Agronomy Pamphlet #88 December, 1967

ANNUAL PROGRESS REPORT

NORTHEAST RESEARCH FARMS
Garden City and Watertown, South Dakota

INTRODUCTION

The State Legislature appropriated money in 1955 for new research crops, soils, and crop diseases in northeastern South Dakota. A 20-acre site was originally selected. It is located on the Otto Korth farm, 15 miles north of Watertown at the junction of Highways 81 and 20. A second site was added in 1965 at Garden City. It is located on the Everett Fletcher farm, 2 miles north and a half mile west of the Garden City junction on Highway 25. There are 45 acres in this farm for crop and soil management and 15 acres for weed control studies.

These farms provide research facilities to obtain solutions for local problems in crop production and soil management. Soil and crop management experiments include tillage methods and the use of fertilizers and the soil fertility. Crop oriented experiments are conducted on disease control, weed control, and the testing of potentially adaptable varieties.

Evaluation of plant materials by plant breeders in the Agronomy Department are carried on at these farms. Local weather conditions aid in the selection of plants adapted to the area.

There will be a field day at the Garden City Unit, June 29, 1968, but tours may be scheduled by the County Extension Agents.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

Member	County	Address
W. H. Schwanke (Chairman)	Codington	Watertown-Rt. #4
Fred Morris (Secretary)	Codington	Watertown
Grant Kellogg	Codington	Watertown-Rt. #2
Harold Hurlbut	Clark	Raymond
William Peterson	Day	Lily
Alfred Skovly	Deuel	Astoria
Lyle Kriesel	Grant	Summit
Oliver Heitsmeyer	Hamlin	Estelline
Donald Naddy	Marshall	Britton
Elmer Greseth	Roberts	Sisseton
Farm Personnel		
Quentin Kingsley	SDSU Agronomy Dept.	Brookings
Donald W. Nelson	SDSU Employee	Garden City Unit
Edwin O. Noeldner	SDSU Employee	Watertown Unit

This report was prepared by the staff members of South Dakota State University as indicated in each section, and assembled by Q. S. Kingsley, Agronomy Department.

BRIEF HISTORY

All experiments or cultural practices, which were at Watertown are discontinued. New ones are now being studies at Garden City. During the coming 1968 season at Garden City, the following general work will be continued: winter wheat hardiness and yield trials; to determine and control the local diseases and insects of potatoes; influence of sorghum row spacing and population on yield; sunflower seed production, and plots to increase the seed supply of some experimental barleys and plant introductions. All experiments are on the contour with roadways located in the grassed drainways for access to the experiments.

The Watertown Unit is utilized for adaptation studies with corn, small grain, winter grain, sorghum, soybeans, grasses, and for plant disease observations. These studies will be continued on this farm due to its environment and soil condition.

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1967 CROP SEASON

Table 1. Total Rainfall and Average Temperature by Months with Their Departure from Long-Time Average at Northeast Research Farms*

Watertown and Garden City Units

	April	May	June	July	Aug.	Sept.	Oct.	Total
RAINFALL*								
Total in Inches								
Watertown	0.92	0.69	4.58	1.05	1.13	1.06	0.35	9.78
Garden City	2.48	0.43	3.82	1.61	1.28	1.34	0.65	11.61
Departure from Long-time Avg.								
Watertown	-1.14	-2.18	+0.88	-1.62	-1.65	-0.79	-0.81	-7.31
Garden City	+0.29	-2.42	-0.18	-1.27	-1.68	-0.93	-0.87	-7.06
TEMPERATURE								
Average Monthly in degrees F.								
Watertown	42.6	49.4	62.9	66.2	66.5	58.0	----	----
Garden City	40.4	50.6	62.0	66.6	63.5	57.2	42.8	----
Departure from Long-Time Avg.								
Watertown	-0.6	-6.6	-1.0	-6.1	-2.5	-1.9	----	----
Garden City	-3.9	-6.2	-4.0	-6.2	-7.5	-3.5	-5.8	----
Frost free days								
Watertown	May 21 to Sept. 26 = 129 days							
Garden City	May 20 to Sept. 25 = 129 days							

* Longtime rainfall average for 12 months

Watertown Airport	20.85
Clark	22.46

The past crop season had below normal average temperatures for all months of the growing season. Rainfall was above average at Garden City for April, but below normal for the rest of the season. Because the corn did not mature by frost, much of the corn had a too high moisture content for satisfactory storage. Subsoil moisture reserves were very low when the last soil moisture samples were taken in October.

*The above rainfalls and temperatures were taken and recorded at the Northeast Research Farms. The departure from long-time average was obtained by comparing data taken at the farm to the long-time average at the Watertown and Clark Weather Stations, courtesy U. S. Weather Bureau, Huron, South Dakota.

The frost free periods at the Watertown Unit are reported in Table 2, and shows the length of the growing season for the past 12 years.

Table 2. Periods of Frost-Free Days Recorded at the Northeast Research farm, Watertown Unit.

Year	Last Frost	First Frost	Frost-Free Days
1956	May 4	Sept. 6	125
1957	May 20	Sept. 16	119
1958	May 23	Sept. 16	116
1959	May 22	Sept. 10	110
1960	May 11	Sept. 19	123
1961	May 10	Sept. 25	138
1962	April 30	Sept. 20	143
1963	May 23	Oct. 28	158
1964	June 11	Sept. 10	92
1965	May 28	Sept. 9	104
1966	May 20	Oct. 5	138
1967	May 21	Sept. 26	129
		Average Frost Free Days	125

FERTILITY AND CULTURAL PRACTICE EXPERIMENT

Garden City Unit

Q. S. Kingsley

TITLE: The Long Term Effect of Row Versus Broadcast Method of Fertilizer Application on Soil Fertility and Crop Rotation.

OBJECTIVES OF EXPERIMENT:

1. To compare the effect on crop yields of fertilizer applied in a row with that broadcast and then plowed under or disk-in.

2. To determine the relative management efficiency of the three methods in terms of economic returns for labor, equipment, and other inputs for the typical South Dakota farms.

3. To determin the effect of the three methods on soil tests and the effect of residual carryover on the succeeding crop yield.

NEED TO STUDY:

1. Should the farmer buy equipment for the row application of most of the phosphate required for small grain and row crops: Additional labor would be needed during busy planting time for this application in comparison to the other methods.

2. Should he eliminate the additional labor by having higher rates of phosphate broadcast with nitrogen and plowed under?

3. What is the long term effect on yield and soil fertility of (1) a small amount of fertilizer applied to a small part of the surface soil as compared to (2) a large amount of fertilizer mixed throughout the surface soil?

EXPERIMENTAL PLAN:

The plots receiving nitrogen are to receive the same amount, but the two crops will receive different amounts. Corn has received 50 pounds of nitrogen and wheat, 30 pounds of nitrogen per acre. The phosphate applications vary according to the following summary. In this summary the rates are expressed as elemental phosphours and nitrogen in pounds per acre. Phosphorus may be converted to phosphorus pentoxide by multiplying the elemental P shown in formula by 2.3. To reverse this procedure multiply 0.44 times P_2O_5 to get the elemental quality.

Corn - 6 treatments	Wheat - 6 treatments
N-P-K	N-P-K
0-0-0	0-0-0
0-0-0	30-0-0
50-0-0	30-7-0
50-7-0	30-15-0
50-15-0	30-15-0
50-30-0	30-30-0

The three initial corrective treatments were included in each experimental block, as is shown below. These ratios are also in terms of the elements N,P, and K. A maintenance treatment will be applied to each of these plots starting with the first crop season. No K is added in the maintenance fertilizer. The fertilizer treatment for corn is to be:

Corrective	Maintenance*
100-0-0	50-0-0
100-60-0	50-7-0
100-60-100	50-7-0
for wheat	
100-0-0	30-0-0
100-60-0	30-7-0
100-60-100	30-7-0

* The fertilizer will be broadcast in the fall and spring plowed.

There are 8 replications of the plots for each crop-year block and treatment, except for the corrective treatments which was applied to 3 plots in each of the 16 blocks. These three plots are on one end of each block. A randomized block design was used and the plots will remain as whole plots until the last year of the experiment (1969) at which time all plots are to be divided. Half of each plot will receive fertilizer and the other half none. Residual effects are to be determined at this time. The residual fertility is the fertilizer which was not used by corn but is used the following year by wheat or vice versa.

N and P contents will be determined for the grain, the corn stover, wheat straw and for the soil at the beginning and the end of the experiment.

Fertilizer will be applied at three different times:

1. Fall application, with plowing the following spring.
2. Spring application after plowing, then disk in.
3. Drill-with-the-seed application or starter

Weed control will be maintained at the discretion of the farm manager.

RESULTS:

Table 3. Time, Rate and Placement of Fertilizer for Wheat

Treatment	Time of Method of Fertilizer Application Yield in Bushel per acre								
	Broadcast Fall		Av. protein	Broadcast Spring		Av. protein	Drill with Seed		Av. protein
	1967	65-67	65-66	1967	65-67	65-66	1967	65-67	65-66
0-0-0	29.9	23.3	13.3	33.2	24.3	12.3	29.6	22.8	12.2
30-0-0	37.2	27.8	13.2	36.6	28.2	12.9	37.2	27.7	13.6
30-7-0	37.5	28.3	13.8	39.2	28.9	13.4	43.3	31.7	13.6
30-15-0*	40.5	29.2	13.1	37.0	28.5	12.5	41.7	30.9	13.6
30-15-0**	39.7	29.3	13.6	37.0	27.9	12.9	40.3	29.4	13.7
30-30-0	39.8	29.8	13.5	40.2	29.9	12.2	42.4	32.0	12.8

*30-15-0 Preceded by corn 1966 with 50-15-0 treatment
**30-15-0 Preceded by corn 1966 with 0-0-0 treatment

DISCUSSION AND INTERPRETATION OF RESULTS:

For this year, the addition of phosphorus with nitrogen increased yields more than nitrogen alone when compared to the untreated plot. The method and time of application of the different levels of fertilizer seemed to affect the yield. Fall broadcasting of fertilizer (table 3) at 30-15-0 pounds per acre, which was preceded by 50-15-0 pounds

per acre for corn in 1966, produced 10.6 bushels more than the untreated plot. Spring broadcasting of fertilizer at a rate of 30-30-0 pounds per acre, produced 7.0 bushels more than the untreated plot. At a rate of 30-7-0 pounds per acre, fertilizer drilled with the seed increased yields 13.7 bushels per acre more than the unfertilized plot. The time, rate and placement of fertilizer were important factors during the 1967 crop season.

