Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-1

1977 WEATHER

JAMES VALLEY AGRICULTURAL RESEARCH AND EXTENSION CENTER

Climate conditions of 1977 are shown in the table. The early spring precipitation provided adequate moisture to facilitate tillage, planting and proper crop germination, although there was an over winter shortage of subsoil moisture. Precipitation throughout the remainder of the growing season was below normal, but occurred at sufficient intervals to maintain crop growth. The absence of long periods of high temperatures with accompaning high velocity southerly winds also contributed to fairly good dryland crop production.

Irrigation was limited to research plot areas on May 12 by request of the Water Rights Commission, Department of Natural Resources Development, State of South Dakota. This amounted to irrigating approximately 40 acres sparingly until July 21 when the water level in the James River dropped so low it was no longer feasible to pump. Yields of experimental plots were reduced because of less than adequate irrigation.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Table 1. Precipitation, Temperature and Evaporation Data for the James Valley Agricultural Research and Extension Center for 1977.

Month	Precip. inches.	Departure	Temp. (°F)	Departure	Evap. open pan inches
Jan.	0.05	-0.30	1.2	-9.0	—
Feb.	1.33	+0.97	23.4	+5.5	—
March	5.30	+3.83	31.6	+3.3	—
April	1.78	-1.41	53.5	+9.7	3.60*
May	1.78	-0.75	65.7	+8.6	9.22
June	3.46	-1.39	68.7	+1.9	6.58
July	0.34	-2.15	75.2	+2.9	11.01
Aug.	2.39	+0.26	66.5	-4.3	5.28
Sept.	4.39	+2.77	61.7	+1.2	3.16
Oct.	1.30	+0.08	47.1	-1.6	1.35
Nov.	1.71	+1.12	27.8	-4.5	—
Dec.	0.48	+0.09	12.4	-6.5	—
Total	24.31	+3.12	—	+7.2	40.20

*Evap. from April 11
Last frost: April 25 (28°)
First frost: Oct 2 (28°)
Frost free days: 159

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-2

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. Specific sites were located at Groton, Highmore, Redfield and Watertown. An observation trial was set up at Pine Ridge but was only sampled for oil content in the sunflower seed. The sites in South Dakota were located at Groton on the Lloyd E. Strom land. The other three plantings were located on Research Stations near the towns mentioned. Sunflower work, crop sequences and insect studies will be continued on these locations in 1978.

Sunflower yields taken on the Redfield Research Station in 1977 were much better than in previous years. There was some bird damage as would be expected on small plantings. Root and stem weevil damage did not reach the proportions experienced in 1976, which may be due to rapid growth and larger stems of the sunflower plants. Standability is increased with larger stalks and breakage during the dry down period is reduced. Head Moth is still the number one problem in growing sunflowers. To alleviate this problem it is almost necessary to include two sprayings in the sunflower program. By planting late, some of the head moth flights may be missed, but this means your plants will be standing late in the fall. Bird damage then becomes excessive and much of the yield is lost to bird feeding and rapid shattering by the wind.

The maintenance of weed free conditions on farm land, when in the sunflower program, is a necessity because weeds are alternate hosts of insects and disease. In 1977, there were fields with stalk rot present that had no past history of sunflowers being grown previously. By destroying the standing stalks and loosening the soil, the overwintering areas of the root weevil and the stem weevil are disturbed and they are killed by exposure. Care must be taken in this fall tillage operation because sunflowers tend to make the soil loose and it may blow.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-3

DATE PLANTING OF SUNFLOWERS, REDFIELD, 1977

Q. S. Kingsley

OBJECTIVE: To determine what date may be the best to plant sunflowers with physiological maturity occurring before the first fall frost.

CROP YEAR HISTORY:
Planted: May 11; May 17; May 24; June 1. Harvested Oct. 19.
Variety: Interstate 894 Fertilizer: 60-20-0
Replications: Four Soil preparation: Chisel Plow
Herbicide: Tolban, 1qt/A on Sunflowers, disked in
Ramrod on corn at planting time
Insecticide: Supracide, 1qt/A or ½#/A
Plant population: 16,000 plants per acre, 36 in. rows
Cultivations: 2
Soil type: Beotia-Great Bend-Harmony
Rainfall: May 11 to Oct. 19 - 13.52 inches
May 17 to Oct. 19 - 13.52 inches
May 24 to Oct. 19 - 12.42 inches
June 1 to Oct. 19 - 11.74 inches
First killing frost: Oct. 2

RESULTS:

Table . Date planting of Sunflowers and Corn, Redfield, 1977

	Date planted	Sunflowers percent oil	Sunflowers yield lbs/A	Corn yield bu/A
1st	May 11	46.5	902.1	49.3
2nd	May 17	47.7	1021.2	50.0
3rd	May 24	46.7	1514.8	50.3
4th	June 1	48.9	1531.8	53.7

DISCUSSION:

In 1977, the first planting was made May 11 and then at 7 day intervals till June 1. The June 1 date was selected as the last date of planting because sunflowers are a full season crop and require about 120 days to develop to full maturity. Normally the first frost occurs in mid-September and the plant would be physiologically mature at this time. The first fall frost did not occur till October 2 in 1977 and the June 1st planted sunflowers were green and very little leaf droppage had occurred at frost time. The seeds were fully developed but contained about 25 percent moisture at this time.

Each date of planting was sprayed 2 times with Supracide for insect control with the 2 earliest plantings receiving the most insect damage. The May 11 and 17 dates of planting were sprayed first when the flowers were about 5 percent in bloom, which was too late for good head moth control. The May 24 and June 1 plantings were first sprayed in the pre-bloom or when the bud was just opening and control of the head moth was much better. Many seed weevils, blister beetles, thistle caterpillars and grasshoppers were killed when spraying for control of head moth.

Sunflower seed yield increased with each date of planting in 1977 as did the corn yields. The early planted corn had a seed moisture content of 12 percent whereas the late planted corn had seed moisture of 30 percent. The overall ear size was uniform for all dates of planting.

Late planted sunflowers in 1977 produced about 600 pounds more seed per acre than the May 11 planting and roughly 500 pounds more than the May 17 planting date. There was some escape from the sunflower head moth in the later plantings but not to the extent that an insecticide spray was not necessary.

A few fields were observed in 1977 where the sunflowers had been planted in late June and early July. There was a definite reduction in number of filled seeds in the head and at freeze-up time the moisture in the head was about 40 percent. Of the seeds that were opened to inspect the actual fill, there were 5 percent with complete fill and the others were 50 percent or less and these seed meats were mushy.

An economic comparison of sunflower yields to corn yields may be made in this manner. Referring to Table 1 using a corn yield of 50 bushels per acre and the late October price at $1.70 per bushel versus sunflowers selling at that time for $8.00 per hundred weight. It would take 1063 pounds of sunflowers to gross the same money as for 50 bushels of corn. Each aerial spraying of Supracide for insect control, using 5 gallons of water per application, cost $9.00 per acre in 1977. Assuming 2 applications were made, it would take 112.5 pound increase in seed production for each application of insecticide or a total increase in yield of 225 pounds of seed to pay for the insecticide.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-4

SUNFLOWER INSECT AND MANAGEMENT EXPERIMENT

Q. S. Kingsley

OBJECTIVE: To provide information about economic thresholds for use in future monitoring programs for sunflower head moth, Homeosoma electellum.

CROP YEAR HISTORY:
- Planted: Replant June 1 Harvested: Oct. 13
- Variety: Interstate 894 Fertilizer: 60-20-0
- Replications: Four Soil preparation: Chisel plow
- Herbicide: Tolban, 1qt/A disked in
- Insecticide: Supracide, 1qt/A or ½#/A
- Plant population: 16,000 plants per acre, 36 in. rows
- Cultivations: 2
- Soil type: Beotia-Great Bend-Harmony
- Rainfall: June 1 to Oct. 13 - 11.74 inches
- First killing frost: Oct. 2

RESULTS:

Table . Sunflower Head Moth Study (Homeosoma electellum), Redfield, 1977

Number of Insecticide Treatments*	Test Weight	Percent Oil	Yield lbs/A
None	32.2	44.1	1106.4
1 spray**	31.0	45.0	1370.0
2 sprays	31.0	45.2	1478.0
3 sprays	31.0	44.5	1413.2

*Supracide applied at ½ pound per acre per spraying.

**Dates of spraying: 1 spray, July 27; 2 sprays, July 27 and Aug. 2; 3 sprays, July 27, Aug. 2 and Aug. 7.
Statistically significant at (.05) LSD, 349.

DISCUSSION:

The spraying of Supracide for insect control was performed by using a high clearance sprayer. A series of spray tips were set up so full coverage of the plant was accomplished with each spraying. Drop nozzles were used between the rows and a nozzle was set to spray directly down on the head. With this setup, the plant was covered from top to bottom. Any head moth Homeosoma electellum that may be hiding under the leaves received some spray and was probably destroyed.

Head moths were first noticed July 26th on heads that were just starting to open. They had worked their way down into the center portion between the petals and were actively depositing eggs. The first spraying was very effective in controlling the head moth but also killed a very large population of seed weevils. Seed weevils noted of any abundance were the reddish weevil Smicronyx fulvus and the slightly larger gray weevil Smicronyx sordidus. Some root weevils having the black color Baris strenua were not too abundant. In this year of fair rainfall, the gray spotted stem weevil Cylindrocopturus adspersus was not evident or of serious consequence.

The effect on yields of various numbers of spraying for head moth control are indicated in table 1. A single spray increased yield over the none treated 274 pounds and 2 sprayings increased yields about 372 pounds. By spraying 2 times at a 5-7 day interval controlled second flights of head moth and some of the larvae that were out on the surface of the flowers.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

SUNFLOWER VARIETY TRIALS

Q. S. Kingsley

PR 78-5

OBJECTIVE: To test various sunflower varieties grown in the state for yield, maturity, oil content and plant height.

CROP YEAR HISTORY: Same as for the Sunflower Head Moth Study except the planting date was May 17.

RESULTS:

Table . Sunflower Variety Trials, Redfield, 1977

Oil Seed Variety		Plant Height Inches	Test Weight	Percent Oil	Yield lbs/A
Sunbred	254	62	34.5	45.1	1825.6
Sigco Hybrid	903	66	34.0	45.6	1597.4
Cargill	204	63	33.0	44.9	1545.5
Cal/west	903	64	33.0	45.9	1524.8
Hybrid	8943	63	35.5	46.4	1504.0
Big top +		64	33.0	46.7	1483.0
Interstate	894	64	33.0	46.5	1429.9
Cal/west	894	65	34.0	47.0	1400.3
Sigco	894	64	33.5	46.7	1370.0
Sun Hi	301A	64	35.0	49.6	1307.0
Oil Master +		62	34.0	45.8	1255.1
Sun Gro	380	66	35.0	48.9	1224.0
Sun Hi	304	63	34.0	47.7	1213.6
Sun Gro	372A	84	34.0	47.3	1161.8
Peredovik		67	32.0	47.9	778.0
Sunbred	223	63	31.0	44.1	767.6
Sputnik	71	70	31.5	49.5	757.2
Yield Mean					1302.6
LSD at .05	528#				
CV	20.5				

DISCUSSION:

The ability of a sunflower to self-pollinate is a very important factor when it is necessary to spray for insects. Another problem is the increase in field size which reduces the efficiency of the pollinating insects, such as bees. The concentration of bees in a large field or small field requires 1 colony per acre for proper pollination. Most commercial operators usually have about 50 colonies per site, which would be too few for 100 percent pollination of areas over 50 acres.

The grower should have some questions in mind when buying seed: 1st what is the percentage of self-pollination, and 2nd what percentage of the grow out is free of throw backs. To explain the second question further: Will the seed you buy produce uniform plants similar to the variety you are interested in. Also, what about disease resistance; uniform seed for planting and plant height. The shorter the plant, the easier it is to harvest.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-6

SOIL APPLIED INSECTICIDE FOR INSECT CONTROL IN SUNFLOWERS

Q. S. Kingsley

OBJECTIVE: To determine how effective soil applied insecticides were in control of insects through systemic poisoning.

CROP YEAR HISTORY:
Planted: June 1 Harvested: Oct. 13
Variety: Interstate 894 Fertilizer: 60-20-0
Replications: Four Soil Preparation: Chisel plow
Herbicide: Tolban, 1qt/A disked in
Insecticide: No Supracide sprayed on, only soil insecticides listed in Table 1
Plant population: 16,000 plants per acre, 36 in. rows
Cultivations: 2
Soil type: Beotia-Great Bend-Harmony
Rainfall: June 1 to Oct. 13 - 11.74 inches
First killing frost: Oct. 2

RESULTS:

Table . Soil applied Insecticides for Insect Control, Redfield, 1977

Insecticide		Test Weight	Percent Oil	Yield lbs/A
Furadan	12oz/A	32.0	47.2	1144.4
Counter 15G	8oz/A	32.0	45.2	1168.4
Dyfonate 20G	6oz/A	32.0	46.3	1167.0
Thimet 15G	8oz/A	31.0	43.6	1143.4
Temik 15G	8oz/A	31.5	44.3	1199.0
Disyston 15G	8oz/A	32.0	44.0	1147.6
Untreated		32.5	43.3	1069.8

No significant differences.

DISCUSSION:

In this phase of the experiment, no effort was made to control head moth with spray. The study was concentrated at the base of the plant and upward to the point where soil insecticides lost their effectiveness.

Insect control was noted till the plant attained a height of between 12 to 18 inches. When the plant had elongated beyond the fourth node in height, the effect of the insecticides seemed to dissipate. Insect injury then started and could be seen in the stems and leaves.

In 1977, very few of the gray spotted stem weevil Cylindrocopturus adspersus were observed in this experiment. The black colored root weevil Baris strenua were seen during this period but in reduced numbers. Their population was lower than in 1976.

