	2X	105.2	2.0	18.9	46
Western KX-55	2X	104.8	3.1	23.0	63
Sokota TS-44	2X	104.3	7.3	16.8	48
ACCO UC 2851	2X	103.9	2.6	20.2	55
Trojan TXS 102	2X	103.0	3.4	21.9	65
RBA 92	3X	102.7	11.6	17.6	62
SDAES Check #3	2X	102.6	6.0	16.7	50
Pride 2269	2X	102.3	7.4	16.2	51
Top Farm SX 100	2X	101.6	4.2	18.7	61
McCurdy MSP 111	3X	101.1	4.1	18.1	60
Cenex 2111	2X	101.1	5.5	16.7	58
Asgrow RX 37	3X	100.4	8.9	15.2	59
Asgrow RX 2345	2X	100.4	7.3	20.8	69
SDAES Check #5	4X	99.9	4.6	20.1	67
Funks G-4171	3X	99.8	3.3	15.9	56
Pride R-328	3X	99.3	6.3	18.4	66

Table 2. (cont.) Redfield irrigated Corn Performance Trial, 1978

Funks G-4141	2X	99.0	3.8	14.6	54
Security SS-105	2X	98.9	2.1	21.8	70
Cargill 810	M2X	98.9	7.8	13.5	57
McCurdy 76-10	2X	97.1	3.7	14.8	64
Disco SX-30	2X	96.0	11.5	32.3	75
Cargill 832	M2X	95.9	7.5	15.6	68
Payco SX 680	2X	95.6	3.9	18.2	71
Security SS-108	2X	92.0	3.4	22.8	74
Funks G-4195	3X	91.5	10.2	15.4	72
Cenex 3015	3X	89.9	2.1	17.5	73
Means		111.1	4.3	19.3	
LSD (.05)		22.1	CV - % = 16.0		

Table 3. 1978 Grain Sorghum Performance Trial, Redfield (irrigated)

Brand & Variety	Yield, lb/A	Test Wt. lb/B	Height, inches	Percent Moisture 9/14/78	Date Headed
Pride P508GB	5195	57	46	35.+	8/9
SDAES RS 455	5040	56	58	25.6	7/29
Frontier 385R	4825	56	44	35.+	8/10
Asgrow Corral	4765	59	49	35.+	8/14
Frontier 4000R	4760	57	47	35.+	8/14
Northrup-King NK 2233	4710	59	49	35.+	8/13
Growers E110	4655	57	47	35.+	8/12
Warner W-601T	4635	57	50	35.+	8/15
Western WS-206	4565	58	47	35.+	8/14
Asgrow Dorado E	4520	58	49	35.+	8/14
ACCO R 1019	4505	57	42	35.+	8/16
Funks G-251	4505	56	39	34.3	8/6
Growers GSA 1180	4420	55	43	35.+	8/16
Frontier 395R	4340	58	47	35.+	8/18
Growers GSA 1210A	4280	56	48	35.+	8/13
ACCO R 920	4275	55	45	32.1	8/2
Cenex 333	4265	54	46	35.+	8/13
Northrup-King NK 2022	4215	59	46	35.+	8/13
Warner W-561T	4215	55	48	35.+	8/15
ACCO GR 1018	4200	56	44	35.+	8/14
DeKalb B-38+	4145	58	45	35.+	8/9
DeKalb A-28+	4135	57	43	31.9	8/5
SDAES RS 506	4110	55	52	35.+	8/7
Northrup-King NK 1580	4085	59	46	35.+	8/13
Growers GSA 1060	4040	58	47	35.+	8/12
Cenex 322T	4035	54	49	35.+	8/16
Pride P158GB	3960	54	41	33.6	8/9
Cenex 300T	3905	57	53	35.+	8/16
ACCO R 1014	3790	56	43	35.+	8/13
ACCO R 980	3640	59	40	35.+	8/14
SDAES SD 104	3405	55	41	25.9	7/26
SDAES SD 204	3390	54	48	24.1	7/29
Funks HW 3840	3380	56	37	33.1	8/6
Mean	4270				
LSD (.05)	675			CV - % = 11.0	

Table 4. 1978 Soybean Performance Trial, Redfield

Identification of Entries[1]			1978 Field Data: Maturity Date	Plant Height	100 seed wgt.	Yield, B/A 1978	Yield, B/A 1977-78
Standard Varieties:			(mo.-day)	(inches)	(grams)		
Entry	Maturity Group[2]	Days to Mature[3]					
Evans	0	- 3	9-16	29	14.1	35.7	34.0
Swift	0	0	9-19	29	14.1	34.9	38.5
Harlon	I	+ 1	9-20	31	16.4	30.7	33.1
Steele	I	+ 3	9-22	31	15.1	36.6	37.2
Hodgson	I	+ 4	9-23	30	14.4	36.9	35.4
Hodgson 78	I	+ 5	9-24	31	16.7	39.7	
Corsoy	II	+ 5	9-24	33	12.9	43.6	40.7
Coles	II	+ 7	9-26	35	16.3	40.7	35.1
Harcor	II	+ 7	9-26	33	14.3	44.1	43.1
Hark	II	+ 7	9-26	34	15.1	37.6	36.8
Wells II	II	+ 9	9-28	32	15.9	40.6	
Wells	II	+10	9-29	34	16.0	38.0	37.6
Amsoy 71	II	+13	10-2	36	15.3	35.0	35.3
Sloan	II	+13	10-2	35	15.1	41.5	43.6
Proprietary Entries:							
Brand	Entry						
Pfizer-Clemens	CX 282		9-20	31	13.0	34.3	
Pfizer-Clemens	CX 155		9-23	34	13.2	36.0	
Northrup-King	S 1346		9-24	26	16.1	40.3	41.3
Northrup-King	Multi 42	(B)	9-24	28	16.1	39.3	
Pfizer-Clemens	CB 200	(B)	9-26	35	13.7	42.5	
Peterson-Pioneer	3100	(B)	9-27	35	13.1	40.9	39.1
Pfizer-Clemens	CX 175		9-27	33	13.5	40.9	40.4
Pfizer-Clemens	CX 114		9-27	35	14.9	36.5	39.7
Pfizer-Clemens	2ER-75	(B)	9-29	33	13.9	32.6	39.4
Pfizer-Clemens	CB 244	(B)	9-30	35	14.1	41.2	
Schettler	Liberty	(B)	10-5	34	13.4	36.2	