RESULTS:

Table 4. Time, Rate and Placement of Fertilizer for Corn

Treatment	Time and Method of Fertilizer Application Yield in Bushels per acre								
	Broadcast Fall		Av. Protein	Broadcast Spring		Av. Protein	Starter In Row		Av. Protein
	1967	65-67	65-66	1967	65-67	65-66	1967	65-67	65-66
0-0-0*	40.7	39.8	8.2	36.3	40.0	8.0	38.8	41.3	8.8
0-0-0	38.6	39.6	8.1	37.2	40.2	8.2	35.1	39.0	8.1
50-0-0	52.6	53.9	9.2	49.0	54.0	9.0	49.4	51.4	9.0
50-7-0	60.6	60.2	9.1	48.5	53.6	8.5	59.1	56.1	8.6
50-15-0	59.9	58.2	8.8	58.4	60.2	8.5	57.7	56.0	8.7
50-30-0	55.6	57.1	9.1	53.2	55.8	8.2	54.3	54.1	8.5

* This treatment received 30-15-0 for wheat in 1966

DISCUSSION AND INTERPRETATION OF RESULTS:

The broadcasting of fertilizer in the fall seemed to be the better method for corn the 1967 crop season. Yield, Table 4, response from nitrogen alone was not as high as those having phosphorus in the ratios. A residual carryover for the 0-0-0 treatment, which was preceded by 30-15-0 in 1966, helped increase yields 2.1 bushels in the fall broadcast of fertilizer and 3.7 bushels in the starter applied fertilizer treatment. The yields on an over all average are lower than for 1966 and the moisture content was higher.

Three plots of each replication received high applications of fertilizer for wheat and corn in 1956. Subsequent to this large application, a maintenance amount is to be applied each year as indicated in tables 5 and 6.

RESULTS:

Table 5. Large Initial Application of Fertilizer plus Maintenance Fertilizer for Wheat

Rate 1965	Rate 1967	Yield Bu/A	Av. 65-67	Av. Protein 65-66
100-0-0	30-0-0	38.9	28.5	12.6
100-60-0	30-7-0	41.1	31.5	13.7
100-60-100*	30-7-0	42.0	31.6	13.8

*Potassium was applied in 1965 only.

As a brief resume, wheat was planted initially in the spring of 1965 after the plots received the initial heavy application of fertilizer reported in table 5. Each fall starting with 1965, the maintenance amounts of fertilizer were applied and then plowed under the following spring.

The yield increase caused by the large initial application plus the maintenance application of fertilizer, table 5, produced a slightly higher yield than the similar treatment which lacked the initial application, table 3.

RESULTS:

Table 6. Large Initial Application of Fertilizer Plus Maintenance Fertilizer for Corn

Rate 1965	Rate 1967	Yield Bu/A	Av. 65-67	Av. Protein 65-66
100-0-0	50-0-0	53.6	56.8	8.7
100-60-0	50-7-0	62.3	62.9	8.8
100-60-100*	50-7-0	63.2	63.9	9.1

* Potassium was applied in 1965 only.

Corn was planted following these heavy applications in 1965 and the management was the same as for fertilized wheat. By comparing table 6 to the fall broadcast treatment in table 4 the effect of residual fertilizer becomes apparent. Increases in yield vary from 1.0 bushels for the 50-0-0 treatment to 2.1 bushels for 50-7-0 treatment and may increase in yield above this point may be due to the potassium in the initial application.

RESULTS:

Table 7. Time, Rate and Placement of Fertilizer for Wheat. Fall Broadcast Fertilizer, Moisture use and Bushels Per Inch of Water Utilized.

Treatment N+P Lbs/A	Yield Bu/A.	Water Loss Inches*	Precip. During Season	Loss from Profile and Precip. **Inches used	Bushels per inch of water used***
0-0-0	29.9	4.67	6.98	11.65	2.57
30-0-0	37.2	5.51		12.49	2.98
30-7-0	37.5	5.33		12.21	3.07
30-15-0(1)	40.5	5.36		12.34	3.28
30-15-0(2)	39.7	4.85		11.83	3.36
30-30-0	39.8	5.75		12.73	3.13
100-0-0(3)	38.9	5.23		12.21	3.19
100-60-0(4)	41.1	3.85		10.83	3.80

*Soil water loss in the 3-foot section of the soil from April 20 to Aug. 15 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation, and runoff after receiving precipitation. Even though some is lost, all figure into the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

(1) Preceded by 50-15-0 in 1966
(2) Preceded by 0-0-0 in 1966
(3) 100-0-0 applied in 1965 with 30-0-0 applied every year after.
(4) 100-60-0 applied 1965 with 30-7-0 applied every year after.

Table 8. Time, Rate and Placement of Fertilizer for Corn, Fall Broadcast Fertilizer, Moisture Use, and Bushels of Grain Per Inch of Water Utilized.

Treatment N+P Lbs/A	Yield Bu/A	Water Loss Inches*	Precip. During Season Inches	Loss from Profile and Precip. Inches** Used	Bushels per Inch of Water Used***
0-0-0	38.6	2.59	8.69	11.28	3.42
0-0-0(2)	40.7	2.76		11.45	3.55
50-0-0	52.6	1.85		10.54	4.99
50-7-0	60.6	2.84		11.53	5.26
50-15-0	59.9	2.46		11.15	5.37
50-30-0	55.6	2.28		10.97	5.07
100-0-0(3)	53.6	2.74		11.43	4.69
100-60-0(4)	62.3	3.18		11.87	5.25

*Soil water loss in the 3-foot section of the soil from May 29 to Oct. 19 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation and runoff after receiving precipitation. Even though some is lost, all figure into the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

(2) Preceded by 30-15-0 in 1966
(3) 100-0-0 applied in 1965 with 50-0-0 applied every year after.
(4) 100-60-0 applied in 1965 with 50-7-0 applied every year after.

DISCUSSION AND INTERPRETATION OF RESULTS

The use of stored soil moisture and precipitation during the growing season to produce wheat or corn was studied in the plots fertilized by the fall-broadcast method. The results are reported in tables 7 and 8. Residual response for fertilizer applied in previous years increased wheat or corn yields and the use of moisture in comparison to untreated plots. With the addition of fertilizer, plants made better use of the moisture and produced more bushels of grain per inch of water used this season.

TITLE: DEPTH PLACEMENT OF FERTILIZER FOR WHEAT AND SILAGE CORN

OBJECTIVES OF EXPERIMENT

1. Evaluate various methods of fertilizer application.
2. How much will placement increase yield or profits?
3. What effect will fertilizer placement have on moisture extraction?

EXPERIMENTAL PLAN:

1. Land was laid out by areas and each Block contained 8 plots which represented 1 replication. There are five replications in each phase.

2. A rotation of wheat and silage corn is being used.

3. Treatment No. 1 - The fertilizer is broadcast on the stubble and plowed in;
   Treatment No. 2 - Plow Sole fertilizer is banded at 21 inch intervals;
   Treatment No. 3 - Deep Application- fertilizer is banded at 21 inch intervals and from 16 to 18 inches deep.

4. All fertilizers are applied in the fall except in the first year. Plots not receiving deeply placed fertilizer are subjected to the same deep ripping treatment.

5. Plowing is on the contour along the long axis of the block with beginning and finish of plowing in the alleyways between blocks.

6. Direction of plowing must be altered every year.

7. Planting is on the coutour. Silage corn in 30 inch rows, small grain in 7 inch rows.

8. A plant mulch is maintained for winter cover.

9. Soil moisture is sampled with a Neutron measuring and recording device at depths of 8 inches, 12 inches, 24 inches, and 36 inches.

10. Soil analysis - Soil samples to be taken at 0-6", 6-12", and 12-18" for Organic matter, Soluble Nitrates, Available P, Available K, pH, and Soluble salts.

ROTATION

1. Wheat-Silage Corn

TREATMENTS

	Wheat	Corn
Broadcast on stubble	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Plow Sole	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Deep placement	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Check plot (Ripped)	0-0-0	0-0-0
Check plot (not ripped)	0-0-0	0-0-0

* The 15 pounds of phosphorus will be applied with the grain drill at planting time.

Ratios expressed in actual N and P

PLANTING RATES

1. Wheat; 1 Bushel-1 1/4 Bushel per acre. Chris wheat.
   Corn, Silage 17-18 thousand plants per acre.

WEED CONTROL

Small grain; 2, 4-D
corn - Ramrod and 2,4-D

RESULTS:

Table 9. Depth Placement of Fertilizer for Wheat. Spring Applied in 1967. Moisture Use and Bushels of Grain Per Inch of Water Used.**

Treatment N+P (4) Lbs/A		Yield Bu/A	Water Loss Inches*	Precip. During Season	Loss From Profile and Precip. Inches Used**	Bushels Per Inch of Water used***
0-0-0	No Rip	29.7	4.50	6.98	11.48	2.59
0-0-0	Rip	31.6	4.94		11.92	2.65
60-0-0	Broadcast (1)	37.4	5.53		12.51	2.99
60-0-0	Plow Sole (2)	39.2	5.40		12.38	3.17
60-0-0	Deep (3)	38.6	5.66		12.64	3.05
120-0-0	Broadcast	38.4	5.40		12.38	3.10
120-0-0	Plow sole	39.7	5.89		12.87	3.08
120-0-0	Deep	38.3	5.07		12.05	3.18

*Soil water loss in 3-foot section of the soil from April 20 to Aug. 15 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation and runoff after receiving precipitation. Even though some is lost, all figure in the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + percipitation}}$ = bushels of grain produced per inch of water used.