Yield differences and insecticide effect differences are not statistically significant. In summation, there was insect control for a short period of growth but the effect of the insecticide did not become systemic and continue upward as the plant developed.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-7

CROPPING SEQUENCES FOLLOWING SUNFLOWERS

Q. S. Kingsley and Joe Giles

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, April 15 Harvested: July 21
Corn, May 17 Harvested: Oct. 19
Fertilizer: None, residual from 1976 Sunflower planting
Replications: Four Soil preparation: Chisel plow and disk
Herbicide: Corn, Lasso-Bladex tank mix, broadcast, May 23
Insecticide: Corn, Counter, 7.3lbs/A banded
Plant population: Corn, 15,500 plants per acre
Wheat, 1Bu/A; Oats, 2½Bu/A; Barley, 1Bu/A
Cultivations: Corn, 2
Soil type: Beotia-Great Bend-Harmony
Rainfall: April 15 to July 21 - 6.69 inches for small grain
May 17 to Oct. 19 - 13.52 inches for corn

RESULTS:

Table . Cropping Sequences Following Sunflowers, Redfield, 1977

Crop	Test Weight	Yield Bu/A
Corn (Jacques J x 62)		58.9
Barley (Prilar)	48	50.2
Oats (Chief)	34	60.0
Wheat (WS 1809)	58	30.0

DISCUSSION:

The 1977 crops were not fertilized and any fertility available was residual left from the 1976 sunflower crop. Emphasis was placed on how well other crops would produce following a sunflower planting.

When subsoil moisture is at a level where germination is rapid and some rainfall is received during the rapid growing period, the yields are satisfactory. In 1977, rainfall did not exceed the long term average for any month during the growing period.

Sunflowers leave the soil in a friable condition and this may be one reason for the better yield.

Weeds were not a problem in any of the crops.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-8

Population, Fertility and Planting Method

Q. S. Kingsley

Objectibes: Determine the most favorable plant population and fertility per acre using conventional and listing methods of planting.

Crop Year History:
- Planted: June 1 Harvested: Oct. 14
- Variety: Interstate 894 Replications: Four
- Plant Populations: 12,000; 16,000; 20,000 in 36 in.rows
- Fertility: 0-0-0; 0-20-0; 40-20-0;80-20-0(all starter)
- Herbicide: Tolban 1qt/A disked in
- Insecticide; Pupracide ½ lb/A
- Cultivations: two
- Rainfall: June 1 to Oct. 14 - 11.74 inches
- First killing frost: Oct. 2
- Soil type: Beotia-Great Bend-Harmony

Results:

Table. Population, Fertility and Planting Method, Redfield, 1977

Treatment LBS/A $N-P_2O_5-K_2O$	Conventional Planter % Oil	Conventional Planter Yield lbs/A	Lister Planter % Oil	Lister Planter Yield lbs/A
0- 0 - 0	45.7	1296.8	44.7	1308.9
0- 20 - 0	44.8	1471.3	44.5	1461.1
40- 20 - 0	46.1	1960.3	44.9	1747.2
80- 20 - 0	45.6	1959.8	43.7	1815.8

Least Significant Difference (.05) Fertility 224.8 lbs.

Discussion:

This experiment was planted June 1st when the soil temperature and moisture were adequate for rapid germination. A preplant weed control using Tolban disked in was applied prior to planting sunflowers. The fertilizer was applied at planting time 2 inches below and 2 inches to the side of the seed. Supracide was sprayed on 2 times for insect control. The first spraying was at prebloom and the second spray 5 days later.

When comparing lister planting to conventional planting in 1977, no appreciable differences were found favoring one method over the other. The big advantage to lister planting is the once over operation with no previous tillage. Weed control chemicals must be applied using the lister planter. Chloramben (Amiben), in the granular form, is an effective method of weed control using this planting method. The differences in yield may easily be affected by the saving in reduced tillage.

The addition of 40 pounds of nitrogen to the 20 pounds of P_2O_5 increased yields 489 pounds over the 0-20-0 treatment and 664 pounds more than the 0-0-0 treatment for conventional planting. The addition of another 40 pounds of nitrogen for the 80-20-0 treatment did not aid in increasing yields. In the lister planting method, the addition of fertilizer increased yields in all increments over the 0-0-0 treatment. An increase in yield may be noted for the 80-20-0 over the 40-20-0, but the 62 pound increase in yield does not pay the fertilizer costs. When figuring $0.19 a pound for nitrogen and $0.089 a pound for sunflower seed, the loss would amount to $1.46 per acre.

The plant population objective of this experiment was not acheived in 1977 due to low population in the higher intensities. A population of 16,000 was reached and all plots were thinned to that stand.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-9

Tillage Effects on Spring Wheat Yield

Joseph F. Giles and Robert A. Sanders

There are currently many tillage methods being used for seedbed preparation under continuous spring wheat production.

The timing and type tillage operation greatly influences the degree of soil moisture storage and weed control. The Objective of this study was to evaluate a number of tillage implements used at different times and in combination with one another.

Procedure

Following the harvesting of the spring wheat crop in 1976, the initial fall tillage treatments were completed during August, with the second fall tillage being done in October. Following the spring tillage treatments, each of the tillage plots were split in half and tilled at right angles to the initial tillage with either a tandem disk or sweeps. On April 26 the plot area was seeded with Olaf wheat at a rate of 75 pounds per acre.

Soil tests for N, P, and K were very high so no fertilizer was applied. The plot area was sprayed with 2.4.D amine (½-16/A) to control broadleaf weeds.

The wheat was swathed on July 18 and combined on July 27 with a self propelled combine. Yield values are averages of four subsamples.

Results and Discussion

Table 1 shows the yields obtained from the tillage treatments. The initially tilled plots yields were significantly greater than the no tillage plots. However, there was no significant difference between the various types of tillage. The tandem disk tillage treatment across the other tillage yielded significantly more than when the sweep tillage was used.

Weed growth prior the herbicide treatment was visually greater on the no tillage treatment, which may account for some of the yield reduction.

These results show that some type of fall tillage is essential, unless the ground is to be moldboard plowed in the spring, for good spring wheat yields under continuous wheat production.

Table 1. Tillage Effects on Spring Wheat Yields on Land in Continuous Dryland Wheat Production.

Tillage Treatment	Disk	Sweeps	Mean
	Yield, Bu/A		
Plow, Spring	37.8	25.7	31.7
Plow, Fall	37.9	32.3	35.1
Disk, Fall	34.3	25.5	29.9
Chisel, Fall	32.5	31.5	32.0
Noble Blade, Fall	39.3	28.9	34.1
Chisel, Fall-Spring	37.6	28.5	33.0
Disc, Fall-Chisel, Spring	38.8	31.9	35.3
Noble, Fall-Chisel Spring	39.8	30.2	34.9
No Tillage	17.5	16.0	16.8
Mean	35.1	27.8	31.4

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-10

Spring Wheat Performance Under Irrigation

Don L. Keim and Joseph F. Giles

Materials and Methods

Twenty-five varieties were planted under dryland, one irrigation and two irrigations. Each plot was 5 feet long with two replications per irrigation treatment. The first sprinkler irrigation took place on June 8 at about boot stage of development with a total of 2.0 inches of water. No second irrigation took place because of lack of water on the farm.

Results and Discussion

No significant yield differences occurred between the dryland and irrigation. Yield was slightly higher for the nonirrigated treatment.

Varietal difference occurred within and among irrigation treatments. Yield had a significant relationship with plant height (r = 0.72**) indicating that the taller varieties in this study were more adapted than the shorter varities. Many of the short varieties are Mexican semidwarfs that were selected for high yield under irrigated conditions.

(See back of page for summary Table 1)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Table 1. 1977 Spring Wheat Variety Performance Under Irrigation and Dryland.

Variety	Grain Yield Dryland[1]	Grain Yield Irrigation[2]	Average	Test Weight	Heading Date[3]	Height
	-----Bushels/A-----			lbs/bu		inches
SD 2254	37.3	36.5	36.8	60	18	34
Butte	31.3	37.5	35.4	61	13	32
SD 2016	34.3	35.3	34.9	59	20	32
Olaf	34.8	34.5	34.5	61	17	32
SD 2273	33.3	33.6	33.5	59	15	32
Eureca (SD 2185)	36.2	31.3	32.9	59	18	36
Kitt	35.9	30.9	32.5	60	18	30
SD 2295	29.4	33.6	32.3	60	16	34
Bounty 309	31.0	31.8	31.5	60	18	24
Era	37.0	28.8	31.5	59	20	28
WS 1809	34.8	28.5	30.5	58	12	22
WS 25	32.1	28.4	39.5	60	18	29
SD 2014	29.6	28.8	29.0	58	16	33
Prodax	35.5	25.9	29.0	60	19	28
Waldron	31.2	27.0	28.4	60	16	32
Chris	30.5	26.9	28.1	59	16	33
Protor	28.3	27.4	27.6	60	14	22
Inia 66	31.6	24.0	26.5	58	15	23
Profit 75	26.3	26.6	26.5	59	16	24
Anza	32.0	21.9	25.3	58	16	24
Yecora 70	27.6	24.0	25.1	59	19	24
Siete Cerros 'S'	27.1	24.1	25.1	58	18	27
Ciano 67	27.5	21.1	23.3	57	18	23
W-433	23.1	20.4	21.3	58	12	22
Cajeme 71	23.9	15.6	18.4	58	18	22
Average	31.3	28.1	29.3			
C.V.(%)	13	18	17			
LSD (.05)	8.5	7.4	5.6			

1/2 reps
2/4reps, Irrigated on June 8, Amount 2 inches.
3/Days from June 1

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station

South Dakota State University

PR 78-11

1977 Soybean Performance Trial

J. J. Bonnemann and G. W. Erion

Soybean trials have been conducted at the Research Center for several years and have shown potential as a profitable crop if properly managed and irrigation water is available. Distance to market facilities is presently also a problem.

The plot was seeded on May 25 and harvested on October 20. The trial suffered from variable stands as the gophers nipped off the plants as the cotyledons spread out after germination. Variablility was high because of this problem. The trial was seeded in 30-inch row spacings and included four replications. A recommended herbicide was banded over the row at seeding to aid in weed control. The trial was cultivated twice, the last just prior to the only irrigation of 3 inches on July 8. The flow in the river source was not adequate for any more irrigations.

The cooler temperatures of late summer delayed maturation and some soybeans were still not mature at harvest. The absence of a killing frost until early October benefitted the trial as it permitted later maturing material to produce good yields of fair quality soybeans.

Several of the commercial varieties have good yield records and merit consideration. Amoung the standard varieties two Group II soybeans, Corsoy and Wells,have the best yield records. Harcor, a group II, has also done well but testing is for a shorter period of time.

(Summary table on the back of this sheet)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Table 1. 1977 Soybean Performance Trial, Redfield, SD

Identification of Entries[1]			Maturity Date	Plant Height	Poten. Shatter Loss[4]	100 Seed Wgt.	Average yield in Bu/acre					
							1974	1975	1976	1977	1974-75	1976-77
Standard Varieties:			(mo.-day)	(inches)		(grams)						
Entry	Maturity Group[2]	Days to Mature[3]										
Evans	0	- 1	9-16	25	1	10.9	28.8	31.0	22.4	32.4	28.6	27.4
Swift	0	0	9.17	25	1	11.2	25.3	25.2	15.6	42.1	27.2	29.1
M 68-49	0	+ 2	9-19	26	1	13.1				32.2		
Harlon	I	+ 3	9-20	28	1	11.8		25.8	16.9	35.5		26.2
Grande	0	+ 4	9-21	21	1	13.9			18.5	20.8		19.6
Steele	I	+ 4	9-21	29	1	11.8	28.3	28.6	18.8	37.9	28.4	28.3
Hodgson	I	+ 7	9-24	27	1	12.7	28.0	28.0	22.5	34.0	28.1	28.2
Corsoy	II	+ 8	9-25	27	1	11.7	26.5	31.9	26.1	37.8	30.6	31.9
Harcor	II	+10	9-27	31	1	11.7		31.6	23.0	42.2		32.6
Coles	I	+11	9-28	29	1	14.1			20.1	29.5		24.8
Hark	I	+12	9-29	30	1	12.4	23.5	29.4	23.2	36.0	28.0	29.6
Amsoy 71	II	+12	9-29	29	1	12.6				35.7		
Wells	II	+13	9-30	29	1	12.1	21.9	30.2	28.7	37.2	29.5	32.9
A73-25050	II	+14	10-1	30	1	13.4				45.8		
Marion	II	+18	10-5	31	1	17.4				42.0		
Proprietary Entries:												
Brand	Entry											
Northrup King	Multivar 41 (B)		9-22	24	1	12.4				34.2		
Northrup King	S 1244		9-23	27	1	13.5		29.8	20.2	44.9		32.5
Peterson-Pioneer	3100(B)		9-25	28	1	12.3		30.8	20.4	37.4		28.9
Northrup King	S 1346		9-26	29	1	14.4		31.8	18.7	42.4		30.5
Pfizer-Clemens	CX 114		9-26	30	1	11.5			23.0	42.9		32.9
Pfizer-Clemens	CX 175		9-27	30	1	12.5				39.9		
Pfizer-Clemens	2ER-75		9-30	28	1	11.8				46.2		
Pfizer-Clemens	CX 215		10-2	27	1	13.0				38.6		
Pfizer-Clemens	E94-7		10-3	32	1	15.4				35.5		
Pfizer-Clemens	9L-75		10-4	30	1	12.8				23.1		
Pfizer-Clemens	CB 347 (B)		10-4	28	1	13.5				29.4		
Pfizer-Clemens	CX 285		10-5	29	1	14.7				33.9		
Pfizer-Clemens	2L-76		10-5	31	1	13.3				43.7		
Pfizer-Clemens	CX290		10-6	33	1	13.0				43.4		
Pfizer-Clemens	CX 350		10-7	32	1	14.2				28.7		

Mean, B/A	39.6
CV- -%	17.6
LSD (.05)	11.2

1- Listed in order of Maturity in 1977

2- Maturity group from USDA classification:) - early, I-early to mid-season, II-mid-season to late at Redfield.

3- Expected relative maturity at this site compared to Swift when not exposed to a killing frost.

4- Shattering potential: 1=no loss; 2=up to 5%; 3=5-10%; 4=10-20% 5=20% or more.

(B) = blend

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-12

ALFALFA YIELDS UNDER IRRIGATION

Joseph F. Giles and Robert A. Sanders

Two objective of this experiment was to obtain information on the relative yielding capacity of three newer varieties of alfalfa during five years under irrigation.