Mean, B/A	38.5
LSD (.05)	7.0
CV - %	12.9

1 - Listed in order of maturity in 1978.
2 - Maturity group from USDA classification: 0 = early, I = early to mid-season, II = mid-season to late at this location.
3 - Expected relative maturity at this site compared to Swift when not exposed to a killing frost.

(B) - blend

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AGRICULTURAL EXPERIMENT STATION
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PR79-7

SPRING WHEAT BREEDING

D. L. Keim and G. W. Buchenau

A large variation in grain yield among entries occurred in the Advanced Yield Trial, (AYT), the Preliminary Yield Trial (PYT) and the Uniform Regional Spring Wheat Nursery (URSW) grown at Redfield in 1978 (Tables 1, 2, and 3). Primary reasons for the low yield of some entries were one or a combination of late maturity, infestation by Hessian fly, and low genetic yield potential. Stand establishment and nursery uniformity was good as noted by the low coefficients of variation (C.V.).

The experimental line, SD 2845, ranked first in the AYT followed by Butte and WS 1809. SD 2845 is a selection out of the cross Butte/SD 2273 'sib'. Stem rust infections as high as 90% occurred in susceptible cultivars. This indicated that the pathogen was present and a high degree of resistance exists in most lines and varieties.

In the selection nursery, 2360 plots (6.1 acres) of breeding lines (F_2 - F_8) were grown for evaluation and selection. Several lines performed well and were advanced in the program. The most promising selections were several F_4 lines from the cross, Protor/RL 6010. Yield, early vigor, and stem rust resistance was very good on these lines. Quality evaluations are being made on these and other selections.

Table 1. 1978 Advanced Yield Trial (AYT) - Redfield

Name	Entry No.	Grain Yield[1/]	Test Weight	Heading Date	Plant Height	Stem Rust
		-bu/A-	-lb/bu-		-inches-	
SD 2845	34	39.3*	62	6/23	37	0
Butte	5	36.9*	60	6/22	36	0
WS 1809	4	36.8*	60	6/22	30	0,TMS
SD 2841	30	34.7*	58	6/25	34	30S
SD 2536	17	33.7*	60	6/24	32	0
SD 2842	31	31.6	56	6/26	33	0,30S
SD 2256	8	31.5	54	6/26	37	10R
SD 2846	35	31.0	61	6/22	35	0
SD 2273	44	30.6	58	6/22	35	0
SD 2016	6	30.2	58	6/28	33	10MS
SD 2678	22	29.9	57	6/26	33	5MR
SD 2700	26	29.8	60	6/23	34	0
SD 2323	10	29.8	56	6/26	32	10MS
Prodax	42	29.6	56	6/26	35	30MR
SD 2329	11	29.0	56	6/27	35	0
SD 2847	36	28.7	56	6/26	32	TMS
SD 2843	32	28.6	57	6/24	37	0
SD 2716	25	28.2	57	6/23	35	TMR
SD 2708	24	27.1	56	6/26	32	5R
SD 2838	27	27.1	57	6/27	37	5S
SD 2354	12	26.4	54	6/26	35	0
Bounty 309	43	26.2	58	6/23	30	60S
SD 2660	21	25.8	58	6/26	35	TMS
SD 2840	29	25.7	52	7/1	41	80S
Eureka	47	25.6	56	6/26	35	0
SD 2167	7	24.7	58	6/23	31	50S
SD 2607	18	23.8	58	6/26	31	0,10S
SD 2355	13	23.6	56	7/1	38	0
Olaf	3	23.3	56	6/27	32	TMS
SD 2649	20	23.2	54	6/26	36	0,20MR
Coteau	40	22.9	54	7/1	38	TMR
SD 2697	23	22.7	56	7/1	35	TMR
Era	2	22.6	54	7/1	32	0
Waldron	1	22.4	55	6/25	35	0,TS
SD 2288	9	22.3	58	6/25	30	90VS
SD 2844	33	22.1	54	6/27	31	10S
SD 2448	14	22.0	56	7/1	31	0
SD 2502	15	20.6	53	7/1	33	0
SD 2271	37	20.5	54	6/24	32	5MR
Solar	41	20.2	53	7/1	32	0
MT 7416	38	19.9	54	6/26	32	10MR
SD 2640	19	18.8	53	7/1	35	0
Angus	39	18.3	56	6/27	32	0
SD 2526	16	17.6	54	7/1	30	40S
SD 2839	28	14.3	55	7/1	33	0
Average		26.2	56.3			
C.V. = 10.3%						

[1/] Average of three replications; harvested area 4.5' x 15.3'

*The entries with an asterisk are not significantly lower than the highest yielding entry (L.S.D. $_{.01}$ = 5.7 bu/A).

