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December 1968

SOUTH CENTRAL RESEARCH FARM
Presho, South Dakota

INTRODUCTION

This is the eleventh annual report of the South Central Research Farm. The experimental area, located on the Glen Hutchison farm, is approximately ten and one-half miles south of Presho, South Dakota. The soil, a fine clay, was derived from Pierre shale and is identified as a Promise clay. It contains 3.3% organic matter, is medium in available phosphorus, and is high in potassium.

Rainfall in 1968 was below normal at the beginning and end of the year but above normal during most of the growing season. The cool temperatures and excellent rainfall distribution resulted in high yields of all the crops grown. The cool summer did increase the number of days needed for some grain sorghum varieties to mature. However, the late first frost provided an unusually long growing season.

More than seventy people attended a field tour held on July 2, 1968. The Wheat Fertility plots, Chemical Rust Control plots, Variety Trials, Grass Forage Production, and Soil Management studies were discussed.

SOUTH CENTRAL RESEARCH FARM ADVISORY COMMITTEE

Officers	Address	County
Walter Stolte	Chamberlain 57325	Brule
Fred Lucas	Platte 57369	Charles Mix
Ed Bailey	Lucas 57549	Gregory
Lyn Lyman	Murdo 57559	Jones
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Jerry Bruning	Wood 57585	Mellette
Lyle Hedman	Hayes 57537	Stanley
John Fernen	Mission 57555	Todd
Don Jorgensen	Ideal 57541	Tripp

This report was prepared by members of the South Dakota Agricultural Experiment Station. It is an annual report and results published herein are for one year only. They are therefore neither complete nor conclusive.

TABLE OF CONTENTS

Table 1. Weather Data - South Central Research Farm, 1968.

Month	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rainfall in inches*	.02	.06	.06	3.95	2.41	5.46	1.13	2.96	1.00	.24	.11	.40	17.74
Longtime Average**	.47	.57	1.02	1.79	2.38	3.11	1.66	2.08	1.45	.98	.67	.39	16.57
Departure from Longtime Average	-.45	-.51	-.96	1.16	.03	2.35	-.53	.88	-.45	-.74	-.56	.01	1.17
Average Temperature*	19.6	24.4	41.7	46.2	54.4	68.0	74.6	73.0	64.3	54.9	35.7	19.1	
Longtime Average**	18.6	21.9	31.8	47.6	58.9	68.7	76.8	75.0	64.5	51.4	34.8	23.9	
Departure from Longtime Average	1.0	2.5	9.9	-1.4	-4.5	-0.7	-2.2	-2.0	-0.2	3.5	0.9	-4.8	
Av. Monthly Maximum - 1968*	29.6	32.9	54.2	57.6	66.1	79.7	87.9	86.4	79.0	69.8	43.7	26.8	
Av. Monthly Minimum - 1968*	9.6	15.8	29.2	34.9	42.8	56.4	61.4	59.7	49.6	39.7	27.8	11.4	
Av. Soil Temp @ 2" (Fallow)	----	----	44.0	50.5	62.8	76.8	86.0	81.3	71.2	58.8	----	----	
Av. Monthly Maximum Soil Temp.	----	----	49.7	56.7	70.8	84.1	97.1	90.6	79.1	66.6	----	----	
Av. Monthly Minimum Soil Temp.	----	----	37.0	43.6	54.7	69.6	74.9	71.9	63.4	51.1	----	----	
Average inches of water evaporated from free surface	----	----	----	4.71	4.70	8.22	9.25	6.64	4.43	3.46	----	----	

Note: The maximum recorded air temperature for the year was 107° and occurred on July 20.
Last killing frost - April 24; First frost - October 3; First killing frost - October 4; Growing Season - 163 days.

* Data taken and recorded at South Central Research Farm.
** Longtime averages were recorded at Kennebec, South Dakota, based on 30 year period 1931-1960 inclusive.

SMALL GRAIN VARIETY TESTING

D. G. Wells, P.B. Price, R. S. Albrechtsen, J. J. Bonnemann, and H. A. Geise

Objective: To observe and compare small grain varieties and experimental strains for winterhardiness, grain yield, disease resistance, and other characteristics of area adaptability.

Rye

Twenty varieties of rye were grown in the 1968 season. Data on grain yield and some plant characteristics are shown in Table 2. Von Lochow was introduced from West Germany. It is a stiff strawed variety with a yield slightly greater than Frontier. Von Lochow is less hardy and heads several days later than Frontier, Caribou, or Pierre.

Table 2. Drill-Strip Rye Variety Trial - South Central Research Farm.