Procedure

The alfalfa was seeded in May, 1973. The varieties were not fertilized, as yearly soil tests for phosphorus and potassium were high. Water was supplied as needed throughout the growing season with an overhead sprinkler system. However during the last two years of the study, irrigation water became limited and caused irrigation to cease in mid July each year. As a result only one-half the normal amount of water was applied during these two years.

The alfalfa was harvested at approximately one-tenth bloom with a self-propelled swather, forage weighed and moisture sample taken. Yields were converted to tons of 12% moisture hay per acre.

Results and Discussion

Yields of the three alfalfa varieties for the five years are illustrated in the table. No significant yield differences occurred in the total production of the three varieties. A lack of irrgation water following the first cutting in the second, fourth and fifth year limited the total yields. Because of the lack of irrigation water during the last two years, a stand reduction began to occur along with an increase in weed competition.

Iroquois and Saranac varieties were significantly higher yielding in the second year of production. These varieties were selected because of their regrowth characteristics. After each cutting these two varieties observed to grow back at a more rapid rate than did Vernal. This increased regrowth could be observed for about three weeks after cutting.

Table 1. Yields of Three Varieties of Alfalfa Over Five Years Under Irrigation.

	Years					
Variety	1973*	1974	1975	1976	1977*	Total
	Yields, Tons/A					
Vernal	3.36	5.36	7.20	5.59	3.84	25.35
Iroquois	3.82	6.62	7.25	5.57	3.87	27.13
Saranac	3.59	6.53	7.55	5.78	3.83	27.28
LSD .05	NS	.30	NS	NS	NS	NS

* Only two cuttings taken.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-13

GRASS -- ALFALFA VARIETY TEST

J. G. Ross, G. L. Holborn 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 April 14, 1977, 100 lbs. of nitrogen (N) as ammonium nitrate was applied only to the grass plots. The first cutting was made June 2 after which 50 lbs. of N was again applied. The second cut was made on July 13. Irrigations were made as follows: 2.00 inches May 20, 4.00 inches - June 24, because of unavailability no water was applied after the second 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

The yields obtained from the two cuttings and averages of these are shown in Table 1. No difference was found between the grass with alfalfa and grass alone. The total yield was almost the same in each instance indicating that the grass alone yielded as much as with alfalfa. This may have been due to cool temperature which was below the optimum for alfalfa as well as the optimum nitrogen supplied to the grass. In 1976 the alfalfa yielded significantly more than the grass on the third cutting and also for the total. The third cutting was not made in the late fall of 1977 because of the early snow. A cutting before growth in the spring would probably indicate an advantage for the alfalfa plots as noted in 1976 because of the deeper root system of the alfafla. The deeper rooted grasses such as intermediate wheatgrass would also probably be shown to advantage.

Differences between the different species of grasses were found. In general Nordstern orchardgrass yielded less than the other species because of its poor first harvest resulting from winter injury. Smooth bromegrass yielded slightly more than the other species, followed by reed canarygrass, intermediate wheatgrass and creeping foxtail.

The 1977 results contrary to those in 1975 and 1977 do not show an advantage in regrowth at second cut and total yield to SD 5 bromegrass over Lincoln bromegrass. The reason for this is probably environmental since the June and early July temperature was considerably cooler than the previous two years. SD 5 was selected for regrowth under high summer temperatures but under cooler temperatures yields about the sames as unselected material.

SD 101 creeping foxtail yielded more than Garrison at each of the cutting dates as well as total yields. This variety has been selected for seed retention and has not lost forage yield potential in comparison with Garrison which has extreme seed shattering.

Oahe and Slate have yielded about the same in the various comparisons.

From this year's results at Redfield it appears that the environment did not allow the expected regrowth advantage of SD 5 bromegrass noted other years, to be expressed. The bromegrass varieties, however, yielded more forage than the other species including reed canarygrass and orchardgrass.

(Continued, Table 1 on back of this sheet)

Table 1. Redfield Irrigation Grass-legume

Experiment, 1977. Four replicates, rows seeded 6" apart.

	Grass-alfalfa			Grass alone		
	6/2 cutting	7/13 cutting	Total	6/2 cutting	7/13 cutting	Total
			Tons/acre*			
Smooth bromegrass						
SD 5	2.00 ab	1.54 abc	3.54 ab	2.17 a	1.50 abc	3.67 a
Lincoln	1.01 ab	1.62 ab	3.63 ab	2.13 ab	1.60 ab	3.73 a
Creeping foxtail						
SD 101	2.03 a	1.45 bc	3.48 abc	2.10 ab	1.33 c	3.43 ab
Garrison	1.84 ab	1.34 c	3.18 cd	1.83 bc	1.28 c	3.11 bc
Intermediate wheatgrass						
Oahe	2.00 ab	1.42 c	3.42 abc	2.04 ab	1.30 c	3.34 abc
Slate	1.90 ab	1.39 c	3.29 bc	2.06 ab	1.35 bc	3.41 ab
Reed canarygrass						
Commercial	1.80 bc	1.66 a	3.46 abc	1.84 bc	1.78 a	3.62 a
Orchardgrass						
Nordstern	1.61 c	1.45 bc	3.06 d	1.57 c	1.33 c	2.90 c
Means**	1.90	1.48	3.38	1.97	1.43	3.40

*Yields followed by different letters differ significantly.

**Comparable means for grass-alfalfa and grass alone did not differ significantly.

1000 copies printed of each report at estimated cost of 2¢
per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-14

CORN PRODUCTION WITH LIMITED WATER SUPPLY

Darrell W. DeBoer and Albert C. Dittman

Department of Agricultural Engineering

Water and fertility management practices were originally associated with the plots on field 2A; however, the experimental goals were not completed as planned because of inadequate water in the James River. The main findings are associated with irrigated corn yields under less than optimum soil water conditions.

Four corn varieties were used in the experiment; two of approximately 95 day maturity and two of approximately 105 day maturity. The corn was planted on May 5 under conditions which caused some uneven plant emergence. Weeds and insects were not serious problems. Table 1 summarizes the corn yield results. The longer maturing varieties had greater yields than the shorter maturing varities.

Water inputs were 10.0 inches of precipitation from April 1 through mid September, a 3.0 inch irrigation on July 6 and 7 and a 2.5 inch irrigation on August 11 for a total of 15.5 inches during the growing season. From other work it was estimated that it took from 20 to 22 inches of water to reach the yield potential for corn in South Dakota during 1977. The plots received 3.5 inches of precipitation in June but only a total of 3.3 inches of precipitation and irrigation water in July. The 3.0 inch irrigation occured near the critical time of corn tassel. Soil samples indicated that the top two feet of the soil profile was near the wilting point on July 6, however there was 1.8 inches of available water at the 3-4 foot depth. This illustrates the value of a deep soil profile where water can be stored for future crop use.

Table 1. Corn Yields

Corn Variety	Maturity	Harvest Pop. Plants/A	Yield* Bu/A
Pioneer 3709		23,100	137
Trojan TX 102	102 day	22,900	135
Acco MC 1151		20,100	119
Jacques JX62		20,500	102**

* Machine harvested
**Some barley infestation from previous activity.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-15

EFFECT OF TILLAGE ON YIELD OF FURROW IRRIGATED CORN

Joseph F. Giles and Robert A. Sanders

This experiment was to compare the yield of corn on land that was fall tilled to that on spring tilled land. Also, each conventional tillage method was compared with a bedding system used to facilitate furrow irrigation prior to crop emergence and throughout the growing season. This system combines the bed shaping, furrow forming and seed planting into one operation.

Procedure

The land in 1976 was in corn which was harvested for grain. The tillage treatments were initiated on the plots during that year. Following stalk chopping, half of the bedded area was tilled with a bed splitter. During this operation, the existing ridge was divided filling in the old furrow and covering most of the crop residue. The soil surface was then ridged and uneven. The conventional tilled area was tandem disked prior to the half of the area being plowed with a moldboard plow. On April 26 both the plowed area and the disked half were tandem disked. The remainder of the bedded area was split on the same day. The fall plowed area was dug with the field cultivator on May 11 to improve the seed bed. Trojan TSX94 was planted on May 12 in all plots at a population of 24,800 seeds per acre in 36 inch rows. The disked and fall plowed plots were planted with a conventional planter, while the split area was planted with the bedding system. Counter insecticide (713 lbs/A) was banded over the row at planting time. Following planting, Bladex (2 lbs/A) and Lasso (2 qt/A) were broadcast applied in 20 gallons per acre of water. All plots were cultivated on June 17. On June 28 the conventional tilled areas were cultivated a second time. Three inches of water were applied to the entire field on July 6. Corn yields were hand harvested on September 13.

Results and Discussion

Yield, moisture content of ear corn, and plant population for each of the tillage treatments are given in Table 1. Yields given are based on 15% moisture content. The yields reflect a growth stress caused by the lack of moisture. Due to a shortage of irrigation water during July and August, a majority of the ears were not completely pollinated nor filled the intire cob length. There was a difference in the yield of the four tillage treatments. Although the seeding rate was the same for both planting units, the harvest population for the conventional planter plots was significantly higher. This may be due to the different cultivation used, since the bedded cultivation moves a large amount of soil and has a tendency to cover up small plants. The difference in moisture content between the treatment is reflective of the population difference. With a higher population under the moisture stressing conditions due to a lack of irrigation water, the decrease in corn moisture was delayed.

Table 1. Effect of Tillage on Yield, Moisture Content and Population of Corn.

Tillage Treatment	Yield Bu/A	Moisture %	Population Plants/A
Fall Split-Bed	96.4	33.0	19,511
Spring Split-Bed	92.7	33.2	20,782
Fall Plow-conventional	83.1	36.0	24,775
Spring Disk-conventional	99.0	36.5	25,410
LSD .05	NS	2.4	1726
Coeffecient of variation	11.6%	4.5%	5.0%

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-16

CONTROL OF SUNFLOWER HEAD MOTH USING 0.45 POUNDS LANNATE

B. H. Kantack, Extension Entomologist

An aerial application of Lannate at 0.45 pounds AI per acre was applied to two varieties of sunflowers at the Redfield Experiment Station, Redfield, South Dakota. The varieties included Interstate 894 and Peredovik as indicated in Table 1. The spray application was applied when less that five percent of the plants were in bloom with the treatments applied both to the irrigated and dryland portions of the field for each variety. Harvest samples taken from five randomly selected heads in each of three locations in each of the plots indicated very little head moth control and very little difference in yield between untreated and treated portions of the fields.

The conclusion is that 0.45 pounds AI Lannate is not efficacious enough to show any differences on this experimental plot. This was also true of the 0.45 pounds actual per acre applied to sunflowers at the Beresford, South Dakota station using ground equipment where even two applications at the lower rate did not give sufficient head moth control. Thus it is concluded that the 0.45 dosage level is too low for further evaluations. Future evaluations should involve the one pound AI per acre rate, comparing one application with two applications.

Table 1. Control of Sunflower Head Moth Using 0.45 lbs. Lannate.

Redfield, South Dakota

Variety	Irrigated		Dryland	
	Yield lbs./sample Treated	Untreated	Yield lbs./sample Treated	Untreated
Interstate 894	.91	.95	.81	.91
	.76	.89	.85	.68
	.76	1.02	.87	.57
	.79	.76	.74	.97
Peredovik	.62	.31	.96	.66
	.52	.46	.75	.56
	.91	.42	.80	.86
	.79	.62	.99	.92

Weights based on five heads randomly selected in each of three locations in the plots. All applications aerially applied in two gallons of water.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-17

RECLAMATION AND IMPROVEMENT OF GLOSSIC UDIC NATRIBORALLS (ALKALI CLAYPAN SOILS)

L. O. Fine and P. D. Weeldreyer

The field experiments concerned with the modification and improvement of claypan soils (primarily Aberdeen series) of the Lake Dakota basin were terminated at the end of the 1977 growing season. The site was located 5 miles northwest of the Center and was leased from Mr. Glenn Mager for the past 8 years.

General Operations

The main sump drain pump was put in operation on April 12; free water surface at that time was 5 feet below ground level. The pump ran intermittently and some tile flowage continued (except short periods around June 8 and June 30) until cessation during the period July 29-August 1. During the approximately 12 weeks of operation, 9,543 cu ft of water were removed through the tile system. Water quality data are presented below.

On May 3, 161 lbs of nitrogen and 21 lbs of P_2O_5 (in urea and diammonium phosphate) were applied per acre by truck bulk spreader. A week later the corn ridges were split, the field tandem disced, and planted with the tri-bed planter used in 1976. Sokota SS51 hydrid was used, planting 24,800 per acre; planting was completed May 10. Dyfonate 20 F at 5# per acre in bands over the row was used for soil insect control. On May 12 a full coverage spray consisting of 2 lbs (acid equivalent) Lasso and 2 lbs Bladex per acre was applied, and on June 8, 0.4 pint Banvel and 0.4 pint 2,4-D amine per acre were applied as a cover spray. Resulting weed control was excellent and carried well into the summer. A rain of 0.96 inches on May 21 and May 22 was sufficient for excellent emergence. The non-irrigated portion of the experiment was thinned by hand chopping to a stand of approximately 13,000 plants per acre on June 2-3. A population of approximately 23,000 plants per acre was achieved on the irrigated plots.

On June 20 all plots were cultivated, the only tillage used. On June 30, measurements made in replication II showed that plants on the deep-plowed portion average 1 ft taller than those on shallow-plowed areas.

Irrigation and Rainfall

Because of the extremely limited water supply in the James River, areas in each plot actually irrigated were reduced by 40-50%, resulting in only 14-16 rows being irrigated. This provided enough area so that a yield sample would be representative and of sufficient size. All plots were irrigated on July 12-14; an average application of 6.25 inches was made. A second irrigation, averaging 4.4 inches, was made on July 26-27. Total water applied was 10.65 inches.

Rainfall recorded in April through August totaled 9.63 inches; none occurred in September prior to harvest of plots, but 4.39 inches occurred after yield sampling. Of the total rainfall recorded, 1.29 inches fell in small showers of less than 0.20, and cannot be considered as effective precipitation entering the root zone. Thus about 8.34 inches of rain was effective.