Table 2. 1978 Preliminary Yield Trial (PYT) - Redfield

Name	Entry No.	Grain Yield[1/]	Test Weight	Heading Date[1/]	Plant Height	Stem Rust
		-bu/a-	-lb/bu-		-inches-	
WS 1809	2	38.9*	61	6/22	29	TMS
Butte	1	36.0*	62	6/23	36	0
SD 2830	11	35.3*	59	6/24	32	10R
SD 2831	12	34.7*	60	6/24	33	40MR
SD 2835	16	34.3*	60	6/23	36	TMR
SD 2836	17	33.2	60	6/24	37	0
SD 2833	14	31.1	58	6/23	29	TMS
SD 2827	8	29.0	58	6/24	34	0
SD 2829	10	28.0	57	6/24	34	10MR
SD 2837	18	27.1	59	6/24	35	TMS
SD 2826	7	26.9	58	6/25	37	0,10S
SD 2834	15	26.6	60	6/23	32	20MR
SD 2825	6	24.9	57	6/24	37	0
SD 2828	9	23.8	56	6/27	36	0
Waldron	5	23.5	56	6/25	33	0
Olaf	3	20.9	56	6/29	33	0
SD 2832	13	20.7	56	6/26	35	20MR
Era	4	19.0	56	7/1	31	0
Average		27.2	57.3			
C.V. = 9.5%						

[1/] Average of three replications; harvested area 4.5' x 15.3'.

*The entries with an asterisk are not significantly lower than than the highest yielding entry (L.S.D. $_{.01}$ = 5.5 bu/a).

Table 3. 1978 Uniform Regional Nursery (URSW) - Redfield

Variety Name or Number	Entry No.	Grain Yield -bu/a-	Test Weight -lb/bu-	Plant[1] Height -cm-	Days To[1] Heading	1000 KWT -g-
MN 7222	17	35.9[1]	61	74	49[2]	33.4
MN 7378	21	35.4	60	71	50	36.7
MN 70181	18	34.9	58	74	50	32.1
MN 7336	20	32.8	59	75	51	38.7
MN 7125	16	29.6	58	77	50	41.3
SD 2273	9	29.5	59	80	48	35.6
ND 563	8	29.3	58	84	50	36.0
SD 2355	10	28.8	58	79	52	29.2
MN 70170	15	28.6	59	62	52	30.3
NK 75S5511	24	28.4	60	71	50	30.1
MN 70202	19	28.0	61	75	49	29.1
ND 560	6	28.0	60	85	51	34.4
NHS 183-74	22	27.6	59	73	48	33.9
MT 749	12	27.4	61	76	49	29.6
ND 543	11	27.4	60	74	51	33.2
ND 550	4	27.0	58	81	51	29.0
ND 557	5	26.8	58	88	51	28.7
Era	14	23.7	58	71	52	31.3
WSMP 122	25	23.6	56	78	—	30.6
MT 7416	13	23.2	59	73	48	27.9
ND 561	7	23.0	58	79	52	38.1
Waldron	3	21.8	56	81	48	36.2
WA 6389	26	21.2	54	66	51	32.5
Chris	2	21.0	58	78	51	30.9
Marquis	1	20.0	56	86	50	29.9
NHS 1001-75	23	18.2	57	72	—	31.4
Average		27.0	58			

[1] Average of two replications; harvested area 4.5' x 10'8".

[2] Days from planting.

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PR79-8

THE IRRIGATION OF SOYBEANS FOR MAXIMUM YIELD AND WATER USE EFFICIENCY

L. O. Fine

Eight recognized reproductive stages of the soybean plant were used to divide the growing season and attempt to manage the soil water status to study soybean response to irrigation. Small plot irrigation was accomplished with gated pipe in furrows between 30-inch spaced rows. The reproductive stages are as defined below and the irrigation scheme was regulated so as to provide seven different combinations of water or no water applied in the eight stages.

R-1: Beginning bloom — one open flower at any node on main stem

R-2: Full bloom — open flower at one of the two uppermost nodes on the main stem with a fully developed leaf

R-3: Beginning pod -- Pod 5 mm (3/16") long at 1 of 4 uppermost nodes on main stem with a fully developed leaf

R-4: Full pod -- Pod 2 cm (3/4") long at 1 of 4 uppermost nodes on main stem with a fully developed leaf

R-5: Beginning seed -- seed 3 mm long in a pod at 1 of 4 uppermost nodes on main stem with a fully developed leaf

R-6: Full seed — Pod containing a green seed that fills the pod cavity at 1 of 4 uppermost nodes on main stem w/fully developed leaves

R-7: Beginning maturity -- One normal pod on the main stem that has reached its mature color

R-8: Full maturity -- 95% of pods have reached their mature color

Irrigation was accomplished on 16 different date/reproductive stage combinations. Rainfall or initial stored soil water removed soil water stress which would have provided other opportunities to irrigate. Irrigations were performed at the stages beginning pod to full pod (R3 & R4), beginning seed (R5), full seed (R6), and beginning maturity (R7). Control plots with dry conditions were also maintained for each of these stages.