Variety	Date of Heading	Height Inches	Percent Survival	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1968	Av. 1965-68
Von Lochow	6- 5	48	92	58.4	54.8	52.6
Frontier	6- 1	49	95	59.1	53.7	--
Caribou	5-31	47	95	57.9	43.6	36.3
Pierre	5-26	49	95	59.1	37.6	33.3
				Mean	47.4	

Frontier is a new variety developed at Swift Current, Saskatchewan. It has excellent winterhardiness and medium maturity. Frontier is medium-tall and has poor lodging resistance. The seeds of this variety are small and predominantly blue-gray in color. It has high bushel weight. Some of the other varieties listed in Table 3 have not been thoroughly tested.

Table 3. Standard Variety Rye Trials - South Central Research Farm

Variety	Date of Heading	Height Inches	Percent Survival	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1968	Av. 1967-68
Zelder	6- 4	47	95	56.5	61.7	56.4
Pearl	6- 2	46	95	55.5	58.9	--
Dominant	6- 2	48	96	56.5	57.9	53.5
Von Lochow	6- 3	45	94	57.0	57.0	52.8
Guelzower	6- 5	48	93	56.0	44.9	51.7
Frontier	5-31	48	96	57.0	55.4	51.1
Petkus	6- 2	45	97	56.0	51.8	49.8
Elk	6- 3	50	95	56.0	50.1	50.8
Antelope	5-30	48	95	56.5	49.0	44.1
Caribou	5-28	48	97	56.5	46.3	42.1
Dakold	5-26	48	95	57.0	46.0	40.6
Toiva	6- 4	49	98	54.0	45.8	42.8
7276	5-20	49	94	57.0	45.1	39.4
Adams	5-28	51	96	56.5	43.9	39.8
Pierre	5-24	48	98	57.0	43.1	40.4
N.F. #7	5-24	50	97	56.5	41.6	35.3
Sangaste	6- 5	51	94	54.5	40.6	41.1
Elbon	5-22	48	99	57.0	37.1	32.2
Bonel	5-23	51	95	57.0	33.3	29.3
Tetra Petkus	6- 4	49	94	54.5	31.3	--
				Mean	47.6	

Winter Wheat

Winter Wheat varieties were evaluated in two separate trials in 1968. The larger test, containing the recommended varieties (Table 5,Page 6), was seeded in large drill-sized plots and harvested with a self-propelled combine. They were seeded on September 25,1967 and harvested directly from the field on July 20, 1968.

The second trial (Table 4) contained a number of new selections in varying stages of development. It was seeded on September 12, 1967 and harvested on July 17, 1968.

Table 4. Regional Winter Wheat Performance Trial, 1968

Variety	Date of Heading	Percent* Survival	Height Inches	Test Wt Lbs/Bu	Grain Yield Bu/Acre
NB 66425	6-11	90	34	58	51.7
NB 66403	6-10	90	36	58	51.0
KS 644	6- 5	95	35	59	46.8
Scout 66	6- 7	90	34	59	45.9
Scout	6- 8	95	36	59	45.1
TX62A2607-6	6- 6	95	30	57	45.0
C.I. 13874	6- 5	85	31	58	44.4
CO 652363	6- 9	95	37	58	44.2
TX61A58	6-13	90	37	61	43.7
NB 64334	6-10	--	44	58	43.4
NB 64308	6-12	--	45	60	42.0
Warrior	6-11	--	41	54	42.0
NB 66404	6-11	90	35	58	41.9
Early Blackhull	6- 6	95	35	57	41.6
Triumph	6- 5	90	31	59	41.0
C.I. 13875	6- 6	85	31	59	40.6
Ottawa Selection	6- 8	90	38	59	40.6
Comanche	6- 9	90	35	57	40.4
TX62A4793-7	6- 7	90	30	54	39.4
NB 64365	6-12	--	43	58	39.2
C.I. 13876	6- 6	90	30	57	39.0
C.I. 13877	6- 6	85	32	59	38.0
Trapper	6-13	--	43	57	37.2
Kharkoff	6-14	95	41	58	36.2
NB 66490	6- 7	--	37	55	35.7
Hume	6-10	75	36	57	35.2
SD 56-758	6-14	--	45	56	35.2
Winoka	6-14	--	45	60	34.6
Winalta	6-14	--	44	58	34.4
MT 6319	6-14	--	43	56	33.4
Trader	6-13	--	42	55	32.8
TX62C436	6-10	70	34	57	32.3
SD 56-849	6-14	--	47	57	31.5
MT 6326	6-14	--	45	57	27.5
MT 639	6-14	--	48	54	25.9
MT 6320	6-12	--	46	52	25.7

* Survival greater than 85% where not specifically listed.

Table 5. Winter Wheat Variety Trial - South Central Research Farm, 1968.