Stored soil water at the beginning of the growing season within the 4 ft rooting depth of corn was approximately 9.75 inches. The third and fourth foot layers of soil were near field capacity at planting. Soil water at the time of taking field core soil samples in early October was estimated to be at least as much as that in the 4 ft profile at planting time, thus, net depletion of soil profile water during the growing season was essentially zero.

Sample areas of plots were hand-harvested for yield data on Sept. 19-20.

Yields

Although mature (except that on spots of Exline soil), the corn was still high in moisture (24-32%) at the time of plot harvest. Yield samples were taken from 4 adjacent rows of sufficient lenght to give a harvested area of 0.005 A.

The yield data for all soil amendment plots were bulked and averaged. The values given are for bushels per acre of corn at 15% moisture.

Deep-Plowed		Shallow-Plowed	
Irrigated	Non-irrig.	Irrigated	Non-Irrig.
128.9	55.8	116.9	43.4

Although the % yield increase for deep-plowed as compared to shallow or conventional tillage (irrigated) is only 10.3 in 1977, as compared with 19.1 in 1976, the absolute yield increased by 3.3 and 14.7 bushels (deep and shallow, respectively) over the 1976 yields. The variability among plots given chemical amendments (sulfur, gypsum and fly ash) is so high that conclusive statements concerning their effects cannot be made until statistical treatment of the data is completed.

(Continued, over)

The relative yield increase for deep-plowing on the non-irrigated land continued at above 20%, as in 1975 and 1976. Yield increases with various crops on deep-plowed land for the period of record have been 12.6% or greater except one instance, non-irrigated corn in 1974. The over-all mean increase has been 21% for wheat, alfalfa, and corn. There was no irrigated wheat in the averages used, but alfalfa and corn data include both irrigated and non-irrigated yields.

Infiltration Studies

Water intake measurements were made in October of 1976 and May of 1977. Soil water content was high both times. October non-irrigated soil water values ranged from 19-31% in the top 4 feet, whereas irrigated areas ranged from 21.5 to 31.5% water content by weight. In May, 1977, at the time the spring studies were made, the soil water values were 26.5, 27.5, 28.3 and 33.1% respectively in the first, second, third and fourth layers. The 1976 data indicated infiltration rates generally from 0.72 to 1.45 inches per hour. Because of the high rates observed, we repeated the work in the spring of 1977, with the following condensed results. (Eight paired plots were measured, with 2 double-ring infiltrometers on each plot).

Mean terminal intake rates, inches per hour	
All shallow-plowed plots	All deep-plowed plots
0.315	0.395
% increase-----25.3	

The over-all average rates (for the total periods of measurement) were higher by 10 to almost 50%, because the initial rate for the first 6-10 hours was somewhat higher than the terminal. From 6.3 to 26.9 inchesof water infiltrated in the various plots in the 26-28.9 hour measurement periods.

A graph showing the results of 4-hour study conducted in the fall of 1973, and the results of the first 20 hours of our spring, 1977 study is shown ás figure 1, at the end of this report. The data presented in the figure are cumulative intake values for various periods of time. Intake results are given in millimeters with the corresponding values in inches given in parentheses.

Water Quality

Irrigation: The James River was at a low flow stage and was moderately saline, rising to an electrical conductivity value of 1390 micromhos/cm by July 27. The sodium adsorption ratio was 5.27.

Drainage waters: Main sump drainage water quality followed the same pattern as in previous years, being initially very good water and gradually becoming more saline as increasing evapotranspiration demands with the progress of the growing season extracted ever-greater portions of the water moving through the root zone. For example, an average of 280 ft 3/day was pumped in mid-April, compared with 16.5 ft 3/day in late May. The salinity increased from 950 mecromhos/cm to2670 during that period.

The pumped volumes and approximate accompanying chemical parameters are presented in table 1.

Total drainage intercepted and removed by the tile line was equivalent to 0.243 inches of water from the 10.8 acres (cropped) of the site, or approximately 0.98 inches from the area actually irrigated this year.

Plans

The experiment (field phases) has been terminated. Upon completion of laboratory work and data analysis, a detailed report will be made.

Table 1. Tile Drainage Water Observations, 1977

Date	Water pumped since previous reading, cu. ft.	EC, micro-mhos/cm	Sodium Adsorption Ratio
April 12	(pump installed)	949	1.72
April 28	4466	1590	3.29
May 3	710	1830	4.47
May 4	304	1890	3.93
May 10	601	1980	4.21
May 17	433	2000	4.60
May 24	427	2170	4.82
June 3	165	2670	5.24
June 20	646	2780	4.80
June 27	476	3390	6.42
June 30	24	3880	6.24
July 14	104	1170	1.51
July 19	842	2400	4.13
August 1	345	2600	4.14
Season Total 9543			

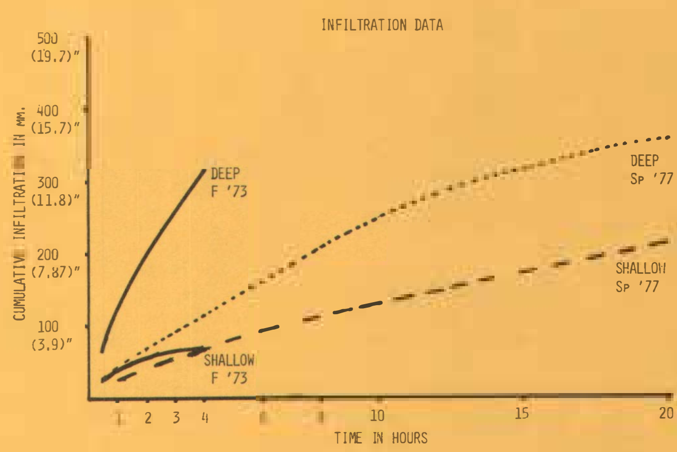

Figure 1. Infiltration data from 1973 and 1977 at claypan soil site near Redfield, S.D. Data presented are cumulative intake amounts.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-18

1977 Performance Trials of Winter Small Grains, Corn and Grain Sorghum

J. J. Bonnemann

Performance trials with winter small grains, corn and grain sorghum were seeded at the Research Center for 1977 harvest. Lack of supplemental water reduced row-crop yields somewhat but rainfall and cooler temperatures in late summer alleviated some of the shortages.

Germination of the winter grain trials was good and stands quite uniform. The adapted varieties survived the winter quite well but the semi-dwarf stands were reduced to 20% or less. Most yields were good to excellent. The rye yields were good for all varieties except Cougar. The yield was probably reduced for several reasons, amoung them being poorer germination of the seed and some winterkill.

All small grain yields are averages of three replications. The grain was seeded on September 10, 1976 and harvested on July 8, 1977. The trials were seeded as 6 row plots, 10-inch spacings between the rows, 14 feet long. Approximately 60 pounds per acre of 18-46-0 fertilizer was applied down the tube with the seed.

Performance trials of hybrid corn were seeded on both dryland and irrigated areas of the Center. Both trials were seeded on May 25. Custom built 31-cell cone seeders mounted above commercially built flex-planter units with double-disc openers were used for seeding all row crops. A grain sorghum trial was seeded on the irrigated portion of the Center on the same date using the same equipment and row-spacing, 36 inches.

Soil moisture was good for germination of both the irrigated and dryland corn trials. The grain sorghum seedbed was somewhat dry with small clods and germination was not as rapid or uniform. Recommended insecticides and herbicides were banded over the row and time of seeding. The fertilizer was applied as anhydrous ammonia on July 6, just prior to irrigating. The irrigated trial received 160 lbs per acre and the dryland trial 60lbs per acre. Soil samples taken at seeding indicated supplies of P and K were available in the soil in ample amounts. Because of limited flow in the river source of water only one irrigation, 3 inches, was applied on July 8. The trials were cultivated twice, the last time just prior to irrigating.

Because of limited soil moisture and the possibility of reduced river flow and limited irrigation water, the seeding rates were lowered for all crops. Instead of the 18,000 and 22,00 plants per acre usually seeded on the irrigated trials the seeding rates were reduced to 16,000 and 20,000 plants per acre. The dryland trial rate was to be 10,000. Final counts averaged 15,200 and 17,700 for the irrigated trial and 9,600 plants per acre for the dryland trial. The irrigated grain sorghum trial was seeded at the rate of 125,000 kernels per acre. The final stand was about half of the seeded rate because of seedbed and germination problems. The reduction of all stands in the irrigated trials was no doubt beneficial because only one irrigation was possible. No measure of the possible benefit or gain was made. Even though two stands were used in the irrigated trial no statistical difference was found for either the high or low populations.

The grain sorghum trial was harvested on October 3. The yields were less than in 1976 but good considering the season and irrigation water available. Temperatures of late summer were below normal, as over much of the state, and delayed maturation. The absence of a killing frost until early October permitted the crops to reach maturity and produce quality grain despite the cooler conditions. Yields ranged from 5070 down to 2645 pounds per acre. Yields reported are the average of three replications.

The corn trials produced good yields for the weather conditions and irrigation water available in 1977. The mean yield of the irrigated trial was 107 B/A and the dryland mean was 72 B/A. The mean percent moisture was 21.4 for the irrigated trials and 19.9 for the dryland trials. The ranker growth and heavier ears of the irrigated corn may have contributed to more stalk lodging amoung the entries in the irrigated trial.

The corn yields are listed in descending order by performance score. This is a measure of the three factors most important when harvesting corn and rates the entries on a weighted scale; 50% for dry, sound corn and 15% for upright, harvestable corn that will go through equipment. The results are presented for 1977 only. Additional data on the trials will be found in the Performance Trial publications for all these crops available from the SDSU Agricultural Experiment Station or your County Extension Office.

(Continued)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Table 1. 1977 Standard Variety Winter Wheat Trial Yields and Available Averages, B/A

	Redfield					
	Bushels per acre				T. W.	
Variety	1974	1976	1977	3 year	1977	3 year
Nebred	13.4	61.9	50.7	42.0	61	59
Lancer	20.7	57.0	48.9	42.2	62	60
Scout 66	37.7	61.5	51.8	50.3	61	60
Winoka	19.3	50.5	47.0	38.9	63	60
Bronce	17.3	56.4	28.9	34.2	61	58
Scoutland			40.7		62	
Eagle	30.5	63.5	44.9	46.3	60	59
Centurk	23.9	68.7	43.0	45.2	60	58
TAM 101			18.7		56	
Baca		60.4	53.9		62	
HiPlains	22.3	54.7	44.0	40.3	62	60
Buckskin	31.3	60.9	57.5	49.9	62	62
Homestead	35.4	57.6	45.2	46.0	61	59
Sage	31.0	62.7	56.6	50.1	61	59
Trison			46.1		62	
Gent	32.7	62.3	53.5	49.5	62	60
Lancota		58.9	42.8		61	
Roughrider			39.3		61	
Lindon		59.7	16.1		59	
Vona		59.4	10.0		55	
Agate		65.2	55.0		62	
Rall	30.8	63.4	55.8	50.0	61	59
Froid						
Mean, B/A			44.5			
CV - %			17.4			
LSD (.05)			12.6			

1975 lost to winterkill

Table 2. 1977 Standard Variety Rye Trial Yields and Available Averages, B/A, South Dakota

	Redfield							
	Bushels per acre				Test weight, lb/bu			
Variety	1974	1976	1977	3 yr	1974	1976	1977	3yr
Cougar	23.5	58.5	39.7	40.6	51	57	56	55
Puma	23.6	43.4	63.4	43.4	54	57	57	56
Pymin	32.2	48.8	58.7	46.5	53	57	57	56
SD Sel.75		46.8	73.4			58	58	
Mean, BA/			58.8					
CV - %			13.8					
LSD (.05)			12.1					