(1) Fertilizer broadcast on surface and plowed in.
(2) Fertilizer applied at 21 inch spacing 6-7 inches deep.
(3) Fertilizer applied at 21 inch spacing 14-16 inches deep.
(4) At planting time, 15#of P is applied with grain drill to the nitrogen treatments.

DISCUSSION AND INTERPRETATION

Deep tillage loosens and shatters the soil to increase water penetration. It is most effective when the soil is dry as was the case this last fall when the plots were prepared for 1968.

The wheat yields, table 9, increase due to ripping of unfertilized plot was 2 bushel more than the untreated plots. Nitrogen fertilizers, either 60-0-0 or 120-0-0, increased yield 7 to 10 bushels, but the depth placement did not seem to have much effect. In addition, the number of bushels of wheat produced per inch of water lost which was stored in the soil and added by precipitation was not increased by ripping but was increased by nitrogen application.

CORN, SUDAN, AND SORGHUM FORAGE STUDIES

Garden City

OBJECTIVES OF EXPERIMENT:

1. Determine yield of crop in 20 and 40 inch row spacings and plant spacing in the row.

2. Compare yields of sorghum varieties, sudan and a corn variety under similar conditions.

ENVIRONMENT:

Fertilizer	60-16-0 elemental
Planting Date	June 2
Harvest Date	October 4
Rainfall	8.05 inches

RESULTS:

Table 10. Corn and Sorghum Forage Tests - 1967. Tons Per Acre Garden City Unit.

Crop*	Plant Space In Row Inches	Plants Per Acre Thousand	40" Row Silage Wt.	40" Row 12% H_2O Wt.	20" Row Silage Wt.	20" Row 12% H_2O Wt.
Forage Sorghum Waconia	2	78	9.5	4.3		
	3	52	9.9	4.3		
	3	104			11.8	4.1
	4	78			11.8	4.2
Forage Sorghum Hybrid Leafy, Pioneer 931	4	39	10.2	5.0		
	6	26	10.1	4.9		
	6	52			12.0	5.6
	8	39			11.3	4.9
Sorghum Sudan Caladino-Greenlan	1	156	8.0	4.0		
	1.5	104	10.6	5.0		
	1.5	208			9.7	4.3
	2	156			10.0	4.3
Corn Pioneer Blend	8	19.5	9.9	5.1		
	12	13	8.0	3.9		
	12	26			10.1	4.6
	16	19.5			9.7	4.4
Forage Sorghum Hybrid Advance 1071 F	2	78	10.6	4.0		
	3	52	9.8	3.9		
	3	104			11.3	4.3
	4	78			12.9	5.3
Sudan NK Trudan II	1	156	5.7	3.3		
	1.5	104	4.9	2.7		
	1.5	208			7.0	3.7
	2	156			6.3	3.1

* Planted June 2
Harvested October 4

DISCUSSION AND INTERPRETATION

This experiment formerly was conducted using the more popular varieties. Forage yields of six types of plants are now being studied. These plants are a true forage sorghum, a leafy type forage sorghum hybrid, a forage sorghum hybrid, a sorghum sudan, a true sudan, and a silage blend of corn. The row spacings remain the same, but the plant populations were changed as indicated in table 10.

The crops planted in 20-inch rows, in general, produced the most silage, but dry matter production varied from one row width to the other as plant spacing varied.

GREEN CHOP FORAGE

OBJECTIVES:

1. Determine the forage yield of crops planted with a grain drill using oats and various companion crops.

2. Compare regrowth of these crop combinations.

RESULTS:

Table 11. Green Chop Forage Combination Test 1967, Tons Per Acre
Garden City Unit

Crop*	Wet Wt.	12% H_2O Wt.
Oats + Sorghum	6.8	3.7
Oats + Soybeans	4.5	3.2
Oats + Field Peas	5.9	3.8

* Planted May 23
Harvested Sept. 1

DISCUSSION AND INTERPRETATION OF RESULTS:

A press drill was used for the planting of these crops. The planting rate for oats was 2 bushels per acre and the other crops were planted at half their normal recommended rates per acre. No fertilizer was applied in 1967. In 1968, each treatment will have fertilizer applied to half of it. Oats will be grown without a companion crop in 1968 as an added part of this experiment.

The oats plus sorghum produced enough regrowth for pasturing but not cutting.

PERFORMANCE TRIALS, NORTHEAST RESEARCH FARMS, WATERTOWN UNIT, 1967

J. J. Bonnemann

OBJECTIVE OF TRIALS:

Testing only at Brookings would be an insufficient guide to varietal performance of the major crops grown across the state. Hence, testing is conducted at substations and with farmer cooperators so those interested can be better informed on the relative performance of varieties grown under similar environmental conditions.

STANDARD VARIETY SMALL GRAIN TRIALS

The small grain trials were seeded on April 5 and harvested from July 28 through mid-August. Germination was slow but uniform until late April when the cold temperatures caused some stand losses, especially in the oat trial. Precipitation was limited in all months except June but the surplus June moisture together with continued below normal temperatures throughout the growing season permitted small grains to perform quite satisfactorily. The prolonged drought effects are most noticeable in the test weights of the grain, particularly barley and spring wheat.

The durum wheats were highest yielding in the 1967 trial and the newer variety, Leeds performed quite satisfactorily. The variety, Manitou, has yielded quite satisfactorily for the three years it has been in these trials.

The new South Dakota release of barley, Primus, was better than the two other recommended malting types in the trial, Larker and Dickson. Liberty continues to perform well and has the best record of the feed barleys.

The oat yields were good in 1967 and test weights proportionately higher than in the other small grain trials. Clintland 64 has the highest 4-year average. Some of the varieties that have generally performed well in this area were down in 1967 due to stand losses caused by the continued cold in late April.

Of the varieties presently resistant to the known races of flax rust in North America, Summit, Windom and Redwood have the highest 4-year averages.

Further information on the 1967 small grain trials will be found in Circular 182, 1967 Small Grain Variety Trials.

CORN PERFORMANCE TRIALS

Twenty-eight corn hybrids were included in the 1967 trials. Seeding was done on May 19 and harvest was completed October 16.

Weather conditons were not ideal for row crops in 1967. Yields ranged from 44.1 to 18.6 bushels per acre. The mositure content was very high in some entries, with nearly all entries above 25 percent at harvest time.

The entries included are the choice of the particpating seed producers. Further information on the trials will be found in Circular 183, 1967 Corn Performance Trials.

GRAIN SORGHUM PERFORMANCE TRIALS J. J. Bonnemann

The present test program has been conducted at the Watertown unit for six years. conditions during 1967 were as unfavorable, weatherwise, as any of the previous

years. Though somewhat dry, conditions at planting time were excellent but from that time on progress was extremely slow.

Moisture samples obtained on September 18 indicate all samples of grain were over 35 percent moisture. One variety was just pollinating when freezing temperatures stopped growth. Yields were low and of very poor quality grain.

Further information can be found in Circular 184, 1967 Grain Sorghum Performance Trials.

Table 12. Standard Variety Spring Wheat and Durum Trial, Watertown Unit, 1967

Variety	Test Wt. lb/bu	Yield, Bu/Acre 1967	1965-67
Leeds*	61.5	44.6	
Lakota*	57.0	44.4	38.1
Fortuna	60.0	44.1	
DT 191*	60.0	43.8	
CI 13937	59.5	43.7	
Wells*	59.0	43.3	37.6
Crim	57.0	42.7	30.5
Manitou	59.0	41.3	34.2
Selkirk	55.0	40.8	29.5
Rushmore	59.0	40.7	29.2
11-55-16	60.0	39.8	
Chris	57.0	39.7	35.8
Justin	57.0	38.9	30.5
Pembina	57.0	38.4	29.2
CI 13773	60.0	38.1	36.8
Thatcher	57.0	37.6	26.9
Sheridan	58.0	35.8	32.0
Stewart 63*	60.0	35.1	33.2
	Mean	40.7	
* durums	LSD (.05)	3.6	

Table 13. Standard Variety Barley Trials, Watertown Unit, 1967

Variety	Test Wt. lb/bu	Yield, Bu/Acre 1967	Yield, Bu/Acre 1966-67
Liberty	47.5	70.8	51.1
CI 11864	47.0	68.5	43.6
Primus	48.0	67.3	46.3
Traill	47.0	67.0	41.7
Conquest	46.0	66.7	46.2
CI 11863	47.0	64.8	42.8
Larker	47.5	61.2	42.7
Trophy	46.5	60.7	40.4
CI 13110	45.0	60.5	40.7
Firlbecks III	50.0	59.5	
Spartan	50.5	56.0	46.6
Galt	45.0	55.7	39.4
Dickson	47.0	48.5	31.6
Plains	48.0	48.3	42.7
	Mean	61.1	
	LSD (.05)	13.4	

Table 14. Standard Variety Oat Trial, Watertown Unit, 1967

Variety	Test Wt. lb/bu	Yield, Bu/acre 1967	Yield, Bu/acre 1964-67
Clintland 64	37.5	108.5	90.0
O'Brien	40.0	104.9	
Orbit	34.5	104.7	
Clintford	41.0	104.1	84.6
Dodge	38.5	103.5	83.5
Stormont	34.5	103.3	
Tippecanoe	38.5	102.5	81.1
Kelsey	34.0	101.9	
Portage	35.5	101.8	83.8
Burnett	39.0	101.7	85.1
Multiline E68	41.0	101.1	
Santee	38.0	101.0	86.4
Jaycee	37.0	100.1	
Minhafer	38.5	99.7	83.0
Brave	38.0	99.6	85.1
Sioux	36.0	99.4	
CI 8178	36.5	99.0	
Andrew	37.5	98.7	79.4
Ortley	39.5	96.4	82.6
Multiline M68	38.5	93.8	
Coachman	37.5	93.4	78.6
Tyler	36.5	91.8	80.9
CI 8273	38.5	91.3	
Dupree	35.5	91.0	82.2
Garry	35.5	90.8	76.8
Dawn	38.0	86.8	
Rodney	34.5	86.7	72.7
Lodi	34.0	83.5	75.1
Holden	34.5	83.3	85.5
Wyndmere	35.5	80.7	
Garland	37.5	76.4	80.3
	Mean	96.3	
	LSD (.05)	13.0	