Variety	Date of Heading	Height Inches	Rust Reaction* Leaf	Rust Reaction* Stem	Percent** Protein	Percent Moisture	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Gage	June 8	38	R	R	13.2	9.74	60.4	56.6
Scout 66	7	38	S	R	13.3	9.56	60.9	48.8
Lancer	10	40	S	R	13.8	9.83	61.6	48.0
Trapper	13	41	S	R	13.3	11.60	61.2	47.7
N64365	12	40	S	R	13.6	11.90	61.5	47.3
Scout	June 10	40	S	R	13.1	10.28	60.4	46.4
Nebred	14	41	S	S	13.3	10.46	61.4	44.6
Warrior	12	40	S	S	12.5	11.00	60.5	44.5
Omaha	8	41	S	S	13.7	9.47	61.6	44.2
Trader	14	42	S	R	11.9	11.22	61.0	43.7
Guide	June 7	41	S	R	12.6	9.02	58.8	43.3
Ottawa	8	39	S	S	13.6	10.46	60.9	43.2
Hume	12	42	S	R	12.8	10.64	60.8	41.6
Winoka	14	44	S	R	13.4	13.40	60.8	40.7
Turkey	14	43	S	S	13.7	12.38	61.0	39.3
Minter	June 14	38	S	R	13.2	11.15	59.8	38.2
Wichita	10	39	S	S	12.8	10.28	60.7	36.5
LSD(05) - 5.4 Bu/A							Mean	44.4

* Letter indicates usual reaction to rust: S-susceptible, R-resistant (New race may be present to which all varieties may be susceptible.)

** Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.

Winter Barley

The winter barley varieties tested vary in winterhardiness. Previous tests have shown Kearney and Dicktoo to be the most hardy, Mo. B1222 to be intermediate, and Mo. B969 and Chase to be the least hardy. However, due to the mild conditions during the winter those varieties which have shown the least hardiness had a better stand in the spring than those varieties which have shown the highest degree of winterhardiness.

Kearney is a 6-rowed, hulled, rough-awned variety which was released by the Nebraska Agricultural Experiment Station in 1961. It has shown some resistance to Greenbugs. This variety is objected to by the Malting Industry because of small kernels, low extract, and high nitrogen. Dicktoo is similar to Kearney in appearance and is comparable in winter hardiness. It was released by Nebraska in 1952. Chase is also similar to Kearney, but is superior in straw strength. It has a deciduous type awn and was released by Nebraska in 1961. Mo. B1222 is similar to Kearney in straw strength and hardiness, but is slightly earlier, shorter, and has a lower yield. Mo. B969 is similar to Mo. B1222 but heads a few days later.

Table 6. Winter Barley Variety Trial - South Central Research Farm,

Variety	Date of Heading	Percent Survival	Height Inches	Test Wt Lbs/Bu	Grain Yield-Bu/Acre 1968	Av 1963-68*
Chase	6- 4	90	32	48.0	54.2	38.0
Dicktoo	6- 4	89	32	48.6	53.4	40.9
Mo. B1222	6- 4	90	32	47.9	38.2	37.2
Kearney	6- 6	88	32	46.9	37.0	40.7
Mo. B969	6- 6	89	31	46.5	33.7	32.6
				Mean	43.3	

*1965 test was lost because of winterkill

Oats

Several new varieties were grown in the yield trials at South Central Research Farm in 1968. They were Pettis, Kota, E-68, and M-68. Pettis was developed by the Missouri Agricultural Experiment Station. It is a medium-early, medium-tall, variety which has long slender red-colored seed. It has fair resistance to lodging. It is moderately susceptible to stem rust, susceptible to crown rust, and moderately tolerant to Barley Yellow Dwarf Virus (Red Leaf).

Kota is a new release from South Dakota which is of medium-maturity, of medium-height, and has moderate resistance to crown and stem rust. It has a medium-plump yellow-colored seed. M-68 and E-68 were released by the Iowa Agricultural Experiment Station. They are comprised of a number of closely related lines which give them moderate resistance to crown and stem rust. The seed is yellow and medium in size. E-68 is an early-maturing variety, whereas M-68 is of medium-maturity. Neither variety has tolerance to Barley Yellow Dwarf Virus.

All varieties listed in tables 7 and 8 were seeded on winter wheat stubble. The soil was fertilized with 80 pounds of nitrogen per acre prior to spring tillage, and 15 pounds of elemental phosphorous per acre applied with the seed when planted. The plots were seeded on April 17, and were harvested with a self-propelled combine on July 31, 1968.