Table 3. Corn Performance Trial, Area C1 (Irrigated), Redfield, 1977

Brand & Variety	Type and Cross	Yield B/A	% Root Lodged	% Stalk Lodged	% Ears Dropped	% Moisture	Performance Score Rating
Sokota TS-67	2x	129.8	0.0	3.4	0.0	24.0	1
Pioneer 3710	2x	121.5	0.0	1.7	0.0	21.4	2
Asgrow RX 40	2x	118.5	0.0	2.4	0.0	18.1	3
Acco UX 3301A	2x	123.9	0.0	5.6	0.0	24.8	4
Sokota SS-67	M2x	121.8	0.0	5.0	0.0	23.2	5
Northrup-King PX46	2x	116.5	0.0	2.7	0.0	21.7	6
Trojan TXS 102	2x	119.2	0.0	5.9	0.0	23.5	7
SDAES EX 107	2x	117.2	0.0	6.2	0.0	21.5	8
Pioneer 3780	2x	115.1	0.0	1.3	0.0	21.1	9
Pride 4488	2x	115.8	0.0	0.9	0.0	22.2	10
P-A-G EX 231070	2x	115.3	0.0	3.1	0.0	21.9	11
Pioneer	M2x	115.2	0.0	0.9	0.0	23.0	12
McCurdy MSX 44A	2x	116.7	0.0	4.0	0.0	23.5	13
McCurdy MSP 111	3x	112.6	0.0	2.2	0.0	20.5	14
Sokota TS-44	2x	113.2	0.0	6.1	0.0	20.2	15
Cargill 838	M2x	113.9	0.0	6.6	0.0	21.0	16
P-A-G SX 177	2x	111.6	0.0	2.8	0.0	20.1	17
Sokota SS-51	M2x	110.3	0.0	1.3	0.0	19.3	18
Asgrow RX 2222	2x	111.6	0.0	3.9	0.0	20.0	19
Cenex 2155	2x	115.8	0.0	4.2	0.0	24.4	20
SDAES EX 105	2x	113.2	4.7	11.2	0.0	19.7	21
Funks G-4444A	2x	112.7	0.0	2.5	0.0	22.7	22
Curry SC-142	2x	113.6	0.0	3.5	0.0	23.5	23
Pride 3315	2x	109.1	0.0	1.4	0.0	19.6	24
Acco UC 3301	2x	115.4	0.0	7.1	0.0	24.3	25
Master Farmer MF 94	2x	110.9	0.0	1.9	0.0	21.5	26
SDAES Check-3	2x	109.0	0.0	2.2	0.0	19.8	27
Trojan 105A	2x	110.8	0.0	3.5	0.0	21.4	28
Pioneer 3975A	M2x	106.9	0.0	1.0	0.0	18.3	29
Payco Sx 775	2x	110.8	0.0	3.1	0.0	21.7	30
Northrup-King PX 26	2x	110.4	0.0	2.9	0.0	21.8	31
O'S Gold SX1100	2x	109.8	0.0	3.0	0.0	21.9	32
Payco SX 680	2x	107.7	0.0	1.4	0.0	20.5	33
Northrup-King PX 20	2x	105.1	0.0	2.7	0.0	17.6	34
Funks G-4321	2x	108.9	0.0	3.1	0.0	21.8	35
Disco SX 98	2x	106.0	0.0	0.9	0.0	20.1	36
Funks G-4272	3x	108.5	0.0	6.3	0.0	20.8	37
McCurdy MSX 46	2x	109.3	0.0	2.8	0.0	23.7	38
Top Farm SX 106	2x	106.4	0.0	2.4	0.0	21.0	39
Asgrow RX 2345	2x	107.3	0.0	9.8	0.0	20.4	40
O'S Gold SX1111	2x	107.7	0.0	0.9	0.0	23.9	41
SDAES Check-2	2x	108.8	0.0	5.1	0.0	23.7	42
Pride 4417	2x	105.2	0.0	1.7	0.0	21.2	43
Northrup-King PX 32	2x	105.0	0.0	4.5	0.0	21.3	44
Acco UC 2901	2x	105.7	0.0	9.7	0.0	21.2	45
Trojan TXS 94	2x	102.3	0.0	1.3	0.0	20.7	46
Master Farmer MF 92	3x	101.3	0.0	4.4	0.0	18.7	47
Funks G-4141	2x	100.2	0.0	3.1	0.0	18.1	48
Master Farmer MF 105	2x	106.0	0.0	6.8	0.0	22.9	49
McCurdy 76-14	2x	101.8	0.5	6.4	0.0	20.8	50
Sokota TS-64	2x	104.9	0.0	4.0	0.0	24.9	51
Cenex 2201	2x	102.7	0.0	1.4	0.0	24.9	52
Acco UX 3002	2x	102.3	0.0	5.4	0.0	23.3	53
Pride 2206	2x	95.7	0.0	2.3	0.0	17.6	54
Cargill 810	M2x	93.3	0.0	7.0	0.0	17.5	55
Master Farmer MF 100	3x	96.2	0.0	3.2	0.0	21.9	56
Cenex	3x	97.3	0.0	2.1	0.0	23.7	57
Curry SC-140	2x	93.5	0.0	5.3	0.0	19.8	58
Sokota TS-49	2x	93.8	0.0	3.3	0.0	21.3	59
Northrup-King PX 15	2x	89.7	0.0	3.8	0.0	18.2	60
P-A-G SX 210	2x	96.6	0.0	15.1	0.0	21.5	61
Cargill 863	M2x	93.2	0.0	9.0	0.0	21.1	62
Top Farm SX 110	2x	96.7	0.0	8.6	0.0	25.1	63
Northrup-King PX 585	3x	92.9	0.0	3.6	0.0	24.1	64
Funks G-4085	3x	85.7	0.0	2.9	0.0	17.7	65
MCurdy 76-10	2x	85.3	0.0	4.5	0.0	18.1	66
Means		107.4		4.1		21.4	

LSD (.05) 13.9 CV - 11.4%

Table 4. Corn Performance Trial, Area C1 (Dryland), Redfield, 1977

Brand & Variety	Type and Cross	Yield B/A	% Root Lodged	% Stalk Lodged	% Ears Dropped	% Moisture	Performance Score Rating
Cargill 838	M2x	89.7	0.0	3.1	0.0	20.1	1
Trojan TXS 102	2x	90.4	0.0	1.7	0.0	24.2	2
Funks G-4444A	2x	84.8	0.0	1.5	0.0	25.2	3
Payco SX 775	2x	82.3	0.0	0.7	0.0	22.1	4
Funks G4288	3x	82.4	0.0	0.0	0.0	22.6	5
Sokota SS-67	M2x	83.1	0.0	1.8	0.0	24.1	6
Northrup-King PX20	2x	78.6	0.0	0.8	0.0	17.7	7
Acco UC 1901	2x	79.0	0.0	1.6	0.0	19.5	8
SDAES EX 199	3x	78.4	0.0	0.8	0.0	20.2	9
Pride 2206	2x	76.7	0.0	0.0	0.0	17.7	10
Acco UC 2301	2x	78.4	0.0	0.0	0.0	21.0	11
Payco SX 680	2x	77.6	0.0	0.0	0.0	20.3	12
Pride 4488	2x	77.4	0.0	0.0	0.0	22.1	13
SDAES Check-4	2x	76.8	0.0	0.9	0.0	20.9	14
Sokota TS-44	2x	76.3	0.0	2.7	0.0	19.7	15
Pioneer 3975A	M2x	74.9	0.0	0.0	0.0	18.6	16
Top Farm SX 100	2x	75.8	0.0	0.8	0.0	20.9	17
Pride 4417	2x	75.1	0.0	0.8	0.0	20.1	18
Acco UC 1151	2x	74.3	0.0	0.8	0.0	18.9	19
Trojan TXS 94	2x	74.7	0.0	0.8	0.0	20.2	20
SDAES EX210	3x	72.9	0.0	0.8	0.0	17.3	21
Top Farm SX 97	2x	74.1	0.0	2.5	0.0	18.8	22
Cenex 3015	3x	74.2	0.0	1.6	0.0	19.7	23
Northrup-King PX 15	2x	73.0	0.0	0.8	0.0	18.9	24
Trojan TXS 99	2x	73.1	0.0	0.9	0.0	20.2	25
Asgrow RX 2222	2x	73.1	0.0	2.6	0.0	19.5	26
Pride 3315	2x	71.9	0.0	0.0	0.0	19.0	27
Curry SC-142	2x	76.6	0.0	2.8	0.0	25.5	28
Sokota TS-64	2x	76.3	0.0	2.9	0.0	26.4	29
Cenex 3121	3x	71.7	0.0	0.0	0.0	20.1	30
Pioneer 3965	3x	69.1	0.0	0.8	0.0	18.6	31
Funks G-4085	3x	68.4	0.0	3.4	0.0	17.3	32
SDAES EX 147	4x	67.2	0.0	0.8	0.0	18.7	33
Curry SC-140	2x	67.5	0.0	0.8	0.0	20.6	34
Pioneer 3710	2x	67.4	0.0	0.0	0.0	21.4	35
Cargill 810	M2x	64.6	0.0	0.0	0.0	17.1	36
SDAES Check-8	2x	65.9	0.0	4.1	0.0	17.9	37
Funks G-4195	3x	65.1	0.0	0.0	0.0	19.7	38
Asgrow RX 29	4x	62.6	0.0	2.6	0.0	17.5	39
Master Farmer MF 92	3x	63.1	0.0	3.4	0.0	19.1	40
Master Farmer MF 85	3x	59.7	0.0	0.9	0.0	18.0	41
Asgrow RX 32	2x	59.8	0.0	1.7	0.0	18.4	42
Cenex 2010	2x	59.3	0.0	0.9	0.0	18.5	43
Cenex 3120	3x	59.1	0.0	3.6	0.0	19.7	44
Sokota TS-46	2x	58.6	0.0	0.9	0.0	20.0	45
Funks G-4180	3x	57.3	0.0	2.6	0.0	19.2	46
Master Farmer MF 80	3x	55.2	0.0	0.8	0.0	17.6	47
SDAES EX 209	3x	54.6	0.0	0.8	0.0	17.1	48
	Means	71.8		1.3		19.9	
	LSD (.05)	10.8	CV - 12.1%				

Table. 5 1977 Grain Sorghum Performance Trial Area Cl (Irrigated), Redfield

Brand & Variety	Yield lb/A	Test Wt. lb/B	Height inches	% Moisture 9/14/77	Date Headed
Cenex 322	5070	55	44	30.5	8/1
Acco R 1014	4965	57	44	35.+	8/1
Northrup-King NK 1580	4930	60	45	33.0	7/29
Growers 1210A	4845	55	49	35.+	8/5
SDAES RS610A	4830	55	47	35.+	8/3
Acco R 920	4785	57	47	17.3	7/23
Acco X-0244	4755	60	43	35.+	7/30
Funks G-393	4685	57	48	33.1	7/30
DeKalb A-28+	4670	58	46	27.5	7/27
Disco 180	4535	56	43	28.5	7/29
Growers E110	4515	60	46	31.3	7/29
Funks G-404	4505	49	39	35.+	8/7
Warner W-561T	4505	58	52	35.+	8/5
Frontier 385A	4500	60	43	30.0	7/25
SDAES RS 506	4475	57	50	27.0	7/25
Cenex 300T	4470	48	52	35.+	8/4
Asgrow Dorado E	4400	57	46	28.7	7/31
Funks G-499 GBR	4350	52	42	35.+	8/7
Pioneer 8901	4260	55	44	24.9	7/24
Pride P808 GB	4255	55	52	35.+	8/6
Northrup-King NK 180	4210	55	45	31.4	8/1
Northrup-King NK X3208	4175	58	46	26.9	8/1
Warner W-601T	4155	55	52	35.+	8/8
Funks G-251	4105	60	40	28.3	7/24
Pride P508 GB	4085	58	42	27.5	7/27
Warner W-55	4050	52	42	29.8	8/1
Northrup-King NK X3207	3980	56	41	27.0	7/25
SDAES NB 505	3915	59	48	27.6	7/26
Growers 1180	3910	53	48	35.+	8/18
Acco GR 1018 (GBR)	3765	54	46	35.+	8/4
Pioneer 894	3725	59	39	18.2	7/22
SDAES SD 106	3590	57	42	22.3	7/20
Acco R 1019	3555	53	45	35.+	8/8
Cenex 221	3400	55	48	16.7	7/20
Warner W-501	3225	56	46	17.3	7/20
SDAES RS 455	2765	58	55	16.3	7/16
SDAES RS 104	2645	59	41	18.0	7/20
Mean	4200				
LSD(.05)	110		C.V. -% = 16.1		

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-19

EFFECT OF TILLAGE PRACTICES ON DISEASE DEVELOPMENT AND YIELD OF ERA SPRING WHEAT AT REDFIELD IN 1977

G. W. Buchenau, J. D. Smolik and C. Wirth

Introduction

Crop residue on the soil surface is known to decrease soil erosion by wind and water. It is also known that when wheat is grown in wheat residue certain foliage diseases such as Septoria and Pyrenophora leaf blights become more severe. This occurs because the overwintering propagules of these fungi are not decomposed by burial; hence they are alive and ready to attack the new crop when weather conditions become favorable for them.

The effect of crop residue on root and crown disease is not well understood in spite of the fact that these diseases are very common in South Dakota and probably affect plant vigor, tillering and subsequent yield to a much greater extent than is commonly believed.

The objectives of these experiments were: 1)to determine the influence of wheat residue on the soil surface on root disease of wheat and 2) to evaluate methods of root disease control. The experiments reported here are the third seasons results at the Redfield station; similar studies are underway at Highmore and Brookings.

Materials and Methods

The four tillage practices, chosen to leave a range of surface residue, were applied to 30-foot strips approximately 100 ft. long. The order of tillage was randomized within replications of a randomized complete block design of four replications. Chemical treatments were superimposed across the blocks, and were assigned at random to plots within the block. The resulting arrangement, with tillage treatments in strips going in one direction and chemical treatment superimposed across them in another direction is known as a split-block design.

Fall tillage in 1976 followed the harvest of Era spring wheat. Spring tillage was completed prior to planting on April 28, 1977. The plots were planted with a standard grain drill, in which the center openings were filled with winter wheat, thereby dividing the drill-strip into two portions, each 3.5 ft. wide across the 30 ft. tillage strip. One half of each plot was used for sampling of plants; the other half was harvested for yield.

Nitrogen was applied to designated plots after planting at 30 lb/A; Terraclor 10G and Benlate 50W were applied on 19 May (5 leaf stage) at rates of 100 lb/A and 4 lb/A respectively, the latter as a spray application.

Root disease, nematode levels, and soil moisture were monitored at planting, midseason, and after harvest. For these, sections of plant rows were excavated at a depth of approximately 8 inches, plant and soil placed in plastic bags and returned to the laboratory for subsequent analyses. Harvest was accomplished with a small plot combine on 28 July.

Results

Residue: Due to a very poor crop in 1976, residue levels were low and quite variable (Table 1). Noble blade tillage resulted in residue levels that were significantly above those of the other practices, but were only about 1/3 as high as in the previous year. Many plots contained substantial Kochia debris, which influenced the variability among plots. Significant differences in soil moisture were not obtained.

Yield: Fall disc treatment resulted in yields that were significantly below those of the other tillage treatments. On the average, fall tillage with chisel or Noble blade increased yield by about 10 bu/A (Table 2). A single application of Benlate also resulted in a yield increase of about 5 bu/A over that of the unsprayed check. Supplemental nitrogen did not result in increased yield.

Test Weight: Noble bladed plots produced significantly higher test weights than disc-disc plots (Table 3). Chisel-disc produced significantly higher test weights than disc-disc, but not significantly higher than chisel-chisel.

Crown Rot: Crown rot was visually estimated by attempting to assess the relative degree of rotting of tillers (Table 4). This procedure was not sufficiently precise for very reliable results, but the relative shallow planting resulted in short sub-crown internode development. Crown rot is usually scored on the basis on sub-crown internode lesions, but this was virtually impossible with these crowns. Crown rot index did not seem to be consistently associated with yield. Benlate resulted in the highest crown rot indices overall, especially in spring disc tillage. Noble blade tillage resulted in the lowest crown rot index among the tillage treatments. No significant differences in tillering were found between tillage or between chemical treatments (Table 5).