Table 15. Standard Variety Flax Trial, Watertown Unit, 1967

Variety	Test Wt. lb.bu	Yield, Bu/acre 1967	Yield, Bu/acre 1964-67
Noralta	53.0	23.3	
Norland	53.5	22.4	20.3
Redwood 65	52.0	22.0	
Summit	53.0	21.7	23.9
Redwood	53.0	21.6	22.7
B-5128	53.5	21.2	21.1
Caldwell	53.5	21.1	21.9
CI 2483	53.0	20.9	
CI 2444	54.0	20.8	
Bolley	53.0	20.7	
CI 2292	54.0	19.5	
Linott	52.5	19.2	
Windom	53.5	18.2	23.0
Mac	53.5	15.4	18.9
Dillman	53.0	14.9	20.3
	Mean	20.2	
	LSD (.05)	2.8	

Table 16. Corn Performance Trial, Area D2, Northeast Reserach Farms, Watertown Unit, 1964-67

Variety	Perfor-mance rating	Percent stalks broken	Percent moisture	Yield, B/A 1967	Yield, B/A 1964-67
SD EX 48 (4x)	3	0	31.2	44.1	
SD Ex 59 (2x)	2	0	25.2	43.2	
SD 240 (4x)	5	2	30.6	39.3	32.4
Pioneer 3956 (2x)	4	0	28.0	38.8	
Pioneer 3935 (2x)	6	0	28.0	38.3	
T-E Suremaker (3x)	14	3	37.9	37.9	
Minn. 805 (4x)	1	1	22.5	37.8	
SD 248 (3x)	11	1	34.3	37.7	35.5
SD 230 (4x)	12	1	33.1	37.0	30.8
T-E Profitmaker (2x)	19	0	39.3	36.9	
SD 220 (4x)	8	3	25.9	36.7	26.0
T-E Hastymaker (4x)	13	0	32.0	36.2	
Sokota 211 (4x)	7	0	23.7	36.0	
Northrup-King KE 497 (4x)	21	0	38.4	35.6	38.9
SD EX 58 (4x)	10	2	26.4	35.2	
Sokota TS-50 (2X)	16	1	32.4	35.2	31.1
Northrup-King PX 525 (3x)	22	0	36.9	35.0	
Pioneer 388 (4x)	15	1	28.9	34.7	30.4
Minn. 806 (4x)	9	0	21.5	34.6	
Pioneer 3854 (4x)	18	0	31.3	34.2	28.4
Sokota 225 (4x)	17	1	27.7	33.4	25.3
Pioneer 3812 (4x)	23	1	33.6	32.9	32.8
Pioneer 3862 (4x)	20	0	29.3	32.8	27.7
Northrup-King PX 527 (3x)	24	0	34.9	32.0	
Pioneer 3658	26	1	41.4	28.7	
Minn. M320 (3x)	25	0	33.8	28.5	
T-E Grosmaster (4x)	27	0	44.1	27.0	
T-E Cashmaker (2x)	28	14	55.5	18.6	
		Mean	32.4	34.9	
		LSD (.05)		4.6	

Table 17. Grain Sorghum Performance Trial, Area D2, Northeast Research Farms, Watertown Unit, 1964-67

Variety	Height, inches	Test Wt.* lb/bu	Yield, 100#/A 1967	Yield, 100#/A 1964-67
SD 441	47	56	22.6	23.6
NK 115	37	54	21.1	26.0
Pioneer X-5848	29	40	17.0	
NK 120	36	49	17.0	24.8
Haapaia BL-101	39	52	16.1	
SD 102	39	48	15.4	
Nebr. 504	38	43	14.0	
NK 125	39	45	13.6	23.5
SD 503	38	48	11.2	22.1
SD 451	39	45	11.1	21.5
Paymaster Ex. 1036	37	49	10.4	
Pioneer 894	31	45	10.1	
DeKalb B-32	36	47	9.6	19.6
T-E 44C	38	47	9.6	
Pawnee	39	34	9.1	21.7
NK X4010	37	39	7.3	
T-E 44	30	30	5.4	
NK 133	37	19	2.5	20.6
DeKalb DD-50	37	[a]	a	
		Mean	12.4	
		LSD (.05)	3.3	

* all varieties were above 35% moisture in grain on 9/18/67
[a] just pollinating at time of first frost

PERFORMANCE TRIALS OF WINTER GRAIN, SPRING GRAIN, CRAMBE, MUSTARD AND SUNFLOWERS AT GARDEN CITY UNIT, 1967.

Q. S. Kingsley

Table 18. Standard Variety Spring Wheat and Durum Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Sheridan	49.0	61
CI 13937	42.4	61
Manitou	40.8	57
Fortuna	40.0	61
Justin	40.0	57
Crim	39.2	59
Chris	39.0	57
Selkirk	35.0	56
Pembina	34.4	57
Rushmore	30.8	59
Durum		
Wells	40.2	62
Stewart 63	33.7	61
Leeds	30.3	62

Table 19. Standard Variety Barley Trials.

Variety	Yield Bu/A	Test Wt. Lb/Bu
Firlbecks III	85.3	49
Primus	83.2	48.5
Larker	78.7	48
Dickson	74.7	46.5
Liberty	72.2	47
Conquest	70.8	46
Traill	69.7	47.5
Trophy	63.9	45.5

Table 20. Standard Variety Oat Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu.
Kelsey	132.5	35
Lodi	130.4	33
Ortley	128.0	34
Portal	127.0	36
Portage	120.4	35
Sioux	115.2	37
CI 8178	113.8	37
Rodney	111.8	33
Orbit	110.0	35
O'Brien	96.5	38
Tyler	94.8	37
Burnett	94.1	38
Wyndmere	89.3	37
Clintford	88.9	41
Garland	88.6	37
Brave	86.5	38
Dawn	82.0	37
Clintland 64	80.6	37
Dodge	80.6	39
Jaycee	80.3	39
Holden	78.2	37
Tippecanoe	72.7	36

Table 21. Standard Variety Rye Trials

Variety	Yield Bu/A
Frontier	63.1
Von Lochow	59.5
Caribou	50.4
Pierre	45.6

Table 22. Standard Variety Flax Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Redwood 65	24.5	52
Noralta	21.2	53
Linott	21.0	53
Caldwell	20.7	53
Bolley	20.2	52
Summit	20.0	53
Redwood	19.6	53
B-5128	19.5	53
CI 2292	19.5	53
Windom	17.1	52
Mac	15.4	53
Dillman	14.7	53

Table 23. Standard Variety Winter Wheat Trials

Variety	Garden City		Watertown	
	Yield Bu/A	Test Wt. Lb/Bu	Yield Bu/A	Test Wt. Lb/Bu
Lancer	51.6	61	46.3	62
Winalta sel	49.6	63	46.6	62
Minter	48.0	61	45.0	61
Hume	42.6	60	44.5	61

Table 24. Crambe, Mustard and Sunflower Trial

Crop	Garden City Lb/A	Watertown Lb/A
Cambe	1100.3	994.3
Mustard	962.9	617.7
Sunflower	1478.2	

COMPARATIVE TESTS OF NEW WHEAT, OATS AND FLAX STRAINS AND COMMERCIAL VARIETIES

OAT BREEDING

R. S. Albretchsen

The Uniform Midseason Oat Performance Nursery, Rod Row Oat I and Rod Row Oat II Nurseries were grown at the Watertown Unit in 1967, as a part of the South Dakota Oat Breeding and Testing Program.

Data on the highest yielding experimental strains and varieties present in the Uniform Midseason Oat Performance Nursery are shown in Table 25. Two-year averages for 1966-67 indicate quite consistent performance of the entries over the 2 years. This nursery includes strains entered by states throughout the North Central Region of the United States and Canada. Entries in this nursery are primarily of the midseason to late maturity class, being as late as, or later than, the Clintland type oats. Most of these strains are of a maturity range suitable for growing in Northeastern South Dakota. Detailed final evaluation in this nursery by all cooperating agencies serves as a basis for decision on the release of strains as new varieties.

Experimental strains in the two Rod Row Nurseries are all of South Dakota origin. Data are not included for these nurseries since they are more preliminary in nature. The most promising strains from these nurseries will be advanced to testing in the Uniformegional Nursery at a later date.

Table 25. Performance of Selected Experimental Oat Strains and Check Varieties in the Watertown Uniform Midseason Oat Performance Nursery

C.I. Number	Variety or Selection	Bushel Weight		Yield	
		1967	66-67	1967	66-67
7463	Clintford	38.5	38.4	116.1	84.7
8304	11-31-21	34.5	*	114.9	*
4988	Mo. 0-205	36.0	34.5	112.9	82.0
8178	B-60-2-149	36.8	34.4	111.1	80.8
7639	Clintland 64	35.5	34.8	110.6	79.8
7811	Orbit	33.2	31.8	110.1	79.6
7971	Jaycee	35.8	34.0	108.3	79.0
8040	Portal	34.5	34.6	106.7	78.6
----	X1137-2	34.8	*	105.4	*
4170	Andrew	35.0	34.6	105.3	78.6
----	X1144-3	35.8	*	105.0	*
----	M-68	33.8	*	104.5	*

* First tested in 1967

FLAX BREEDING

R. S. Albrechtsen

The Uniform Regional Flax Nurseries (early and late seeded), State Rod Row Flax Nursery, Preliminary Rod Row Flax Nursery, a Flax F_1 and F_2 Yield Test Nursery, Flax Rust Differentials, and approximatley 500 flax plant rows were grown at the Watertown Unit in 1967 and part of the South Dakota Flax Breeding and Testing Program.