The soybeans were inoculated and planted May 25, but because of intense, compacting rains on several succeeding days, crusting developed and the seedbed had to be re-worked and the beans re-planted on June 12. Lasso plus Sencor over-all weed spray did a good job of controlling grasses and broadleaf weeds. The beans were not uniformly distributed within the rows and populations attained averaged only 89,000 per acre. The 30-inch rows did not provide plant density required for maximum yields with the non-branching variety (Hodgson) used.

The beans were harvested and threshed at the scene the same day (Oct. 11). After re-cleaning the yields were calculated and the results are presented below. The yield data are for the actual moisture content at final weighing, after cleaning - 8.5%. At a moisture content of 12% yields would be about 1.6 bushels per acre greater. Data are average yields for 4 replications, except treatment 6.

Water Management Treatment

No. of Irrig.	2	1	2	3	1	4	2
Reproductive stages Irrig.	6,7	5	5,6	5,6,7	6	3&4,5 6,7	3&4 6
Yield, bu/A	48.6	46.8	47.0	46.1	46.8	46.0	44.8

No definite conclusions can be drawn on the basis of this one year's test. It appears that the soybean is a "well buffered" plant, and if a good tap root is developed early, stringent water requirements later in the growing season are not indicated by the results thus far.

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PR79-9

GRASS -- ALFALFA VARIETY TEST

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

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 Aug. 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.

On May 4, 1978, 100 lbs. of nitrogen (N) as ammonium nitrate was applied to the grass plots only. Cuttings were made June 13, July 19, and October 10 with a flail-type mower. Forage was weighed and moisture samples taken to be reported as dry weight. Three inches of irrigation water was applied one week before the second cut was taken.

Results and Discussion

The yields obtained from the three cuttings and averages of these are shown in Table 1. Differences were found between the grass with alfalfa and grass alone for the first and the third cutting. For the first cutting the grass alone yielded significantly more forage than the grass with alfalfa as would be expected during the cooler part of the growing season. For the second cut one would have expected the grass-alfalfa combinations to yield significantly more than the grass alone, apparently nitrogen was still available from the May 5 application, and although the combination out-yielded grass alone, the difference was not significant. For the third cut the combination yielded significantly more than the grass alone because the grasses ran short of nitrogen and the alfalfa root system was able to reach soil moisture that was not available to the shallow-rooted grasses.

Differences between the different species of grasses were found. In general orchardgrass yielded well due to the fact that a high level of root reserves were present during the fall of 1977 after only 2 cuttings. Smooth bromegrass yielded about the same as Reed Canarygrass followed by intermediate wheatgrass and creeping foxtail.

These results compare favorably with the data collected in 1975 and 1976. SD 5 does have an advantage over Lincoln after the first cut has been taken. SD 5 was selected for regrowth under high summer temperatures.

SD 101 has been selected for seed retention and has not lost forage yield potential in comparison with Garrison which has extreme seed shattering.

No significant differences in yield were found between Oahe and Slate intermediate wheatgrass although Slate appears to have an advantage earlier in the growing season, but generally farmers and ranchers need more production during the warmer summer months.

From this year's results at Redfield it appears that differences would have been more dramatic if more irrigation water would have been available. In general more production could have been realized from all species.

Table 1. Redfield Irrigation Grass-legume

Experiment, 1978. Four replicates, rows seeded 6" apart.

	Grass-Alfalfa				Grass Alone			
	6/13 Cutting	7/19 Cutting	10/10 Cutting	Total	6/13 Cutting	7/19 Cutting	10/10 Cutting	Total
	Tons/Acre*							
Smooth Bromegrass								
SD 5	1.75 c	1.74 a	1.02 ab	4.51 abc	2.89 abc	1.71 a	.59 abcd	5.19 ab
Lincoln	1.96 ab	1.57 ab	.84 b	4.37 abc	3.13 abc	1.29 ab	.43 cdef	4.85 abcde
Creeping Foxtail								
SD 101	1.86 abc	1.36 ab	1.18 ab	4.40 abc	2.89 abc	1.15 b	.61 abc	4.65 abcdef
Garrison	2.16 ab	1.62 ab	1.20 ab	4.98 ab	2.53 bc	1.16 b	.29 f	3.98 f
Intermediate Wheatgrass								
Oahe	1.95 abc	1.54 ab	1.08 ab	4.57 abc	2.44 c	1.51 ab	.52 abcdef	4.47 bcdef
Slate	2.14 abc	1.34 ab	.98 ab	4.46 abc	2.76 abc	1.65 ab	.73 a	5.14 abc
Reed Canarygrass								
Commercial	2.02 abc	1.16 b	.89 ab	4.07 c	3.31 a	1.36 ab	.72 ab	5.39 a
Orchardgrass								
Nordstern	2.22 ab	1.68 ab	1.25 a	5.15 ab	3.02 abc	1.31 ab	.55 abcde	4.88 abcd
Means	2.01**	1.50	1.06**	4.55	2.87**	1.39	.56**	4.82

*Yields followed by different letters differ significantly.

**Comparable means for grass-alfalfa and grass alone did differ significantly.

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PR79-10

CHEMICAL WEED CONTROL IN VEGETABLES

Joseph Giles, Albert Dittman and Darrell DeBoer

Potatoes, onions and carrots were used as demonstration crops during 1978. The basic objective of the demonstration was to qualitatively evaluate the effectiveness of selected herbicides on weed control since past experience has indicated that weed control is one of the major obstacles for successful vegetable production. The following table summarizes the chemicals used in the demonstration and the results. A severe soil crusting problem occurred prior to carrot and onion germination which resulted in very poor stands. A problem with the irrigation system also prevented proper water applications to assist in herbicide activation and enhancement of crop growth. Di-Syston was used as a systemic on the potatoes with excellent control of the potato beatle. Beatles were observed on the plants but no visual damage was noted.