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Isolations: Limited isolations indicated that the common root and crown rot fungus, *Helminthosporium sativum*, was significantly less prevalent in crowns growing in noble bladed plots than those in other tillage treatments (Table 6).

Nematodes: Plant feeding nematodes were more abundant in plots that were spring disced (Table 7). At midseason, population levels were nearly alike in all tillage treatments, but thereafter developed more rapidly under spring disc tillage. The stunt nematode was the most abundant nematode in the plant feeding population.

Table 1. Effect of tillage on surface residue and soil moisture at Redfield in 1977.

Tillage (Fall-Spring)	Surface residue g/m^2	Soil Moisture 28 April %	Soil Moisture 7 June %
Noble-Noble	35.0[a]	22.0	9.8
Chisel-Disc	25.0	21.0	10.0
Chisel-Chisel	22.1	20.9	8.2
Disc-Disc	20.8	19.3	8.9

Discussion

The reasons for the relatively poor yield under disc-disc tillage have not been clearly identified in these studies. Lower levels of disease causing organisms (crown rot and nematodes) may account for the greater yield of Noble bladed plots, but not for the higher yield of fall chiseled plots. The assumption that fall Noble or chisel treatments resulted in greater moisture retention is not well supported by the soil moisture measurements, although trends indicate that this may have been the case.

The nature of yield increase from Benlate treatment was not identified either. Low incidence of foliage disease makes that an unlikely explanation. Also, Benomyl is not known to be effective against Helminthosporium crown rot. Other root and crown pathogens may have been present that were not detected on the isolation media used.

Table 2. Effect of tillage, fungicides and supplemental nitrogen on yield of Era spring wheat at Redfield in 1977.

Tillage (Fall-Spring)	Chemical Treatment[a] None	Terraclor	Benlate	Nitrogen	Tillage Mean
			bu/A		
Noble-Noble	26.5	23.7	31.1	27.8	27.3[b]
Chisel-Disc	27.3	27.5	35.9	31.4	30.5[b]
Chisel-Chisel	27.1	22.5	32.8	23.9	26.6[b]
Disc-Disc	20.0	15.4	21.8	16.8	18.5
Chemical Mean	25.2	22.3	30.4[c]	25.0	

[a]/Terraclor 10G, 100 lb/A; Benlate 50-W spray, 4 lb/A; Nitrogen, 30 lb/A.

[b]/Significantly different from Disc-Disc at 95% probability.

[c]/Significantly different from all other chemicals at 95% probability.

Table 3. Effect of tillage, fungicides and supplemental nitrogen on test weight of Era spring wheat at Redfield in 1977.

Tillage (Fall-Spring)	Chemical Treatment None	Terraclor	Benlate	Nitrogen	Tillage Mean
			lb/bu		
Noble-Noble	58.1	58.1	59.4	57.9	58.4[a]
Chisel-Disc	57.9	57.9	57.9	58.0	57.9[ab]
Chisel-Chisel	56.8	56.4	59.0	56.7	57.2[b]
Disc-Disc	57.4	56.5	58.2	56.2	57.1[b]
Chemical Mean	57.6	57.2	58.6[a]	57.2	

[a]/Tillage means or chemical means with the same letter are not significantly different at 95% probability.

Table 4. Effect of tillage, fungicides and supplemental nitrogen on crown disease of Era spring wheat at Redfield in 1977.

Tillage (Fall-Spring)	Chemical Treatment None	Terraclor	Benlate	Nitrogen	Tillage Mean
			Crown Disease Index[1]		
Noble-Noble	1.66	1.68	1.67	1.95	1.74
Chisel-Disc	1.86	1.78	2.13	1.62	1.85
Chisel-Chisel	1.84	1.80	1.76	1.93	1.83
Disc-Disc	1.70	1.58	2.13	1.67	1.77
Chemical Mean	1.77	1.71	1.92[a]	1.79	

[1]/Visually rated on a 1-4 scale, 4 = severely rotted at midseason.

[a]/Significantly greater than untreated at 95% probability.

Table 5. Effect of tillage, fungicides and supplemental nitrogen on tillering of Era spring wheat at Redfield in 1977.

Tillage (Fall-Spring)	Chemical Treatment				Tillage Mean
	None	Terraclor	Benlate	Nitrogen	
	Tiller Index[1]				
Noble-Noble	2.3	2.4	2.4	2.1	2.28
Chisel-Disc	2.3	2.3	2.0	2.3	2.23
Chisel-Chisel	2.3	2.3	2.0	2.5	2.25
Disc-Disc	1.9	2.1	2.1	2.3	2.09
Chemical Mean	2.16	2.27	2.12	2.30	

[1]/Visually rated on a 1-3 scale, 3 = many tillers.

Table 6. Effect of tillage and Terraclor application on the incidence of a common foot-rot pathogen of Era spring wheat at Redfield in 1977.

Tillage (Fall-Spring)	Untreated	Terraclor	Tillage mean
	% crowns with *H. sativum*		
Noble-Noble	33	33	33[a]
Chisel-Disc	58	60	59
Chisel-Chisel	83	54	68
Disc-Disc	67	55	61
Mean:	60	51	

[a]/Noble-Noble lower than other tillage at 95% probability; Terraclor vs. Untreated--not significant.

Table 7. Plant feeding nematode population in soil under several tillage regimens under Era spring Wheat at Redfield in 1977.

Tillage (Fall-Spring)	Sample Date-Days From Planting			
	0[a]/	40	104	Tillage Mean
	Total plant feeding nematodes/200cc soil			
Noble-Noble	184	145	362	230
Chisel-Disc	261	146	656	354
Chisel-Chisel	170	180	407	252
Disc-Disc	209	167	662	346
Date Mean	202	159	522	

Table 8. Population breakdown of plant feeding nematodes under Era spring wheat at Redfield, 1977.

	Sample date-days from planting		
	0	40	104
	% of total plant feeders		
Tylenchorynchus-Stunt nematode	49	53	71
Paratylenchus-Pin nematode	12	15	8
Tylenchinae	20	27	15
Pratylenchus-Lesion nematode	17	5	5
Helicotylenchus-Spiral nematode	1	0	0
Xiphinema-Dagger nematode	t	0	t
Hoplolaimus-Lance nematode	0	0	0
Dorylaims[a]	(217)	(103)	(323)
Saprobes[a]	(1251)	(2481)	(1158)

[a]/Neither Dorylaims nor Saprobes are plant feeders-Total number/200cc are included in parentheses as a matter of scientific record.

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-20

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 central plains region of the United States which includes South Dakota is subject to seasonal fluctuations in precipitation with a constant threat to crop production due to drought. In addition, supplies of water for irrigation are frequently limiting in both quantity and quality.

At the same time, irrigators are faced with rising costs and limitations on evergy available during peak use periods. As the supply and cost squeeze continues, irrigators need to know how to effectively manage water, energy, and equipment to maximize return.

The Water Resources Institute at South Dakota State University in cooperation with the Water Resources Institutes at Manhattan, Kansas and at Bozeman, Montana initiated a regional off-season irrigation project beginning in October, 1976. A main objective of the project is to evaluate the carry-over and effectiveness of fall and early spring applied water in crop production. Also, off-season use of equipment can minimize energy peaks and reduce the size of irrigation system needed.

The crops selected for the irrigation study were alfalfa, corn, spring wheat and winter wheat.

The South Dakota portion of the study is being conducted at the James Valley Research and Extension Center. Field plots consisting of approximately 1000 ft^2 each were established in 1976 and 1977. The treatments are shown in Table 1. Each treatment was replicated three times.

The 1977 yield results are shown in Tables 2 through 5. Only the maximum alfalfa irrigation treatment, A-3(F+S+ac), gave a significantly higher yield thank the dryland treatment, A-4(D), as shown in Table 2.

Three corn irrigation treatments--C-3(F+t), C-5(t), C-6(F+121+sk+bk) and C-8(121+sk+bk)--gave significantly higher yields than the non-irrigated treatment, C-9(D). Due to the excess rainfall during portions of the growing season, the soil may have been waterlogged which resulted in yield reductions. The single irrigation at tasseling was the most effective for the season.

The wheat yields are shown in Tables 4 and 5. No significant differences between dryland and irrigated treatment yields were found for either spring or winter wheat. However, the winter wheat stand was poor due to winterkill which may have been a factor in the yield results.

The effectiveness of off-season irrigation may be more easily interpreted through observation of soil water contents and water deficits. Detailed study of the water available to plants under the several irrigation treatments is being conducted. Results of this portion of the study are not complete at this time.

(Continued)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

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)	Irrig. 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)	Irrig. 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)	Irrig. in fall plus at boot stage.
"	Ws-3(b)	Irrig. at boot stage only.
"	Ws-4(j+b)	Irrig. at jointing plus boot stage.
"	Ws-5(F+j+b)	Irrig. in fall + jointing + boot stage.
"	Ws-6 (D)	Dryland; no irrigation.
Wheat, winter	Ww-1(F)	Fall applied irrigation only.
"	Ww-2(j)	Irrig. applied at jointing stage only.
Wheat, winter	Ww-3(b)	Irrig. applied at boot stage only.
"	Ww-4(F+b)	Irrig. applied in fall plus boot stage.
"	Ww-5(F+j+b)	Irrig. applied in fall + jointing + boot stage.
"	Ww-6(j+b)	Irrig. applied at jointing and boot stage.
"	Ww-7(D)	Dryland; no irrigation.

Table 2. Alfalfa Yields

Treatment	Dry matter yield in tons/acre 1st cutting	2nd cutting	3rd cutting	Total
A-1(F)	2.45	1.77	1.08	5.3
A-2(ac)	2.11	1.77	1.43	5.3
A-3(F+S+ac)	2.73	1.78	1.69	6.2*
A-4(D)	2.33	1.59	1.16	5.1

*Treatment A-3(F+S+ac) is the only irrigation treatment that gave a significantly higher yield than dryland, A-4(D), at the 95% probability level.

Table 3. Corn Yields

Treatment	Yield in bu/a	Significance
C-1(F)	100	
C-2(S)	81	
C-3(F+t)	116	*
C-4(S+t)	114	
C-5(t)	128	*
C-6(F+121+sk+bk)	121	*
C-7(S+121+sk+bk)	106	
C-8(121+sk=bk)	116	*
C-9(D)	96	

*Significantly different from dryland yields at the 95% probability level.

Table 4. Spring Wheat Yields

Treatment*	Yield in bu/a**
Ws-1(F)	32
Ws-2(F+b)	33
Ws-3(b)	35
Ws-4(j+b)	31
Ws-5(F+j+b)	34
Ws-6(D)	37

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

**Yield differences between treatments were not significantly different at the 95% probability level.

Table 5. Winter Wheat Yields

Treatment*	Yield in bu/a**
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.

**Yield differences between treatments were not significantly different at the 95% probability level.

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-21

Foliar Fertilization of Irrigated Wheat With Nitrogen, Phosphorus, Potassium and Sulfur.

R.J. Goos, P.L. Carson, B. Nettleton

Summary

High rates of liquid fertilizer application to wheat foliage induced leaf burn and decreased yields. Low rates of application had no effect on yield.

Introduction

The application of fertilizer solutions containing nitrogen, phosphorus, potassium and sulfur to soybean foliage during seed-fill has increased yields in some tests in other states. Greenhouse research in other states has indicated that wheat may respond similarly. The purpose of this field experiment was to determine if wheat would give a yield response to foliar fertilization under irrigated South Dakota growing conditions.

Procedure

The experiment was established at the James Valley Research and Extension Center near Redfield, SD. The experiment was conducted 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 calcareous lake-deposited sediments. Results of soil tests performed on samples taken from the experimental site are shown in Table 1.

A liquid fertilizer solution containing 7.5% N, 2.75% P_2O_5, 2.7% K_2O and 0.6% sulfur was prepared. The fertilizer materials used were urea, potassium poly-phosphate and ammonium sulfate. A surfactant (WEX) was used at 0.1% concentration.

Two applications of foliar fertilizer were made. The first was made on June 24th when the wheat kernels were in the "blister" stage. The second application was on July 6, when the wheat grain was in the late milk stage of growth.

The fertilizer treatments are a conbination of time of application and gallons of foliar fertilizer applied. The gallons applied each time and the total amounts of N, P_2O_5, K_2O and sulfur applied are listed with the treatment numbers in Table 2.

The gallons applied were unintentionally trippled on the first date of application. The fertilizer was applied with a hand sprayer.

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

The plots were harvested with a small self-propelled plot combine.

The variety grown was Olaf which was planted on April 29. Weeds were controlled by spraying with 1 1/3 pint of 2, 4-D amine per acre on May 27th.

The plots were irrigated to make sure moisture was not a limiting factor. The rainfall and amounts of irrigation water applied are reported in Table 3.

Results

The effects of foliar fertilization on wheat yields are presented in Table 4. All plots receiving the first application had yield decreases larger than the experimental error (4.7 bu/A) (least significant difference). Experimental error is the variations in yield brought about by the experimental procedures. When the difference in yield between the plots having no treatment and one receiving a treatment are larger than the LSD, it can be said with a high degree of confidence that the effect was caused by the treatment used. In this case, the yields were reduced by the earlier foliar fertilizer applications. This is probably due to the fact that an amount in excess of (3 times) the planned amount was applied. The high rate of application (132 gallons/A) caused 100% destruction of the flag leaf and a total reduction of foliage amounting to approximately 50%. The 66 gallon rate of application induced a destruction of 25% of the flag leaf and 15% of the total leaf area.

The second application did not increase or decrease the yield. The yield differences, if any, caused by the foliar application were less than the experimental error. The 22 and 44 gallon rates induced negligible leaf burn.

It is unfortunate that the first application was too large, however, the lower second application rates had no effect on yield. This is the second year of testing foliar fertilization of wheat. No yield increases have been recorded. Proper soil sampling, reliable soil testing, and applying the recommended amount of fertilizer is still the best way to insure a good supply of available plant food elements for the growth of wheat.

(Continued)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Table 1. Soil Tests on Samples Taken at the Experimental Site, Foliar Fertilization of Wheat, Redfield, SD 1977

NO_3-N (lbs/a)	Organic Matter %	P (lb/a)	K (lb/a)
130	2.7	41	1000+
(v. high)	(medium)	(v. high)	(v. high)

Table 2. Time of Application and Amounts of Plant Nutrients Applied for Foliar Treatments.