Entries in the Uniform Regional Nurseries are in the final stage of evaluation and these nurseries are grown throughout the North Central flax-growing region of the United States and Canada. Strains in these nurseries will serve as the source of new variety releases by the cooperating agencies.

Table 26 gives agronomic and quality data for entries in the early seeded (April 27) Uniform Regional Flax Nursery. Data on the same entries seeded nearly 4 weeks later (May 23) are shown in Table 27. Overall mean seed yield was reduced from 23.1 bushels per acre at the early seeding date to 15.6 bushels per acre from the late seeding. In general, yield of late maturing strains was reduced much more than that of early strains from late seeding.

Experimental strains in the two Rod Row Nurseries are of South Dakota and Minnesota origin. Data from these nurseries are not included since the tests are more preliminary than the Regional Nurseries. Promising strains will be subjected to more advanced testing.

F_1 and F_2 progeny of all possible single cross combinations among 11 parent strains (110 combinations, including reciprocals) plus the parents were grown in a yield test to study the potential of hybrid flax production and to determine high yielding combinations. Preliminary data show that F_1 mean seed yields ranged from 6% below to 36% above that of the high parent in the cross, with an average increase of 17%. Corresponding comparisons in the F_2 generation ranged from 11% below to 19% above, with a mean increase of 3% over the high parent. The highest yielding F_1 combination yielding 30% above the highest yielding of all parent strains; the greatest corresponding increase in F_2 was 16%.

The Flax Rust Differentials were grown to identify prevalent races of flax rust in the area and to assist in the detection of new races. Poor environmental conditions for development of the rust organism prevented its expression in 1967.

Phenotypically superior lines were selected from the plant row material to be advanced to preliminary yield tests.

Table 26. Results of the 1967 Uniform Regional Flax Nursery - Early; Watertown. (W67 URFN-E)

C.I. Number	Variety or Selection	Height	Maturity Date	Oil Content	Iodine Value	Test Wt.	Yield Per acre		Yield Rank
		(In.)	(Aug.)	%		(Lbs.)	(Lbs.)	(Bu)	
389.	Bison	26	9	39.4	175	54.0	1198	21.4	15
1130.	Redwood	22	11	40.4	178	53.5	1277	22.8	11
1478.	Bolley	23	11	41.5	184	53.5	1193	21.3	16
1823.	Windom	22	11	39.6	183	54.8	1389	24.8	3
1914.	Summit	22	12	39.3	178	54.2	1400	25.0	2
2444.	Rwd. x Birlo	23	15	39.8	178	55.0	1378	24.6	4
2445.	Rwd. x Mar. 79	23	11	40.5	186	53.5	1187	21.2	17
2446.	"	22	11	41.0	183	54.5	1366	24.4	5
2480.	Rwd. x Veluta-Raja	23	13	40.7	180	52.5	1215	21.7	14
2481.	Bison L^{0}M-W^{1}	23	13	40.3	181	52.0	1075	19.2	18
2482.	1085 x Rwd.	24	13	40.7	185	54.8	1321	23.6	7
2483.	1085 x Bolley	22	11	41.7	181	53.0	1288	23.0	9
2522.	Linott	23	10	40.3	180	53.5	1282	22.9	10
2523.	1605 x Minerva	22	14	41.7	179	54.8	1232	22.0	13
980.	B-5128	23	16	40.3	174	54.8	1305	23.3	8
2430.	Noralta	23	6	40.4	175	54.8	1333	23.8	6
2290.	Rwd. x Crystal	24	12	41.1	180	53.5	1271	22.7	12
2292.	B-5128 x Redson	24	14	38.7	178	54.8	1506	26.9	1

Seeded April 27, 1967
Overall mean yield = 1294 lbs. 23.1 bu.
C.U. = 7.7%
L.S.D. 105 = 141 lbs., 2.5 bu., or 10.9%
Number of rep = 4

Table 27. Results of the 1967 Uniform Regional Flax Nursery - Late; Watertown (W67 URFN-L)

C.I. Number	Variety or Selection	Height	Maturity Date	Oil Content	Iodine Value	Test wt.	Yield Per Acre		Yield Rank
		(In.)	(Aug.)	%		(Lbs.)	(Lbs.)	(Bu)	
389.	Bison	28	21	39.0	175	54.0	885	15.8	10
1130.	Redwood	30	23	39.1	184	54.5	823	14.7	13
1478.	Bolley	26	17	40.1	187	53.5	997	17.8	5
1823.	Windom	24	16	38.1	187	54.5	1036	18.5	1
1914.	Summit	24	19	37.4	182	55.0	1025	18.3	3
2444.	Rwd. x Birlo	25	23	39.5	183	55.5	1030	18.4	2
2445.	Rwd. x Mar. 79	27	19	39.4	192	54.5	879	15.7	11
2446.	"	27	19	39.4	188	55.0	868	15.5	12
2480.	Rwd. x Valuta - Raja	28	21	39.4	188	52.5	778	13.9	14
2481.	Bison $L^{6}M^{3}N^{1}$	26	20	39.2	186	54.0	918	16.4	8
2482.	1085 x Rwd.	27	22	39.6	191	55.0	739	13.2	15
2483.	1085 x Bolley	26	18	40.2	187	54.0	1008	18.0	4
2522.	Linott	25	17	38.9	182	54.5	941	16.8	7
2523.	1605 x Minerva	24	23	41.2	181	55.0	941	16.8	6
980.	B-5128	31	26	38.8	182	54.0	633	11.3	17
2430.	Noralta	27	16	38.4	183	54.0	621	11.1	18
2290.	Rwd. x Crystal	29	19	39.8	187	54.0	638	11.4	16
2292.	B-5128 x Redson	29	23	36.2	182	54.5	885	15.8	9

Seeded May 23, 1967
Overall mean yield = 874 lbs. 15.6 bu.
C.U. = 9.9%
L.S.D. .05 = 122 lbs., 2.2 bu., or 13.9%
Number of Reps = 4

WHEAT IMPROVEMENT

D. G. Wells, C. L. Lay

Breeding for better survival of winter wheat is aided by testing at the Watertown station where winter injury is usually intensive. In 1967, there were 2300 rows. More winter injury occurred than is best but we learned something about the breeding lines. Relative survival of 4 varieties seeded in a barley stubble was more representative of their true hardiness than when seeded in fall plowing, however. By this is meant that Lancer and Minter in stubble survived 48% and 80% respectively while on fall plowing they survived 0% and 5% respectively. Since survival in stubble was not only remarkably high but distinguished clearly between varieties so different in hardiness, we seeded 2800 rows in stubble in the autumn for hardiness testing. We also seeded 1800 rows on fall plowing in the autumn.

A seeding rates test of Chris and Wells was continued. Cooperative testing of hard red spring and of durum wheats was continued, partial summaries of which are shown below.

Table 28. Partial Summary of the Cooperative Regional Test of Hard Red Spring Wheat

Entry	Lodging %	Ht. Inches	Test Wt. #	Yield Bu.
Marquis	8	45	53	20
Thatcher	10	43	56	35
Selkirk	10	43	55	37
Justin	10	41	58	40
Chris	25	41	59	38
Manitou	10	44	59	39
II 55-11	15	43	60	38
61-107	8	40	60	43
270	1	35	57	43
4200	8	44	60	45
LSD .05				7 bu.

Table 29. Partial Summary of the Cooperative Regional Test of Durum Wheat

Entry	Lodging %	Ht. in.	Test Wt. #	Yield Bu.
Mindum	5	50	56	21
Wells	1	44	57	38
Lakota	5	43	56	43
Stewart 63	8	50	59	33
Leeds	1	44	62	40
63-3	5	43	60	41
64-36	5	44	60	44
64-207	3	46	59	44
64-214	3	44	61	43
64-238	1	46	60	43
191	1	41	59	46

SORGHUM BREEDING AND TESTING - NORTHEAST FARM

WATERTOWN UNIT 1967

A. O. Lunden

Grain sorghum yields were not very satisfactory in 1967 with the better hybrids producing only about 2,800 pounds or 45 bushels per acre as temperature conditions were undesirable for this heat-loving crop. The planting included 85 hybrids in advanced yield tests or preliminary observation tests. Several of these which were also included in regional preliminary tests will be advanced to regional yield tests in 1968 for planned release in 1969.

One or two extra leafy forage hybrids will also obtain final testing in 1968 for 1969 release. These forage sorghum hybrids are quite different from the SD252-F or Dual type in their growth habit and forage type. They are considerably shorter, have profuse leafing which holds on the plant until frost, are designed for full season production in contrast to the early maturity of Dual and have good lodging resistance. Extensive demonstration plantings are planned in 1968.

SOYBEAN BREEDING AND TESTING

WATERTOWN UNIT - 1967

A. O. Lunden

Soybean yields were not satisfactory in 1967 with the best varieties producing slightly under 14 bushels per acre which is about 35% below the five year average. The yield of Hark, released in 1967, was quite favorable in relation to Chippewa.

The new variety Corsoy, Which will be released in counties south of Brookings in 1968, was also favorable relative to Chippewa, but is not presently recommended as far north as Watertown as it is much later than Chippewa in maturity.

Row spacing tests which included 20 and 40 inch rows of Hark, Corsoy and Chippewa revealed no significant differences in yields under these row spacings. Ramrod was used for weed ocntrol with acceptable results but this chemical is not cleared for commercial soybean production. Narrow-row plantings will be repeated in 1968.

Table 30. 1967 Yields and Five Year Averages for Soybean Varieties at the Northeast Farm.

Variety	Maturity (Relative to Grant)	1967 (Bu/A)	1963-67 (Bu/A)
Group 0 (Early)			
Grant	0	13.5	18.9
Traverse	+1	13.6	18.3
Group I (Midseason)			
Chippewa	+3	11.5	19.5
Hark	+8	13.4	19.7
Group II (Late) Corsoy	+10	13.9	----

PHYSIOLOGICAL MATURITY OF SORGHUM SEED

Garden City and Watertown Units, 1967

R. C. Kinch

Physiological maturity of sorghum seed was studied at both locations. Seed of grain sorghum hybrids-SD 441, SD 451, RS 503- and the forage sorghums-Rancher, 39-30-S and Piper sudangrass- were produced. Harvesting of heads was

started in August and harvests were continued at weekly intervals for the next 11 weeks with the last harvest about two weeks after the killing frost.