	CROPS		
Chemical	Potatoes	Carrots	Onions
Sencor (2 lb/ac)	Excellent		
Eptam (5 pt/ac)	Very good		
Lorox (4 lb/ac)	Good	*	
Treflan		*	
Prefar		*	*
Dacthal			*
Randox			*

*No results because of poor seedbed and water management conditions.

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PR79-11

SUNFLOWER PERFORMANCE UNDER IRRIGATION

Joseph F Giles and Robert A Sanders

Increased interest in irrigating cash crops other than corn has occurred in central South Dakota in recent years a stable price for sunflowers over the same period has caused growers to consider the potential of this crop. The objective of this study was to determine the yield potential of sunflowers under irrigated conditions.

Procedure

Sunflower plots were established under both dryland and irrigated conditions. Both fields were in corn the previous year. The land was spring disked after fall chopping of corn stalks and tandem disked twice again to incorporate herbicide (tolban 1 lb/A) prior to planting on May 25. The planting rate was 24,000 and 27,800 for the dryland and irrigated respectively. Because of crust forming rains on May 27, and May 29, the plots were rotary hoed on June 2. The sunflowers were cultivated twice, June 22, and June 23. A total of six inches of water was applied in two furrow applications on July 3 and July 20. The first applications was during the bud stage of growth. Paraquat was aerially applied to both dryland and irrigated plots on September 2, when 75% of the sunflower heads had turned from green to yellow on the back. A rate of one pint/acre was used with a carrier of five gallons of water. Yields were taken with a self propelled combine on September 26. The moisture contents were below 7 percent at the time of harvest. A temperature below 26°F did not occur until October 7.

Results and Discussion

Yields and plant population at harvest for the two varieties on both irrigated and dryland plots are presented in Table 1. Yields were slightly higher for the nonirrigated treatment. No significant yield occurred between the varities within the dryland and irrigation treatments.

With a higher plant population on the irrigated plots, the size of heads were smaller, which resulted in more bird damage prior to harvest. A reduction in the initial plant population may result in an increased yield under irrigated conditions. The effect of these factors will be the objective of future research.

The insect problems, such as sunflower headmoth, and stem weevil damage, were not of major concern during 1978.

Table 1. Yield of Sunflowers Grown Under Irrigation

	Dryland		Irrigated	
Variety	Yield	Population	Yield	Population
	lb/A	ppa*	lb/a	ppa*
Cargill 204	1793	19,500	1467	20,300
Interstate 894	1706	17,900	1525	23,900

* Plants per acre at harvest.

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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 23. 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 Cobex, Dual and Lasso preplant treatments incorporated 3-4 inches) and harrowed. Plots were planted the same day in 30-inch rows. Nearly 4 inches of rain was received the first week. Post-emergence herbicides were applied when weeds were 1-1½ inches tall.

Weed pressure was high. Annual grasses included green and yellow foxtail. Broadleaves included rough and prostrate pigweed, lambsquarters and a very heavy stand of Russian thistle in 1978. The plots were not cultivated.

Results

The performance of the corn, soybean and sunflower herbicide treatments is presented in the following tables. Evaluations are based on an average of 2 visual estimates for annual grass, broadleaved and Russian thistle control in each plot. A 2-year (1976,1978) evaluation is also included.

Weed control varied considerably, ranging from good to poor. Very few treatments provided over 90% control in 1978. This may be attributed in part to the wet spring conditions and unusually heavy rainfall the first week. Combination or overlay treatments provided better control of both grasses and broadleaved weeds. Most herbicides used alone provided poor control of marginal or tolerant weed species. Amiben, Sencor, Lexone, atrazine and Bladex provided good to excellent Russian thistle control.

The 2-year averages compare treatments over a range of conditions. These values provide a measure of weed control consistency.

Table 1. Corn Herbicide Demonstration Plots

		Percent Weed Control			
		6/30/78		2-Yr Avg	
Treatment	lb/A a.i.	Gr	Bdlf	Gr	Bdlf
PREPLANT INCORPORATED					
Check	—	0	0	0	0
Eradicane	4	88	50	91	65
Eradicane+atrazine	4+1	90	94	—	—
Sutan+	4	69	50	72	62
Sutan++atrazine	4+1	78	90	85	92
Sutan++Bladex	4+1½	80	85	85	90
AAtrex/atrazine	2½	72	95	77	95
Lasso	3½	88	40	—	—
Dual	3	90	60	—	—
PREEMERGENCE					
AAtrex/atrazine	2½	10	95	40	94
Bladex	2½ or 3	40	80	50	85
Ramrod/Bexton/Propachlor	5	78	30	79	50
Lasso	3	82	40	88	55
Dual	3	90	30	88	45
Prowl	2	40	70	52	70
Lasso+atrazine	2+1	65	88	68	87
Lasso+Bladex	2+1½	70	80	70	85
Lasso+Banvel	2+½	84	80	82	86
Dual+atrazine	2+1	78	92	—	—
Prowl+atrazine	1½+1	40	80	—	—
Prowl+Bladex	1½+1½	50	80	—	—
Ramrod+atrazine	4+1	76	85	73	86
PREEMERGENCE AND POST					
atrazine+oil	1½+1 gal	20	94	50	95
Bladex	1½	50	80	67	89
Check	—	0	0	0	0