Treatment No.	Date of Application June 24	July 6	lbs applied per acre of N + P_2O_5 + K_2O + S
	gallons/A*		
1	0	0	0 + 0 + 0 + 0
2	66	0	46 + 17 + 17 + 4
3	0	22	16 + 6 + 6 1
4	132	0	93 + 34 + 34 + 7
5	0	44	31 + 11 + 11 + 2.5
6	66	44	77 + 28 + 28 + 6.5
7	132	22	109 + 40 + 40 + 8
8	66	22	62 + 23 + 23 + 5
9	132	44	124 + 62 + 62 + 9.5

*Each gallon weighs 9.4 lbs.

Table 3. Irrigation Water and Precipitation Received, Foliar Fertilization of Wheat, Redfield, 1977

Month	April	May	June	July	Growing Season Total
Irrigation water	3.5	1.5			5.0
Precipitation	1.78	3.46	.34		5.58
Total	4.28	4.96	.34		10.58

Table 4. Effects of Foliar Fertilization on Irrigated Wheat Yields, Redfield, SD 1977

Treatment Time & Amount of Material Applied June 24 (gal/Acre)	July 6 (gal/Acre)	Average Yield (Bu/Acre)
0	0	47
66	0	42*
0	22	43
132	0	40*
0	44	44
66	44	41*
132	22	36*
66	22	41*
132	44	37*

C.V. % = 4.7 bu/acre
LSD (.05) 7.8%
*Significantly lower than the check (.05 level)

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-22

04D01

Sorghum Herbicide Screening

James Valley Agriculture Research and Extension Center
Redfield, S.D.

Objective:

To evaluate the effectiveness of herbicides and herbicide combinations for control of annual weeds in Sorghum.

Plot Size and Design:

Plots were 10 ft. by 35 ft., replicated four times in a randomized complete block design.

Planting Information:

WS-201 sorghum was planted in 30-inch rows on the 25th of May. Seeding rate was 10 lb/A.

Spraying Information:

All preplant applications were broadcast at 3 MPH and 32 PSI on the 25th of May. A tandem disk was used for the incorporation. Preemergence treatments were broadcast at 3 MPH and 22 PSI with raindrop nozzles on the 27th of May.

Data Taken:

The plots were evaluated visually for the control of foxtail, lambsquarters, redroot pigweed and injury on the 13th of July. Harvest samples were taken from 2 rows 15 ft. each from all plots. All screening data is contained in table I.

(Table 1 on back of this page)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Treatment	Form	Rate	Growth Stage	Trt date	Plant date	Ft (%)	Colq (%)	RrPw (%)	Lodg	Yield gm/plot
HANDWEEDED CHECK	0.0	0.0	POST		145	1.41	1.43	1.43	11.	2162.
						(98)	(98)	(98)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
SHELL ATRAZINE 80W	S 0.80	1.40	PRE	147	145	1.25	1.29	1.27	11.	1848.
						(94)	(96)	(95)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
SHELL ATRAZINE 80W	S 0.80	1.40	PRE	147	145				23.	1608.
						(95)	(89)	(94)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
SHELL ATRAZINE L	L 4.00	1.40	PRE	147	145	1.28	1.25	1.30	20.	1816.
						(95)	(94)	(96)		
RAMROD/ATRAZINE	0.69	4.80	PRE	147	145	1.36	1.32	1.43	39.	984.
						(97)	(96)	(98)		
3139341506	L 0.70	4.50	PRE	147	145	1.29	1.35	1.23	45.	981.
						(96)	(97)	(94)		
3139341506	L 4.00	4.50	PRE	147	145	1.22	1.27	1.15	38.	1436.
						(93)	(95)	(91)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
BLADEX 80W	S 0.80	1.40	PRE	147	145	1.34	1.23	1.26	34.	1276.
						(97)	(94)	(95)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
BLADEX 80W	S 0.80	1.40	PRE	147	145	1.21	1.17	1.28	36.	1257.
						(93)	(92)	(95)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
BLADEX 80W	L 4.00	1.40	PRE	147	145	1.34	1.05	1.15	40.	984.
						(97)	(86)	(91)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
BLADEX 80W	L 4.00	1.40	PRE	147	145	1.35	1.04	1.17	38.	1068.
						(97)	(86)	(92)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
MODOWN 80W	S 0.80	1.20	PRE	147	145	1.27	1.02	1.17	16.	1618.
						(95)	(85)	(91)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
MODOWN 80W	S 0.80	1.20	PRE	147	145	1.37	1.21	1.31	16.	1861.
						(98)	(93)	(96)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
MODOWN 80W	S 0.80	1.60	PRE	147	145	1.33	1.26	1.22	28.	1219.
						(97)	(95)	(93)		
31393 4L	L 4.00	3.40	PRE	147	145 +					
MODOWN 80W	S 0.80	1.60	PRE	147	145	1.33	1.29	1.33	26.	1506.
						(97)	(95)	(97)		
RAMROD 65W	S 0.65	5.50	PRE	147	145	1.36	0.86	1.17	19.	1394.
						(97)	(75)	(92)		
31393 4L	L 4.00	5.50	PRE	147	145	1.36	0.91	0.99	14.	1584.
						(97)	(79)	(83)		
MILOGARD	S 0.65	2.40	PPI	145	145 +					
31393 4L	L 4.00	3.40	PRE	147	145	1.41	1.41	1.39	16.	2089.
						(98)	(98)	(98)		
RAMROD 65W	S 0.65	3.40	PRE	147	145 +					
MILOGARD	S 0.80	1.00	PRE	147	145	1.25	1.27	1.23	21.	1432.
						(94)	(95)	(94)		
WEEDY CHECK	0.00	0.00	POST		145				18.	910.
						(0)	(0)	(0)		

*Some data was transformed for analysis. Original values are in parenthesis.

	Lodg	Yield gm/plot
OVERALL MEAN	25.	1452.
HIGH MEAN	45.	2162.
LOW MEAN	11.	910.
COEFFICIENT OF VARIABILITY	63	41
LSD (.05)	23.	847.

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-23

04D02

Sorghum Herbicide Screening

James Valley Agriculture Research and Extension Center
Redfield, S.D.

Objective:

To evaluate the effectiveness of herbicides and herbicide combinations for control of annual weeds in Sorghum.

Plot Size and Design:

Plots were 10 ft. by 35 ft., replicated four times in a randomized complete block design.

Planting Information:

WS-201 sorghum was planted in 30-inch rows on the 25th of May. Seeding rate was 10 lb/A.

Spraying Information:

All preplant applications were broadcast at 3 MPH and 32 PSI on the 25th of May. A tandem disk was used for the incorporation. Preemergence treatments were broadcast at 3 MPH and 20 PSI with raindrop nozzles on the 27th of May. Post emergence applications were made at 2 MPH and 32 PSI on the 13th and 21st of July.

Data Taken:

The plots were evaluated visually for the control of foxtail, lambsquarters, redroot pigweed and injury on the 13th of July. Harvest samples were taken from 2 rows 15 ft. each from all plots. All screening data is contained in table I.

(Table 1 on back of this page)

1000 copies printed of each report at estimated cost of 2¢
per page. 3-78 fjs

Treatment	Form	Rate	Growth Stage	Trt date	Plant date	Ft (%)	Colq (%)	RrPw (%)	Lodg	Yield gm/plot
HANDWEEDED CHECK	0.00	0.00			147	1.34	1.43	1.43	0.	2458.
						(97)	(98)	(98)		
BEXTON 4L	L 4.00	4.00	PRE	147	147	1.04	0.31	0.45	0.	1573.
						(86)	(30)	(43)		
AATREX 80W	S 0.80	2.00	PRE	147	147 +					
BEXTON 4L	L 4.00	5.00	PRE	147	147	1.30	1.33	0.93	0.	1804.
						(96)	(97)	(80)		
AATREX 4L	L 4.00	2.00	PRE	147	147	1.07	1.18	1.01	0.	2148.
						(87)	(92)	(84)		
MODOWN 4F	L 4.00	1.25	PRE	147	147	0.77	0.75	0.73	0.	2082.
						(69)	(68)	(66)		
MODOWN 4F	L 4.00	1.50	PRE	147	147	0.75	0.93	1.01	0.	2286.
						(67)	(80)	(84)		
BEXTON 4L	L 4.00	6.00	PRE	147	147 ÷					
MODOWN 4F	L 4.00	2.50	PRE	147	147	1.32	1.23	1.40	0.	3018.
						(96)	(94)	(98)		
BEXTON 4L	L 4.00	12.0	PRE	147	147 +					
MODOWN 4F	L 4.00	5.00	PRE	147	147	1.39	1.36	1.43	0.	2985.
						(98)	(97)	(98)		
BEXTON 4L	L 4.00	3.00	PRE	147	147 +					
MODOWN 4F	L 4.00	1.25	PRE	147	147	1.16	0.92	1.21	0.	2142.
						(91)	(79)	(93)		
AATREX 4L	L 4.00	2.00	PPI	145	147	1.26	1.32	1.31	0.	2471.
						(95)	(97)	(96)		
MODOWN 80W	S 0.80	1.20	PRE	147	147	0.80	0.72	0.93	0.	2812.
						(71)	(65)	(80)		
MODOWN 80W	S 0.80	1.60	PRE	147	147	0.75	0.95	1.18	0.	2820.
						(68)	(81)	(92)		
MILOGARD	S 0.80	2.40	PPI	145	147	1.19	1.39	1.36	0.	2648.
						(92)	(98)	(97)		
AATREX 80W	S 0.80	2.40	PRE	147	147	1.08	1.39	1.20	0.	2442.
						(88)	(98)	(93)		
FORMULA 40	L 4.00	0.50	POST		147 +					
RAMROD 65W	S 0.65	5.50	PRE	147	147	1.29	1.39	1.20	50.	2470.
						(95)	(98)	(93)		
CROP OIL	L 8.00	8.00	E.PO	172	147 +					
AATREX 4L	L 4.00	1.25	E.PO	172	147	1.14	1.41	1.41	0.	3403.
						(90)	(98)	(98)		
FORMULA 40	L 4.00	0.50	4-8I	164	147	0.28	0.76	0.85	0.	2042.
						(27)	(68)	(74)		
BANVEL	L 4.00	0.25	4-8I	164	147	0.36	1.17	1.31	0.	2299.
						(35)	(91)	(96)		
MILOGARD	L 4.00	2.00	PPI	145	147	0.96	1.26	1.33	0.	3500.
						(82)	(95)	(97)		
WEEDY CHECK	0.0	0.0			147	0.0	0.0	0.0	0.	1269.
						(0)	(0)	(0)		
OVERALL MEAN						0.96	1.06	1.08	3.	2433.
HIGH MEAN						1.39	1.43	1.43	50.	3500.
LOW MEAN						0.0	0.0	0.0	0.	1269.
COEFFICIENT OF VARIABILITY						18	13	18	0	19
LSD (.05)						0.25	0.20	0.28	0.	685.

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-24

04D03

Prowl and AAtrex on Sorghum

James Valley Agriculture Research and Extension Center
Redfield, S.D.

Objective:

To evaluate the effectiveness of Prowl and AAtrex for control of annual weeds in Sorghum.

Plot Size and Design:

The plots were 10 ft. by 35 ft., replicated four times in a randomized complete block design.

Planting Information:

WS-201 sorghum was planted in 30-inch rows on the 25th of May. Seeding rate was 10 lb/A.

Spraying Information:

All preplant treatments were broadcast at 3 MPH and 32 PSI on the 25th of May. A tandem disk was used for incorporation. Post-emergence treatments were made at 2 MPH and 32 PSI on the 1st, 13th and 21st of June.

Data Taken:

Evaluations for the control of foxtail, lambsquarters and redroot pigweed were made visually. Observations for injury were also made visually. Harvest samples were taken from two rows 15 feet each from all plots. Table I contains the data for this experiment.

(Table 1 on back of this page)

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

PROJECT NUMBER 04D03

Treatment	Form	Rate	Growth Stage	Trt date	Plant date	Colq (%)	RrPw (%)	GrFt (%)	Inj. (%)	Yield (gm)
PROWL 4E	L 4.00	1.50	PRE	146	145	0.65 (60)	0.70 (64)	0.89 (77)	0.0 (0)	1892.
PROWL 4E	L 4.00	1.50	SPK	152	145	1.07 (87)	0.93 (80)	0.70 (64)	0.0 (0)	2339.
PROWL 4E	L 4.00	1.50	1-3L	164	145	1.13 (90)	0.64 (59)	0.66 (61)	0.03 (2)	1845.
PROWL 4E	L 4.00	1.50	5-6I	172	145	1.12 (90)	1.05 (86)	0.15 (14)	0.0 (0)	2136.
PROWL 4E	L 4.00	2.00	PRE	146	145	1.15 (91)	0.86 (75)	0.86 (75)	0.03 (2)	1802.
PROWL 4E	L 4.00	2.00	SPK	152	145	1.08 (88)	1.16 (91)	0.78 (70)	0.08 (7)	2359.
PROWL 4E	L 4.00	2.00	1-3L	164	145	1.11 (89)	0.60 (56)	0.82 (73)	0.04 (3)	1937.
PROWL 4E	L 4.00	2.00	5-6I	172	145	0.98 (82)	0.83 (73)	0.29 (28)	0.0 (0)	1783.
PROWL 4E	L 4.00	1.00	PRE	146	145	0.55 (52)	0.41 (40)	0.45 (43)	0.0 (0)	1632.
AATREX 4L	L 4.00	1.00	SPK	152	145	0.68 (62)	0.93 (80)	0.56 (53)	0.0 (0)	1774.
AATREX 4L	L 4.00	1.00	1-3L	164	145	1.06 (87)	1.25 (94)	0.79 (71)	0.0 (0)	2128.
AATREX 4L	L 4.00	1.00	5-6I	172	145	1.30 (96)	1.14 (90)	0.58 (55)	0.03 (2)	2407.
WEEDY CHECK	0.0	0.0			145	0.07 (6)	0.06 (5)	0.08 (7)	0.0 (0)	908.
HANDWEEDED CHECK	0.0	0.0			145	1.43 (98)	1.43 (98)	1.40 (98)	0.0 (0)	2748.
OVERALL MEAN						0.96	0.86	0.64	0.01	1978.
HIGH MEAN						1.43	1.43	1.40	0.08	2748.
LOW MEAN						0.07	0.06	0.08	0.0	908.
COEFFICIENT OF VARIABILITY						32	30	38	254	17
LSD (.05)						0.45	0.37	0.36	0.05	484.