The heads were dried and threshed and yields are being calculated.

Moisture content at time of each harvest is being correlated with seed yield per acre, test weight, 1000 seed weight, seed germination and seed germination vigor.

Unfortunately summerization of the data has not progressed sufficiently to be included in this report.

WEED RESEARCH

J. F. Stritzke and C. E. Stymiest

Evaluation of Atrazine plus Oil on Sorghum

Objectives: (1) To evaluate foxtail control with various postemergence applications of atrazine plus crop oils.
(2) To evaluate sorghum injury from these various treatments.
(3) To compare three different crop oils in combination with atrazine.

Methods and Materials:

Location: Garden City, South Dakota Research Farm

Soil Type: Silty loam Organic matter content 4%

The herbicide treatments were applied postemergence on June 29 with a tractor type sprayer when grassy weeds were at the two to four leaf stage and sorghum was at the three to five leaf stage. This was a broad-cast application over 10 ft. by 30 ft. plot applying 20 gal. spray solution per acre. The treatments were replicated four times. All plots were cultivated twice.

Results: Both foxtail control and sorghum injury increased as the rate of atrazine and the rate of oil increased (table 31). For example the best foxtail contol and the greatest sorghum injury occurred with three pounds of atrazine plus two gallons of oil. In fact at these high rates stand reduction of sorghum occurred. No differences in weed control and sorghum injury could be noted with the three brands of oil (table 32).

There appeared to be only a slight advantage for two gallons of oil over one gallon for weed control. However using one gallon of oil with atrazine did give better broadleaf and weedy grass control then did atrazine alone. The height reduction caused by the better weed control treatments was only temporary and by harvest no height difference could be detected. But, there was a delayed maturity in those plots which had early height reductions, and these plots suffered from frost damage. This accounted for the low sorghum yields where good weed control was obtained.

Table 31. The Effect of No oil and 1 Gallon, and 2 Gallons of 3 Brands of Oil Plus Various Rates of Atrazine on Weed Control and Sorghum Yields

Treatment	Rate/A	% Control		Sorghum	
		Broadleaf	Grass	Yields lb.A	Ave. Height July 12 inches
Atrazine + No Oil	0 + 0	0	0	147	8
" " "	1 + 0	40	18	437	7.25
" " "	2 + 0	61	18	517	6.50
" " "	3 + 0	71	35	607	7
Atrazine + Co-op Oil	0 + 1	0	0	393	7.25
" " "	1 + 1	95	55	594	4.75
" " "	2 + 1	94	58	555	4.50
" " "	3 + 1	95	58	291	4
" " "	0 + 2	0	0	260	7
" " "	1 + 2	94	50	493	4.75
" " "	2 + 2	94	65	494	4
" " "	3 + 2	95	79	486	3.75
Atrazine + Sun Oil	0 + 1	0	0	233	7.75
" " "	1 + 1	94	43	558	5
" " "	2 + 1	95	60	311	4
" " "	3 + 1	95	63	385	4
" " "	0 + 2	0	0	323	7.25
" " "	1 + 2	94	54	363	4.50
" " "	2 + 2	95	65	371	4.25
" " "	3 + 2	95	75	212	3.50
Atrazine + Humble Oil	0 + 1	0	0	201	7.25
" " "	1 + 1	95	58	566	4.50
" " "	2 + 1	94	46	410	4.50
" " "	3 + 1	94	60	452	4.0
" " "	0 + 2	0	0	269	8.0
" " "	1 + 2	95	44	432	4.0
" " "	2 + 2	95	61	473	4.25
" " "	3 + 2	95	73	366	3.50

Table 32. The Effect[1] of Using Various Brands of Oil at One and Two Gallons Plus Atrazine on Weeds and Sorghum

Treatment	% Control		Sorghum Yield lb/A	Sorghum Ave. Height July 12 Inches
	Broadleaf	Grasses		
No Oil	57	24	520	6.9
1 gal. Coop Oil	95	56	580	4.4
2 gal. Coop oil	94	65	491	4.2
1 gal. Sun oil	95	55	418	4.3
2 gal. Sun oil	95	65	315	4.1
1 gal. Humble oil	94	55	476	4.3
2 gal. Humble oil	95	59	424	3.9

[1] Each number is an average response from one, two, and three pounds of atrazine per acre.

WETTING AGENT AND OIL EVALUATION

Objectives: (1) To evaluate the effectiveness of atrazine, atrazine + oil and atrazine + wetting agent as a post emergent weed control treatment.

(2) To evaluate injury caused to sorghum by various treatment.

Material and Method:

Location North East Research Farm Garden City, South Dakota

Soil Type Silty loam Organic Matter Content 4%

Plot Size and Design Plots were 10 ft. by 30 ft. and were replicated 4 times in a randomized complete block design.

Method of Application Broadcast treatments were applied with a tractor type sprayer applying 20 gal. spray solution per acre.

Date of Application Treatments were applied when grassy were in the 2- to 4-leaf stage and sorghum was at the 3- to 5-leaf stage. Applications were made on June 29.

Planting Data Sorghum was planted on June 9 in 40 inch rows.

Cultivation All plots were cultivated 2 times. All weed control estimates and height measurements were made prior to first cultivation.

Data Taken Estimations of weed control and sorghum height were taken on July 1 1967. Due to unsatisfactory weedy grass control and drought, sorghum yields were not taken.

Results: Evaluation of foxtail control indicated that the crop oils (Standard, Humble, and Savol) were comparable in their performance when mixed with one pound of atrazine (table 33). Lower grade oils such as LS-1032 and # 1 diesel fuel were less effective when added to atrazine. W-29 (a solvent addative) with atrazine was intermediate between the crop oils and diesel fuel for foxtail control. Adding wetting agents to atrazine spray solutions did not increase foxtail control.

Adding a wetting agent or an oil to one pound of atrazine was not essentia for broadleaf weed control. One pound of atrazine alone gave 100% control of the broadleaf weeds (wild buckwheat, kochia, and Russian thistle).

Sorghum height was decreased by the better foxtail treatments (table 33). For example, height of sorghum was reduced 2.5 inches (34%) when 2 gallons of Humble oil or 1 gallon of Savol oil was added to 1 pound of atrazine. This height reduction was only temporary and by midsummer the sorghum had outgrown this effect.

Table 33. The Effect of Adding Oils and Wetting Agents to 1 Pound of Atrazine on Weed Control and Sorghum Height.

Treatment	Rate lb/Acre	Wetting Agent	% Control Foxtail	% Control Broadleaf	Sorgh Heigh inch
Atrazine + Standard	1# + 1 Gal.	Pre mixed	45	100	5.2
Atrazine + Standard	1# + 2 gal.	Pre mixed	52	100	5.2
Atrazine + Humble	1# + 1 gal.	2% Tide	54	100	5.2
Atrazine + Humble	1# + 2 gal.	2% Tide	64	100	4.7
Atrazine + Savol	1# + 1 gal.	T - Mulz	61	100	4.7
Atrazine + Savol	1# + 2 gal.	T - Mulz	60	100	5.0
Atrazine + LS-1032	1# + 1 gal.	10 ml Tide	42	100	6.2
Atrazine + LS-1032	1# + 1 gal.	5 ml T - Mulz	34	100	5.7
Atrazine + LS-1032	1# + 2 gal.	Tide	36	100	5.5
Atrazine + LS-1032	1# + 2 gal.	T - Mulz	44	100	5.5
Atrazine + W-29	1# + 1 gal.	Pre mixed	31	100	6.0
Atrazine + W-29	1# + 2 gal.	Pre mixed	48	100	5.0
Atrazine + #1 Diesel F	1# + 1 gal.	Tide	32	99	6.5
Atrazine + #1 Diesel F	1# + 1 gal.	T - Mulz	30	90	6.2
Atrazine + #1 Diesel F	1# + 2 gal.	Tide	29	96	6.5
Atrazine + #1 Diesel F	1# + 2 gal.	T - Mulz	22	96	5.7
Atrazine + Trionic	1# + 4 pt/100 gal.		25	95	6.5
Atrazine + Tronic	1# + 4 pt/100 gal.		28	98	7.0
Atrazine + Miltifilm X	1# + 4 pt/100 gal.		12	92	6.7
Atrazine	1#		28	100	7.2

WILD BUCKWHEAT CONTROL IN WHEAT, OATS, AND BARLEY

Objectives: To observe new promising herbicides for the control of Wild Buckwheat and compare them to chemicals now recommended. To observe the effect these new chemicals have on crops on which they are to be used.

Materials and Methods:

Location: Northeast Research Farm Garden City, South Dakota

Soil Type: Silty loam Organic Matter Content 4%

Plot Size and Design: Plots were 10 ft. by 20 ft. and were replicated 3 times in a randomized complete block design.

Planting Data: Chris wheat, Dawn oats and Plains barley were press drilled on April 28, 1967 at the rate of 1 1/2 bushels per acre.

Method and Date of Application: Treatments were applied with a tractor type sprayer applying 20 gal. spray solution per acre on June 2, 1967. The small grain was in the 4-leaf stage at the time of application.

Data Taken: At harvest wild buckwheat kochia, and Russian thistle control notes were taken in the wheat plots and wild buckwheat and other broadleaf weed control notes were taken in the barley plots. Oats was very competitive with the weeds and no weed control readings would be made since only a few weeds were present in the oats plots at harvest. Yield data were taken on the small grain plots at maturity.

Results: There was little yield reduction in untreated check plot due to weed competition this year. Bromoxynil plus MCPA, dicamba plus 2,4-D and dicamba plus MCPA gave good control of wild buckwheat and other broadleaf weeds this year. The low volitile formulation of 2,4-D ester gave fairly good broadleaf weed control and the barley and wheat yields from these plots were satisfactory. The oats yields obtained from the 2,4-D treated plots were lower than those of the untreated check plots. (46 bushels per acre v.s. 80 bushels per acre). Results are shown in table 34.