Gr=Grass
Bdlf=Broadleaf

Table 2. Soybean Herbicide Demonstration Plots

Treatment	lb/Aa.i.	Percent Weed Control 6/30/78 Gr	Bdlf	RT	2-Yr Avg Gr	Bdlf
PREPLANT INCORPORATED						
Check	—	0	0	0	0	0
Treflan	3/4	92	84	68	94	91
Cobex	½	93	86	70	93	92
Tolban	1	94	88	75	94	92
Basalin	1	94	88	80	95	92
Prowl	1¼	91	75	0	—	—
Vernam	2½	90	50	10	92	74
Treflan+Sencor/Lexone	3/4+3/8	94	90	80	94	91
PREPLANT INCORPORATED & PRE						
Treflan&Sencor/Lexone	3/4&1/2	95	98	96	96	98
PREEMERGENCE						
Prowl (7 day)	1¼	80	45	10	—	—
Amiben	3	88	95	99	88	92
Lasso	3	90	50	10	92	62
Lasso+Sencor/Lexone	2+½	92	96	96	92	83
Lasso+Lorox	2+1	88	65	45	88	68
Lasso+Modown	2+2	90	70	60	89	76
Lasso+Amiben	2+2	94	98	98	—	—
PREEMERGENCE & POST						
Lasso&Basagran	2&1	84	70	80	—	—
Check	—	0	0	0	0	0

Gr=Grass
Bdlf=Broadleaf
RT=R. Thistle

Table 3. Sunflower Herbicide Demonstration Plots

Treatment	lb/A a.i.	Percent Weed Control Gr	Bdlf	RT
PREPLANT INCORPORATED				
Treflan	3/4	92	85	82
Tolban	1	95	78	86
Cobex	½	92	70	60
Eptam	3	96	30	10
PREEMERGENCE				
Amiben	3	94	98	98

Gr=Grass
Bdlf=Broadleaf
RT=R. Thistle

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PR79-13

SOLAR ELECTRIC DRYING BIN

Joseph F Giles

The Solar-Electric drying bin was used again in the fall of 1978 with good results. Filling began on October 2 and was completed on October 10. Moisture contents ranged from 23.01% to 14.86%, with the average of all corn loads at 19.22%. Final moisture averaged 11.80% with water removal of 7.42 "points".

The fan uses 1809 kilowatt hours and the electric heater 300 kilowatt hours. The heater was only used the first part of the drying period, only during times of cold and cloudy weather.

The amount of corn dried, calculated by volume, was 1,000 bushels. Electricity used was 2.11 kilowatt hours per bushel for removal of 7.42 "points", or 0.284 kilowatt hours per bushel per "point" removed. This is 0.046 kilowatt hours less than the three year 1974-76 average.

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PR79-14

A Regional Evaluation of Off-Season Agricultural Use of Water and Energy Resources

M. L. Horton, R. E. Beyer, C. G. Carlson and J. L. Wiersma

The Water Resources Institute at South Dakota State University in conjunction with the Water Resources Institutes at Manhattan, Kansas and Bozeman, Montana initiated a regional off-season irrigation project in October, 1976. A primary objective of the project was to evaluate the effectiveness of fall and early spring applied water in crop production. The effectiveness of limited applications of water during the growing season was also studied.

Throughout the central plains region of the United States, both water and energy supplies often become limited during the peak crop growing season. Off-season irrigation could help irrigators take advantage of water that is available in spring and fall, reduce the summer energy peak, and allow an irrigator to use his equipment on more acres or reduce the size of the equipment needed. As the supply and cost squeeze continues, irrigators need to know how to effectively manage water, energy, and equipment to maximize return.

In South Dakota, alfalfa, corn, spring wheat, and winter wheat were grown in the experiment. Alfalfa and spring wheat were grown in Montana and corn and winter wheat were grown in Kansas. The results of the Montana and Kansas experiments are not available at this time.

The South Dakota experiments were conducted at the James Valley Research and Extension Center near Redfield, South Dakota. Field plots were established in the fall of 1976 and used for the 1977 and 1978 growing season. Each plot contained approximately 1000 ft^2 and each treatment was replicated three times. A list of the treatments used for each crop is given in Table 1.

Table 2 shows the alfalfa yields for 1977 and 1978.

In 1977, only treatment A-3(F+S+ac) gave a significantly higher yield than the dryland plot. In 1978 none of the treatments were significantly different.

Corn yields for 1977 and 1978 are given in Table 3.

In 1977, four treatments gave a significantly higher yield than the dryland plots; C-3(F+t), C-5(t), C-6(F+12L+sk+bk), and C-8(12L+sk+bk). In 1978 only treatment C-8(12L+sk+bk) gave a significantly higher yield than the dryland. There was a poor stand in some of the 1978 corn plots and this makes interpretation of the 1978 yield data difficult.

Spring wheat yields for 1977 and 1978 are listed in Table 4.

There was no positive response to any irrigation treatment of the spring wheat plots in either 1977 or 1978. In 1978 there was severe Hessian fly and grasshopper damage which reduced yields.

Table 5 shows the 1977 winter wheat yields.

There were no significant yield differences in the winter wheat yields. There is no 1978 yield data because the 1978 crop was entirely winter killed. There was also a reduced stand in the 1977 crop due to winter kill.