Progress Report 1978

James Valley Agricultural Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-25 04E01

Sunflower Herbicide Screening

James Valley Agriculture Research and Extension Center
Redfield, S.D.

Objective:

To evaluate the effectiveness of herbicides or combinations of herbicides for control annual weeds in sunflowers.

Plot Size and Design:

Screening plots were 10 ft. by 35 ft., replicated four times in a randomized complete block design.

Planting Information:

Peredovik sunflowers were planted in 30-inch rows on the 25th of May. The seeding rate was 29,000 plants per acre.

Spraying Information:

Preplant treatments were made at 3 MPH and 32 PSI on the 25th of May. Preemergence applications were made with raindrop nozzles at 3 MPH and 20 PSI on the 27th of May. Post plant incorporated treatments were made at 3 MPH and 32 PSI on the 27th of May. A tandem disk was used for both the preplant and the post-plant incorporations.

Data Taken:

Evaluations for the control of foxtail, lambsquarters and redroot pigweed were made visually. Harvest samples were taken from two rows 15 feet each from all plots. Table I contains the data for this experiment.

Treatment	Form	Rate	Growth Stage	Trt date	Plant date	Ft.	RrPw	Colq	Inj. (%)	
EPTAM	L 7.00	3.00	PPI	145	145	1.12 (89	0.88 (77)	0.77 (69)	0.11 (10)	880.
TOLBAN	L 4.00	1.00	PPI	145	145	1.16 (91)	1.19 (92)	0.94 (80)	0.06 (6)	965.
TREFLAN	L 4.00	1.00	PPI	145	145	1.17 (92)	1.31 (96)	1.06 (87)	0.02 (1)	776.
COBEX	L 2.00	0.50	PPI	145	145	1.22 (93)	1.20 (93)	1.18 (92)	0.03 (2)	1001.
AMIBEN	L 2.00	3.00	PRE	147	145	1.03 (85)	1.10 (89)	0.76 (68)	0.0 (0)	998.

(Continued)

Treatment	Form	Rate	Growth Stage	Trt date	Plant date	Ft.	RrPw	Colq	Inj. (%)	
DUAL	L 8.00	2.00	PPI	145	145	0.89	1.13	0.40	0.04	732.
						(77)	(90)	(39)	(4)	
DUAL	L 8.00	3.00	PPI	145	145	1.10	1.11	0.73	0.03	975.
						(89)	(89)	(66)	(2)	
DUAL	L 8.00	2.00	PRE	147	145	0.52	0.30	0.15	0.08	557.
						(49)	(29)	(14)	(7)	
DUAL	L 8.00	3.00	PRE	147	145	0.88	0.52	0.24	0.08	880.
						(77)	(49)	(23)	(7)	
AMIBEN	L 2.00	2.00	PRE	147	145 +					
DUAL	L 8.00	2.00	PRE	147	145	0.93	1.10	0.76	0.13	1002.
						(80)	(89)	(68)	(12)	
AMIBEN	L 2.00	2.00	PRE	147	145 +					
DUAL	L 8.00	2.50	PRE	147	145	1.00	1.06	0.76	0.11	968.
						(84)	(87)	(68)	(11)	
RYDEX	S 0.50	0.50	PRE	147	145	0.72	0.58	0.43	0.03	1107.
						(66)	(55)	(41)	(2)	
RYDEX	S 0.50	1.00	PRE	147	145	0.78	0.73	0.59	0.01	1031.
						(70)	(66)	(55)	(0)	
PROWL 4E	L 4.00	1.50	PRE	147	145	0.71	0.60	0.78	0.09	709.
						(65)	(56)	(70)	(8)	
AMIBEN	L 2.00	2.00	PRE	147	145 +					
PROWL 4E	L 4.00	1.50	PRE	147	145	1.09	1.03	1.07	0.09	936.
						(88)	(85)	(87)	(9)	
PROWL 4E	L 4.00	1.50	PPI	145	145	1.28	1.28	1.17	0.05	906.
						(95)	(95)	(92)	(5)	
AMIBEN	L 2.00	2.00	PRE	147	145 +					
PROWL 4E	L 4.00	1.50	PPI	145	145	1.34	1.41	1.31	0.13	718.
						(97)	(98)	(96)	(12)	
BEXTON 4L	L 4.00	5.00	PRE	147	145	1.05	0.93	0.57	0.03	1021.
						(86)	(80)	(53)	(2)	
BEXTON 4L	L 4.00	6.00	PRE	147	145	1.03	0.97	0.32	0.02	937.
						(85)	(82)	(31)	(1)	
EPTAM	L 7.00	2.50	PPI	145	145 +					
DEVRINOL	L 2.00	0.75	PPI	145	145	1.03	1.08	0.97	0.0	979.
						(85)	(88)	(82)	(0)	
DEVRINOL	L 2.00	0.75	PPI	145	145	0.33	1.07	0.86	0.05	861.
						(32)	(87)	(75)	(5)	
R 40244	L 2.00	0.50	POPI	147	145	0.32	0.90	0.93	0.03	961.
						(31)	(78)	(80)	(2)	
R 40244	L 2.00	1.00	POPI	147	145	0.29	1.10	1.08	0.05	889.
						(28)	(89)	(88)	(4)	
R 40244	L 2.00	2.00	POPI	147	145	0.06	0.40	0.58	0.06	798.
						(6)	(39)	(55)	(6)	
WEEDY CHECK	0.0	0.0			145	0.0	0.0	0.0	0.0	658.
						(0)	(0)	(0)	(0)	
OVERALL MEAN						0.84	0.92	0.74	0.05	890.
HIGH MEAN						1.34	1.41	1.31	0.13	1107.
LOW MEAN						0.0	0.0	0.0	0.0	557.
COEFFICIENT OF VARIABILITY						22	21	30	150	23
LSD (.05)						0.27	0.28	0.31	0.11	292.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs

Progress Report 1978

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

Agricultural Experiment Station
South Dakota State University

PR 78-26

Conventionally-Dried, Solar-Dried and Acid-Treated Corn and Methods of Vitamin A Supplementation for Fattening Beef Cattle

R. M. Luther, L. B. Embry and J. F. Giles

The possibility of greater costs and shortage of fuels to dry corn has lead to a search for alternative methods of handling wet corn at harvest. Drying by solar energy and preservation with organic acids appear to be safe ways of handling corn grain for several months of storage when harvested at a high content in moisture. The nutritional value of the wet corn when dried or preserved is of major concern to the cattle feeder. Earlier studies have indicated rather small differences in feedlot performance when conventionally-dried, solar-dried or acid-treated corn was fed to fattening cattle. Another experiment was conducted at the James Valley Research and Extension Center, Redfield, during the summer of 1977 to determine the value of corn grain dried or preserved by different methods. In the trial, two methods of supplementing vitamin A were studied, in a free-choice mineral supplement and as a massive one-time injection.

Procedure

Sixty steers averaging 741 lb. were purchased through a livestock auction for the experiment. The steers were ear tagged, weighed and allotted to 6 pens of 10 steers each. Initial weight and final weight were recorded following an overnight stand without feed or water. The steers were implanted with 36 mg zeranol at the start of the trial.

The dietary treatments consisted of conventionally-dried corn, solar-dried corn and acid-treated corn. Whole shelled corn produced during the 1976 crop season at the Center was used for the solar-dried and acid-treated corn treatments. Conventionally-dried corn from the 1976 crop was purchased at a local elevator.

Moisture content of corn at harvest was 21.4% for solar-dried corn and 19.9% for acid-treated corn. Moisture content of conventionally-dried corn at harvest was not known, but most corn grown in the Redfield area was dried with natural gas at local elevators. Solar-dried corn was stored in an experimental steel bin designed for drying with energy from the sun and equipped with a fan and motor. The acid-treated corn was prepared by application of Grain Storer P (Co-op) at the rate of 1.7 gallons per ton (36 bu.) of corn. This product supplied propionic acid in an amount to permit safe storage of corn for up to 1 year. The propionic acid-treated corn was stored in a granary bin of wood construction.

The cattle were started on experiment in mid-May. During the first 2 weeks, they were gradually shifted to a full feed of whole shelled corn with a limited quantity of hay from a ration composed largely of hay and a small amount of whole oats. The hay was good quality alfalfa-bromegrass, chopped through a field chopper and stored in a large pile. Chopped hay was fed at the rate of 2 lb. per steer daily with a full feed of whole shelled corn. No protein supplement was fed. Each corn treatment was replicated with 2 pens of cattle.

The cattle in one replication were allowed free-choice consumption of a mineral mixture composed of ground limesetone (65.3%), trace mineral salt (34.3%) and vitamin A premix (0.4%). The vitamin A concentration in the final mixture was calculated to be 546,000 International Units (IU) per pound using a fresh product. The mineral mixture without vitamin A was allowed free-choice to the second replication of cattle. Mineral intake was expected to be about 9 g per day based on past observations at this location which would provide approximately 11,000 IU of vitamin A per steer daily. Free-choice mineral was placed in salt boxes equipped with a partial cover.

For the injection method of vitamin A supplementation, the vitamin was administered by intramusular injection at the beginning of the feeding period in the amount of 2 million IU. This amount would provide 20,000 IU of vitamin A per steer daily for an expected feeding period of about 100 days.

Supplies of solar-dried corn and acid-treated corn allowed the experiment to continue an additional 38 days, for a total feeding period of 138 days. The cattle were weighed following an overnight stand without feed and water and the experiment was terminated.

The cattle were fed conventionally-dried corn one additional month beyond the 138-day experimental period to reach a desirable market weight and quality. They were trucked to a local meat packing plant for slaughter. Samples of liver tissue were collected and frozen to determine the effects of vitamin A supplementation on liver stores of the vitamin. These analyses have not been completed and results of this part of the trial will be reported at a later date.

Results

A summary of results of the corn treatments is presented in table 1.

Steer gains for the different types of corn were about the same with gains of cattle fed conventionally-dried corn being only slightly lower than the other treatments. Cattle fed the solar-dried corn and acid-treated corn consumed more feed than cattle fed conventionally-dried corn. Differences in feed requirements were small with the lowest requirements obtained with the solar-dried corn.

Corn treated with propionic acid had a lower moisture content at harvest (about 20%) than was desired for this treatment. Steers fed propionic acid-treated corn had greater gains than for conventionally-dried corn, but feed consumption was also higher, resulting in a higher feed requirement for this treatment. This would not be expected in view of the results observed in feeding high moisture corn, which has generally shown an improvement in feed efficiency over dry corn.

The results of vitamin A supplementation are shown in table 2. Weight gains and feed data are of limited value in evaluating the effects of vitamin A supplementation. Three pens of 10 steers each provided suitable numbers for the comparison. However, weight gains of cattle fed rations low in vitamin A and carotene are usually not affected to any appreciable extent until body stores are sufficiently depleted and feed intake decreases.

Steer gains for cattle receiving the intramuscular injection at the start of the trial were higher than those of cattle allowed vitamin A in a free-choice mineral supplement. The injected cattle also consumed slightly more feed and required less feed per unit of gain than cattle allowed the free-choice mineral.

Mineral consumption for all pens of cattle averaged 32 g per steer daily during the 138-day experiment. This intake, which was greater than expected, resulted in a vitamin A consumption of about 38,000 IU per steer daily. This compares with an average daily dose of 14,500 IU for the injected cattle over the feeding period.

Summary

A feeding experiment with yearling beef steers was conducted to compare the value of conventionally-dried corn, solar-dried corn and acid-treated corn. Steer gains were about the same for the three types of corn with the gains of cattle fed conventionally-dried corn being only slightly lower than the other treatments. Differences in feed consumption and feed requirements between corn storage treatments were relatively small.

Feedlot performance of cattle receiving supplemental vitamin A through a free-choice mineral or by a massive single injection did not appear to be related to method of supplementation. An evaluation of these treatments will be made using liver storage of vitamin A when chemical analyses have been completed.

Table 1. Conventionally-Dried, Solar-Dried and Acid-Treated Corn for Finishing Steers (May 18 to October 3, 1977 - 138 days)

	Conventionally-dried corn	Solar-dried corn	Acid-treated corn
No. animals	20	20	19[a]
Avg. init. wt., lb.	741	741	736
Avg. final wt., lb.	1094	1106	1097
Avg. daily gain, lb.	2.56	2.64	2.62
Avg. daily feed, lb. (as fed basis)[b]			
Whole corn	18.41	18.69	19.52
Chopped hay	2.49	2.49	2.49
Mineral mixture	.06	.06	.07
Total	20.96	21.24	22.08
Feed/100 lb. gain, lb.			
Whole corn	719	708	745
Chopped hay	97	94	95
Mineral mixture	2	2	2
Total	818	804	842

[a] One steer died of unknown causes.
[b] A small quantity of whole oats was fed at the start of the trial.

Table 2. Methods of Supplementing Vitamin A to Finishing Beef Cattle (May 18 to October 3, 1977 - 138 days)

	Free-choice mineral	Injection
No. animals	30	29[a]
Avg. init. wt., lb.	741	738
Avg. final wt., lb.	1093	1105
Avg. daily gain, lb.	2.55	2.66
Avg. daily feed, lb. (as fed basis)[b]		
Whole corn	18.82	18.93
Chopped hay	2.49	2.49
Mineral mixture	.07	.06
Total	21.38	21.48
Feed/100 lb. gain, lb.		
Whole corn	738	712
Chopped hay	98	94
Mineral mixture	3	2
Total	839	808

[a] One steer died of unknown causes.
[b] A small quantity of whole oats was fed at the start of the trial.

1000 copies printed of each report at estimated cost of 2¢ per page. 3-78 fjs