Table 34. Weed Control Ratings and Small Grain Yields From Various Herbicide Treatments

Treatment	Rate OZ/A	WHEAT				OATS		BARLEY		
		Buckwheat Control	Kochia Control	% Russian Thistle Control	Yield Bu/A	Lodgings[1] (1-10)	Yield Bu/A	% Buckwheat Control	% Other BLW Control	Yield Bu/A
Bromoxynil + MCPA	2 + 4	30	40	30	36	7.3	81	78	57	64
Bromoxynil + MCPA	4 + 4	80	85	85	39	6.0	88	92	88	70
66-71-B + MCPA	4 + 4	32	27	27	37	7.0	77	38	30	63
Picloram + 2,4-D	1/4 + 4	47	17	45	38	7.3	79	88	38	60
Picloram + MCPA	1/4 + 4	33	7	17	35	6.7	90	62	23	58
Dicamba + 2,4-D	1 + 4	70	80	78	40	5.0	74	90	78	62
Dicamba + 2,4-D	2 + 4	75	87	85	41	2.7	51	92	85	68
Dicamba + MCPA	1 + 4	80	75	72	37	6.3	77	95	93	64
Dicamba + MCPA	2 + 4	70	70	67	36	4.0	65	72	83	59
2-4-D Ester	8	43	95	95	43	3.3	49	99	88	66
2-4-D Amine	12	37	67	63	38	5.0	57	87	73	63
LV Ester	8	63	95	93	40	3.0	46	95	90	69
Check		---	---	---	36	6.3	80	---	---	55

[1] Lodging rating from 1 to 10. A reading of one means no lodging and a reading of 10 means all of grain lodged.

EFFECTS OF ENDOTHALL FORMULATIONS ON BROADLEAF WEEDS AND WHEAT

Objectives (1) To evaluate effectiveness of several endothall formulations for broadleaf weed control (especially wild buckwheat).
(2) To evaluate injury caused by these endothall formulations to the wheat plant.
(3) To compare the effectiveness of early and late applications of some of the treatments.

Material and Methods:

Location: Northeast Research Farm, Garden City, South Dakota

Soil Type: Silty Loam

Organic Matter Content: 4%

Plot Size and Design: Plots were 10 ft. by 20 ft. and were replicated 4 times in a randomized complete block design.

Planting Data: Criss wheat was press drilled on April 28, 1967 at the rate of 1½ bushel per acre.

Method of Application: Treatments were applied with a tractor type sprayer.

Time of Application: Early treatments were applied on May 5, 1967 when wheat was in the 3-leaf stage and wild buckwheat was in the 2- to 4-leaf stage. Late treatments were applied on May 20, 1967, when wheat was in the 5-leaf stage and wild buckwheat was about 3 inches tall.

Data taken: Notes on weed control were taken on August 9, 1967. Injury ratings and yields were taken on August 10, 1967.

Results: Infestation of broadleaf weeds were only fair and growing conditions were good for the wheat in 1967. A late freeze in the spring set the wild buckwheat back and it was not a major problem in the check plots. Broadleaf weeds present in the plots were wild buckwheat, Kochia, and Russian thistle. The latter two species gave similar responses to the herbicides so control of these two species was combined and presented under other broadleaf weeds (Table 35). All of the endothall formulations gave some control of wild buckwheat but they were less effective on other broadleaf weeds. No visual heigh reduction was observed on the wheat from early applications but many of the late treatments caused height reduction of the wheat. This injury is also reflected in wheat yields. Yield reductions resulted from all of the late applications whereas three of the early treatments resulted in increased yields. The only endothall formulation which gave good weed control of both wild buckwheat and other broadleaf weeds was TD-6068 in combination with Pennamine D (oil soluble amine of 2,4-D).

Dicama plus MCPA and bromoxynil plus MCPA when used early also resulted in good weed control and wheat yields.

Summary: Many of the herbicide treatments cuased some yield reduction and it may not be profitable to spray wheat fields with only light infestations of weeds. Several early treatments (TD-6068 plus Pennamine D, dicamba + MCPA, and bromoxynil plus MCPA) gave excellent control of wild buckwheat and other broadleaf weeds with minimum damage to the wheat.

Table 35. Broadleaf Weed Control, Wheat Injury and Wheat Yields From Various Herbicide Treatments.

Treatment	Rate oz/A	% Control Wild Buckwheat	[1] Other BLW	[2] Injury	Yield bu/A
Check	----	----	----		36.2
Wheat 3-leaf stage					
K-endothall + MCPA	3 + 3	56	26		35.4
" " "	4.5 + 3	84	8		26.2
" "	4.5	59	22		31.3
TD-6251 + MCPA	1.5 + 3	49	42		34.7
" " "	3 + 3	69	26		32.5
" " "	4.5 + 3	74	19		39.4
" " "	4.5	76	20		31.9
TD-6068 + Pennamine D	1.5 + 3	30	82		41.0
" " "	3 + 3	61	90		34.8
" " "	4.5 + 3	61	77		34.2
" "	4.5	80	24		28.8
Dicamba + MCPA	1.12+ 3	92	79		38.0
Bromoxynil + MCPA	3 + 3	89	92		34.3
5-leaf to boot					
K-endothall + MCPA	4 + 4	90	31	XX	28.5
K-endothall + 2,4-D	4 + 4	91	59	XXX	31.5
K-endothall + 2,4-D	6 + 4	91	43	XXXX	26.7
" "	6	86	17	XXX	27.2
TD-6251 + 2,4-D	2 + 4	83	84		30.2
" " "	4 + 4	85	56	XXX	32.0
" " "	6 + 4	95	56	XXXX	26.0
" "	6	88	17	XXX	23.3
Dicamba + MCPA	½ + 4	92	87	XXXX	32.5
" + 2,4-D	½ + 4	91	90	XXX	31.7
Bromoxynil + MCPA	4 + 4	94	78		33.7
" + 2,4-D	4 + 4	92	89	X	29.8

[1] Broadleaf weed (Russian thistle and Kochia)

[2] Injury indicated by a check. One check was used for each replication. Two checks means injury was noted in 2 of the 4 replications.

CORN HERBICIDE SCREENING TRIALS

Objectives: To evaluate grassy weed control (primarily green and yellow foxtail) of various corn herbicides.

To compare average yields obtained from treated plots with those obtained from check plots receiving normal cultivation.

Materials and Methods:

Location: Northeast Research Farm — Garden City, South Dakota

Soil Type: Silty loam — Organic Matter Content 4%

Plot Size and Design: The plots were 10 ft. by 30 ft. and were replicated 3 times in a randomized block design.

Method and Date of Applications: Treatments were applied with a tractor type sprayer applying 20 gal. per acre of spray solution. Preemergence treatments were applied May 24 and postemergence treatments were applied June 20 when foxtail was in 4- to 5-leaf stage (3½" tall).

Cultural Method: Corn was planted May 18, 1967 in 40 inch rows at the rate of 13000 plants per acre. All plots received two cultivations.

Data Taken: Estimate of weedy grass control was taken June 20, 1967 and corn was harvested October 23, 1967. Yield is reported in bushels per acre of Number 2 shelled corn (15.5% moisture).

Results: Moisture after applying preemergence treatments was limiting and many of the preemergence herbicides failed to give good weed control. The best foxtail control according to June readings was obtained with Ramrod but the highest yield was obtained from 2.4 pounds of atrazine applied preemergence (Table 36). Treating foxtail plants which are 3½ inches tall with 1 pound of atrazine plus 1 gallon of crop oil did not give satisfactory weed control. Increasing the rate of oil or artazine increased the control of the foxtail but did not effect the yield of corn when compared to the yield from a 1 pound plus 1 gallon of oil treatment.

Table 36. The Foxtail Control and Corn Yield From Plots Treated With Various Rates and Types of Herbicides.

Treatment	Rate lb/A	[2] % WG Control	Yield bu/A
Preemergence			
Atrazine	2.5	55	48
Ramrod	4	71.6	36
Ramrod[1]	4	80	37
Ramrod (gran.)	4	60	37
Ramrod + Atrazine	2 + 1	58.3	37
Ramrod + Lin	2 + 1	48.3	26
CP 50144	2	55	31
CP 50144	2.5	56.6	39
CP 50144	3	66.6	30
R 11914	2	13.3	28
R 11914	4	20	36
Fenaben (glom)	3	48.3	34
Fenaben (gran)	3	50	37
C-6313	2	10	26
C-6313	4	10	35
Postemergence			
Atrazine + Oil	1 + 1 gal.	43.3	39
Atrazine + Oil	1 + 2 gal.	73.3	36
Atrazine + Oil	2 + 1 gal.	73.3	38
Atrazine + Oil	2 + 2 gal.	71.6	38
Check			34

[1] Brown colored powder of Ramrod
[2] % Weedy Grass Control

HERBICIDE TRIAL ON POTATOES

Objectives: The evaluation of hebicides for weed control and their effect on the potatoe plants

Materials and Methods:

Location: Northeast Research Farm, Garden City, South Dakota

Soil Type: Silty loam

Organic Matter Content 4%

Plot Size and Design: Plots were 10 feet by 20 feet and were replicated 3 times in a randomized complete block design.

Method of Application: All treatments were applied by a tractor type sprayer applying 20 gallons spray solution per acre. Preplant incorporated treatments were applied May 6, 1967 and all plots received a double tandom disking prior to planting. Preemergence treatments were applied May 18.

Data taken: Stand of potatoes was not uniform so no yield data was taken but weed control notes were taken on June 12, 1967.

Results: The herbicide used are given in Table 37. No herbicide damage was noted in any of the plots. All of the herbicides which were incroporated gave good weed control. Major weeds were green and yellow foxtail. None of the preemergence herbicides gave satisfactory weed control.