There was above average precipitation in the fall of 1977 and spring of 1978. This masked the effect of any off-season irrigation during this period of time.

Soil moisture content was monitored year round and a detailed analysis of this data will soon be completed. Data collection has been completed for this project and a final report including the Montana and Kansas data will soon be completed.

The results from South Dakota data show no advantage to irrigation in the fall or spring. The years for which data were collected in South Dakota were years of average or above average precipitation. When analyzing these results with results from other states and other years, we conclude that off-season irrigation is of value only when the available soil moisture supply is less than 50%. This situation was not encountered in our work. When this moisture regime was encountered elsewhere, significant yield increases for all crops grown were obtained by both fall and early spring irrigation. We speculate that had this experiment been conducted in the drought years of 1974 and 1975, that positive results from fall and early spring irrigation would have been encountered at the Redfield experiment station.

Table 1. Description of Irrigation Treatments

Crop	Treatment Symbol	Description
Alfalfa	A-1(F)	Fall applied irrigation only.
"	A-2(ac)	Irrigated after each cutting.
"	A-3(F+S+ac)	Irrigated fall, spring and after each cutting.
"	A-4(D)	Dryland; no irrigation.
Corn	C-1(F)	Fall applied irrigation only.
"	C-2(S)	Spring pre-plant irrigation only.
"	C-3(F+t)	Irrigation in fall and at tasseling.
"	C-4(S+t)	Spring pre-plant + tasseling.
"	C-5(t)	Irrigation at tasseling only.
"	C-6(F+12L+sk+bk)	Fall + twelve leaf + silking + blister kernel.
"	C-7(S+12L+sk+bk)	Spring + twelve leaf + silking + blister kernel.
"	C-8(12L+sk+bk)	Twelve leaf + silking + blister kernel.
"	C-9(D)	Dryland; no irrigation.
Wheat, spring	Ws-1(F)	Fall applied irrigation only.
"	Ws-2(F+b)	Irrigation in fall + at boot stage.
"	Ws-3(b)	Irrigation at boot stage only.
"	Ws-4(j+b)	Irrigation at jointing + boot stage.
"	Ws-5(F+j+b)	Irrigation in fall + jointing + boot stage.
"	Ws-6(D)	Dryland; no irrigation.
Wheat, winter	Ww-1(F)	Fall applied irrigation only.
"	Ww-2(j)	Irrigation applied at jointing stage only.
"	Ww-3(b)	Irrigation applied at boot stage only.
"	Ww-4(F+b)	Irrigation applied in fall + boot stage.
"	Ww-5(F+j+b)	Irrigation applied in fall + jointing + boot stage.
"	Ww-6(j+b)	Irrigation applied at jointing and boot stage.
"	Ww-7(D)	Dryland; no irrigation.

Table 2. Alfalfa Yields

Treatment	1977 Dry Matter Yield, tons/acre 1st cutting	2nd cutting	3rd cutting	Total
A-1(F)	2.45	1.77	1.08	5.30
A-2(ac)	2.11	1.77	1.43	5.31
A-3(F+S+ac)	2.73	1.78	1.69	6.20*
A-4(D)	2.33	1.59	1.16	5.08

Treatment	1978 Dry Matter Yield, tons/acre 1st cutting	2nd cutting	3rd cutting	Total
A-1(F)	2.76	1.99	1.79	6.54
A-2(ac)	2.66	1.82	2.18	6.66
A-3(F+S+ac)	2.83	2.02	2.49	7.34
A-4(D)	2.82	1.96	1.95	6.73

*Significantly different from dryland at 95% probability level.

Table 3. Corn Yields

Treatment	1977**	1978***
C-1(F)	100	109
C-2(S)	81	103
C-3(F+t)	116*	117
C-4(S+t)	114	84
C-5(t)	128*	118
C-6(F+12L+sk+bk)	121*	112
C-7(S+12L+sk+bk)	106	115
C-8(12L+sk+bk)	116*	131*
C-9(D)	96	102

*Significantly different from dryland at 95% probability level.
**Due to excess rainfall there was no blister kernel stage irrigation in 1977.
***Due to excess rainfall there was no spring irrigation in 1978.

Table 4. Spring Wheat Yields

Treatment	Yield, bushels/acre 1977*	1978**
Ws-1(F)	32	13
Ws-2(F+b)	33	13
Ws-3(b)	35	13
Ws-4(j+b)	31	12
Ws-5(F+j+b)	34	11
Ws-6(D)	37	17

*Due to excess rainfall, no boot stage irrigation was applied during 1977.
**Due to excess rainfall, no joint stage irrigation was applied during 1978.

Table 5. Winter Wheat Yields.

Treatment	1977 Yield, bushels/acre*
Ww-1(F)	30
Ww-2(j)	33
Ww-3(b)	25
Ww-4(F+b)	28
Ww-5(F+j+b)	32
Ww-6(j+b)	34
Ww-7(D)	27

*Due to excess rainfall, the boot stage irrigation was not applied.

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Effect of Fungicide Application on the Performance of Spring Wheat Cultivars at Redfield in 1978

G. W. Buchenau, D. L. Keim & C. W. Wirth

INTRODUCTION

Foliage diseases frequently influence the yield and quality of spring wheat in South Dakota. Although fungicides are available that control some of these diseases, others may become more prominent and perhaps more damaging when fungicides are applied. In addition, some cultivars are more resistant or more tolerant to some diseases than they are to others. These tests were designed to study the effect of fungicide sprays on the performance of spring wheat cultivars and to evaluate the interactions between different diseases and cultivars.