Table 37. Effect of Various Herbicides on Weedy Grasses

Treatment	Rate lb/A	% Grass Control				
		Rep I	Rep II	Rep III	Total	Average
Trifluraiin - (inc)*	3/4	85	90	80	255	85.0
EPTC - (inc)	3	90	90	95	275	91.7
Benefin - (inc)	1	85	85	80	250	83.3
Linuron (pre)	2	10	0	0	10	3.3
Ramrod (pre)	4	10	0	20	30	10.0
CP - 50144 (pre)	3	40	40	50	130	43.3
Check	-	0	0	0	0	0
EPTC + Ramrod (inc)	3 + 4	99	75	99	273	91.0
Patoran (pre)	6	0	50	35	85	28.3
Patoran - (inc)	6	75	75	90	240	80.0

* Incorporated in soil

CROP DISEASE CONTROL

The Development of Disease Resistance In Hybrid Corn

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In 1967, corn stalk rot and root rot caused greater yield losses to the South Dakota corn crop than in previous years.

Experimental evidence obtained in 1967 indicates the loss to be 21.4 bushel per acre in the heart of the South Dakota corn belt in southeastern South Dakota. Although lodging was extensive in 1967, it does not necessarily follow that without lodging, extensive yield damage does not occur. Rather, lodging is more-or-less a reflection of the time of the growing season when stalk and root rot infection takes place in the corn plants in the field. In other words, important losses occur in the absence of lodging.

The importance of a 21.4 bushel loss per acre would mean that on a 100 acre field, yielding 100 bushel per acre the loss would be 2,142 bushel and with corn selling at $1.03 per bushel, the dollar loss would be $2,206.00 per 100 acres. This constitutes a serious loss not only in dollars on a state wide basis but in the cost of production.

During the past several seasons over 300 experimental disease resistant corn hybrids were developed and seed produced by hand pollination methods in both inbred and 3-way hybrids for performance testing.

The response of these experimental hybrids to stalk rot and lodging at the Centerville Research Farm, where abundant stalk rot and lodging damage occurred during the past season, had been very good when compared to commercial hybrids grown in the area.

Three hundred of these experimental hybrids have been tested for disease and yield performances. All have been grown for at least 3 seasons at the Northeast Research Farm over the past number of years. To more closely evaluate these hybrids, the top 66 were screened out and are being retested as a group.

The 66 top performing experimental hybrids selected from the 300 previously screened were grown in 1967 at the station. The results appear in Table 38.

Table 38. Yield, Moisture Content and Other Performance Ratings of 66 3-way Experimental Hybrids Possessing Varying Degrees of Root and Stalk Rot Resistance in comparison to 5 Other Adapted Commercial Hybrids Grown at the Northeast Research Farm, 1967.

Expt'l hybrid Or commercial Check	Yield Bu/A	Ear Moisture At harvest	Total* Performance Score	Yield Performance Score	Moisture Performance Score
Expt'l 1	51.7	35.0	113.5	121.2	102.0
" 2	51.5	35.6	112.8	120.8	100.8
" 3	50.6	30.6	114.7	118.6	108.9
" 4	50.2	26.1	116.9	118.0	115.2
" 5	49.8	31.7	112.8	117.0	106.5
" 6	49.7	39.2	108.1	116.6	95.4
SD 220	49.5	30.6	113.1	116.1	108.7
" 7	49.2	29.7	113.1	115.5	109.6
" 8	48.8	34.3	109.8	114.3	102.9
" 9	48.0	34.7	108.5	112.6	102.2
" 10	48.0	35.2	108.2	112.6	101.7
" 11	47.5	34.2	108.0	111.7	102.6
" 12	46.5	35.1	106.0	108.9	101.6
" 13	46.3	33.4	106.9	108.6	104.3
" 14	46.2	31.7	107.9	108.3	107.2
" 15	46.1	36.0	105.0	108.1	100.4
" 16	46.1	37.4	104.0	108.2	97.6
" 17	45.8	34.5	105.4	107.6	102.1
" 18	45.4	32.3	106.3	106.4	106.0
" 19	44.9	38.4	101.7	105.5	96.0
" 20	44.8	38.7	101.3	105.1	95.6
" 21	44.4	30.6	105.9	104.3	108.2
" 22	44.3	36.5	102.2	104.0	99.7
" 23	44.1	36.3	101.9	103.4	99.7
" 24	44.0	38.1	100.8	103.3	97.1
" 25	43.9	32.1	104.3	102.9	106.3
" 26	43.9	36.1	101.7	102.9	100.0
" 27	43.9	38.5	100.2	103.1	95.9
" 28	43.5	39.6	99.2	102.1	94.8
" 29	43.2	44.0	95.8	101.5	87.3
DEK 46	43.1	31.7	103.5	101.2	106.9
" 30	43.0	36.2	100.4	100.8	99.9
" 31	42.9	38.8	98.7	100.6	95.8
" 32	42.4	37.5	98.8	99.4	97.9
" 33	42.3	37.7	98.5	99.1	97.5

Table 38. (Cont'd)

Expt'l hybrid Or commercial Check	Yield Bu/A	Ear Moisture At harvest	Total* Performance Score	Yield Performance Score	Moisture Performance Score
Exp'l 34	42.2	33.5	101.00	99.2	103.7
" 35	42.1	42.7	95.2	98.7	89.9
" 36	42.1	35.7	99.5	98.9	100.2
" 37	42.1	35.8	99.3	98.8	100.1
P388	42.0	39.5	96.9	98.4	94.7
" 38	41.8	44.7	93.6	98.1	86.8
" 39	41.7	38.1	97.4	97.7	96.9
" 40	41.5	34.9	99.1	97.5	101.5
" 41	41.3	37.4	97.3	96.8	98.0
" 42	40.9	35.6	97.9	95.9	100.8
" 43	40.8	40.0	95.0	95.6	94.2
" 44	40.6	36.3	97.0	95.2	99.7
" 45	40.6	41.1	93.9	95.3	91.8
" 46	40.6	34.8	97.9	95.5	101.6
" 47	40.5	35.9	97.2	94.9	100.6
" 48	40.4	37.4	96.2	94.8	98.2
" 49	40.4	35.4	97.3	95.0	100.7
" 50	40.3	33.4	98.5	94.5	104.5
SD240	40.3	41.5	93.4	94.6	91.5
" 51	40.2	37.6	95.8	94.3	97.9
" 52	40.1	35.2	97.0	94.3	101.0
" 53	39.8	40.2	93.4	93.3	93.6
" 54	39.7	34.5	96.8	93.0	102.6
" 55	39.2	33.5	96.9	91.9	104.4
" 56	38.5	39.3	92.1	90.5	94.6
" 57	37.8	38.6	91.7	88.8	96.1
" 58	37.8	35.4	93.8	88.5	101.4
" 59	37.4	35.3	93.3	87.8	101.5
" 60	37.3	35.0	93.3	87.5	102.0
" 61	36.9	38.4	90.4	86.4	96.4
" 62	36.5	32.3	93.6	85.7	105.5
" 63	35.9	44.3	85.3	84.3	86.8
" 64	35.6	38.9	88.5	83.6	95.9
SD210	35.6	33.7	91.6	83.4	103.8
" 65	33.7	35.6	87.8	79.0	101.1
" 66	31.8	40.0	82.2	74.4	93.9

*Total performance score is a value based on percent of moisture and grain yield in the corn at harvest. A rating of 100 or more indicated a low-moisture, high-yield hybrid.

A difference of 13.6 Bu/A between any two hybrids shows that one is significantly better than the other.

SMALL GRAIN DISEASES

G. Buchenau & V. Pederson
Plant Pathology Department

Spring grain (barley, oats and wheat) disease nurseries were grown during 1967 at the station. These nurseries are important to the farmers in the area, because they include virtually all of the newly developed unnamed and unreleased lines that have the best potential for the area from the standpoint of yield and resistance to leaf rust, stem rust, and other damaging diseases which occur in present small grain varieties.

These lines are derived from programs not only from state experimental stations but from the U.S.D.A. as well. The nurseries usually provide the final disease screening for new varieties prior to their release.

The wheat and oat disease nurseries contained 35 lines each and the barley nursery approximately 100 new lines.

Extensive tests have been conducted with a new seed treatment chemical compound during the past 2 years which has proven to be highly effective as a seed treatment for the control of loose smut of wheat and barley. It has proven to be virtually 100% effective. Up until now, there has been no satisfactory method of controlling loose smut by any chemical seed treatment. This chemical is unusual in that it is absorbed by the seed as it germinates and stops the growth of the loose smut fungus which lives within the embryo of the seed.

In barley samples received in the laboratory of the plant pathology department, the percent loose smut infection has ranged from a few percent up to 40 percent.

Most seed which is infected with loose smut will produce a plant but, the entire head on the main stem and stools will turn into a mass of smut. So the yield from such infected plants is zero. Hence, a seed lot infected with 40 percent loose smut, means a 40 percent reduction in yield at harvest time for the farmer. However, at the present time, this seed treatment has a restricted usage. As of now it can only be used on seed that is going to be used for seed production and not for food and feed.

INSECT CONTROL ON POTATOES USING A SYSTEMIC INSECTICIDE

B. H. Kantack

A demonstration plot was set up on the northeast research farm at Garden City, South Dakota for potato insect control. Treatments of Thimet (Phorate) were applied to each of three replicated plots as planting time treatments.

The insecticide was applied in a band treatment at the rate of 2½ pounds actual (25 pounds of 10% granules per acre row).

Insect control was excellent on all treated areas with a light infestation of flea beetle and leaf hoopers developing on the untreated plots. No foliar sprays were applied.

Yield checks for the three treated plots as compared with the three untreated check areas showed a yield advantage of 11.3 bushels per acre for the areas receiving the insecticide treatments. This resulted in $15.25 increase in value received from the treated area. Deducting $5.63 for cost of insecticide a net profit of $9.52 was received from each treated area as a result of insect control using a systemic insecticide. Thimet and Di-Syston are two systemic insecticides recommended for use in South Dakota.