Twenty-five cultivars were planted in a split-plot design with three replications. The fungicide mancozeb was applied three times with a ground sprayer at a rate of 1.6 lb active/A, on three dates: 20 June (boot stage - 46 days after planting), 27 June (heading to past heading) and 7 July. By 7 July, both yellow leaf spot (tan spot) and a bacterial blight were widespread in the plots. At that time the early maturing cultivars were in the 1/2 berry growth stage. Three cultivars were omitted from the analysis because of missing data.

RESULTS:

Butte and World Seeds 1809, both early maturing cultivars, were the top yielders in both sprayed and unsprayed plots (Table 1). In unsprayed plots, Butte was significantly better than all cultivars except World Seeds 1809.

Cultivars in the top ten yielders in both treatments were Butte, World Seeds 1809, Eureka and Prodax. Three South Dakota experimental lines also were among the top ten in both treatments, namely SD2016, SD2167, and SD2355.

Fungicide treatment resulted in an overall yield increase of 3.9% mostly due to control of yellow leaf spot (tan spot) caused by the fungus *Pyrenophora trichostoma.* When unsprayed, early maturing cultivars outyielded medium and late maturing cultivars by a highly significant 6.9% (1.2 Q/ha). When sprayed with fungicides the order was changed; mid-season cultivars tended to outyield early cultivars, but the difference was not statistically signficant, possibly due to the small number of cultivars in the medium maturity class (Table 2). Generally we expect early cultivars to be injured less by disease, since a smaller proportion of their photosynthetic potential (ie leaf-days) is destroyed. This is indicated in Table 2, where early cultivars were only slightly benefited by fungicides.

Other diseases were made more conspicuous, if not accelerated, by fungicide application. The bacterial disease was particularly evident on Angus, Bounty 309 (also rust), and a number of other cultivars and experimental lines at both Redfield and Brookings.

Table 1. Effect of mancozeb foliage sprays on yield, test weight and foliage disease of 25 spring wheat cultivars at Redfield in 1978.

		Yield			Test Wt		Leaf Necrosis			
		Unsprayed	Sprayed	Diff	Unsprayed	Sprayed	Unsprayed	Sprayed	Diff	Other
Cultivar	Maturity	Q/ha[a]		(S-U)	Kg/hl[b]		0-10 Scale[c]		(U-S)	Diseases
Eureka	M	15.2	18.1	2.9	76.0	77.8	5.0	4.0	1.0	
Ellar	M	14.8	15.9	1.1	77.2	79.8	7.8	6.0	1.8	
WS1809	E	20.1	18.8	-1.3	82.2	83.2	8.3	6.3	2.0	
Butte	E	24.2	19.9	-4.3	83.8	85.0	7.0	5.3	1.7	BB
Protor	E	13.1	17.3	4.2	81.4	82.4	8.3	6.5	1.8	
Bty208	E	14.5	15.6	1.1	83.0	83.6	8.5	7.3	1.2	
SD2273	E	14.8	17.6	2.8	80.6	81.4	6.0	3.5	2.5	BB
Era	L	13.9	11.9	-2.0	77.2	76.2	7.3	5.5	1.8	
Olaf	L	15.7	13.4	-2.3	78.6	76.8	7.0	4.0	3.0	
SD2355	L	16.1	17.6	1.5	78.2	78.6	5.8	3.0	2.8	
SD2016	L	17.4	17.5	0.1	79.2	77.4	8.5	6.0	2.5	LR
SD2167	E	17.6	16.4	-1.2	80.2	81.4	7.8	4.8	3.0	SR(LVS)
MN70170	L	14.0	18.1	4.1	78.2	76.4	6.5	4.8	1.7	BB
Funks W444	E	15.6	12.8	-2.8	82.6	82.4	9.5	8.0	1.5	LR 65MS
MT7416	ME	11.6	12.8	1.2	76.6	78.8	9.0	7.5	1.5	BB LR 40MS
NK5511	E	14.3	15.2	0.9	81.2	82.8	6.5	4.5	2.0	
NK5513	M	15.5	16.5	1.0	79.8	77.4	6.5	5.8	0.7	BB
Prodax	M	15.2	17.0	1.8	76.4	76.8	9.3	6.3	3.0	LR 90S
Angus	L	12.5	12.4	-0.1	77.4	77.2	8.0	8.3	-0.3	BB+
Kitt	L	12.4	14.8	2.4	74.4	77.4	6.0	6.5	-0.5	BB
Bty309	ME	13.6	15.3	1.7	77.4	80.6	9.3	8.5	0.8	BB+
WS25	ME	14.8	14.4	-0.4	80.0	80.2	8.8	7.8	1.0	
	Means	15.3	15.9	0.6	79.2	79.4				
	LSD_{05}	5.0	5.0	5.0	4.9	4.9				

[a] bu/A (of wheat) = Q/ha x 0.672
[b] lbs/bu = kg/hl x 0.775
[c] 0 = no disease, 10 = all foliage dead.

Table 2. Effect of Fungicide sprays on spring wheat yield broken down by maturity class.

Maturity Class	(No Vars)	Unsprayed	Sprayed	Mean	Diff (S-U)
		Q/ha			
Early	11	15.8	16.0	15.9	0.2
Medium	4	15.2	16.9	16.1	1.7
Late	7	14.5	15.1	14.8	1.0

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