Table 7. Oat Variety Trial - South Central Research Farm,

Variety	Date of Heading	Height Inches	Test Wt Lbs/Bu	Grain Yield-Bu/Acre 1968	Av 1967-68
Pettis	6-20	34	36.6	107.2	----
Burnett	6-23	36	33.5	107.2	98.1
Dupree	6-21	32	33.5	104.8	----
Brave	6-22	35	33.8	100.8	104.6
Wyndmere	6-22	35	34.0	96.8	105.2
Tyler	6-22	30	33.8	96.4	103.8
Tippecanoe	6-22	30	36.0	94.8	102.8
Kota	6-26	37	33.1	93.8	----
Lodi	6-29	42	29.4	88.3	92.2
Portal	6-26	37	33.4	87.8	96.1
Holden	6-24	32	33.4	85.8	91.5
Ortley	6-29	41	34.4	85.1	84.0
O'Brien	6-22	38	36.0	84.4	90.6
Garland	6-22	32	34.7	84.1	80.0
Garry	6-28	39	30.9	81.8	84.0
Rodney	7- 2	38	30.6	81.1	81.0
Clintland 64	6-23	36	34.6	80.7	73.9
Dawn	6-24	41	33.0	80.1	80.8
M-68	6-23	35	34.1	79.0	----
Jaycee	6-22	33	33.9	77.4	85.0
E-68	6-19	32	37.5	77.2	----
Clintford	6-22	31	38.1	70.4	78.9
LSD(.05) - 8.8 bu/a			Mean	88.4	

Table 8. Oat Variety Trial (Forage Type) - South Central Research Farm, 1968

Variety	Date of Heading	Height Inches	Test Wt Lbs/Bu	Grain Yield Bu/Acre	Forage Yield* % Protein	% D.M.	Ton/A
Lodi	6-29	42	29.4	88.3	6.9	43.2	3.3
Ortley	6-29	41	34.4	85.1	7.6	46.4	3.0
Garry	6-28	39	30.9	81.8	7.3	37.8	3.4
Rodney	7- 2	38	30.6	81.1	7.9	41.0	3.5
			Mean	84.1			

*Forage yield is reported in tons dry matter per acre, protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.

Table 7. Oat Variety Trial - South Central Research Farm,

Variety	Date of Heading	Height Inches	Test Wt Lbs/Bu	Grain Yield-Bu/Acre 1968	Av 1967-68
Pettis	6-20	34	36.6	107.2	----
Burnett	6-23	36	33.5	107.2	98.1
Dupree	6-21	32	33.5	104.8	----
Brave	6-22	35	33.8	100.8	104.6
Wyndmere	6-22	35	34.0	96.8	105.2
Tyler	6-22	30	33.8	96.4	103.8
Tippecanoe	6-22	30	36.0	94.8	102.8
Kota	6-26	37	33.1	93.8	----
Lodi	6-29	42	29.4	88.3	92.2
Portal	6-26	37	33.4	87.8	96.1
Holden	6-24	32	33.4	85.8	91.5
Ortley	6-29	41	34.4	85.1	84.0
O'Brien	6-22	38	36.0	84.4	90.6
Garland	6-22	32	34.7	84.1	80.0
Garry	6-28	39	30.9	81.8	84.0
Rodney	7- 2	38	30.6	81.1	81.0
Clintland 64	6-23	36	34.6	80.7	73.9
Dawn	6-24	41	33.0	80.1	80.8
M-68	6-23	35	34.1	79.0	----
Jaycee	6-22	33	33.9	77.4	85.0
E-68	6-19	32	37.5	77.2	----
Clintford	6-22	31	38.1	70.4	78.9
LSD(.05) - 8.8 bu/a			Mean	88.4	

Table 8. Oat Variety Trial (Forage Type) - South Central Research Farm, 1968

Variety	Date of Heading	Height Inches	Test Wt Lbs/Bu	Grain Yield Bu/Acre	Forage Yield* % Protein	% D.M.	Ton/A
Lodi	6-29	42	29.4	88.3	6.9	43.2	3.3
Ortley	6-29	41	34.4	85.1	7.6	46.4	3.0
Garry	6-28	39	30.9	81.8	7.3	37.8	3.4
Rodney	7- 2	38	30.6	81.1	7.9	41.0	3.5
			Mean	84.1			

*Forage yield is reported in tons dry matter per acre, protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.

Spring Wheat

The yield of spring wheat in small plots ranged from 34.6 to 19.9 bushels per acre. The highest yield of hard red spring wheat was obtained from Red River 68, a variety recently released by World Seeds, Inc.. Red River 68 is a semi-dwarf wheat, which is early maturing and has good lodging resistance. It has an awned, erect, nonshattering spike, with good resistance to both stem and leaf rust. Red River 68 is not a high quality milling wheat. Grain yields and other agronomic data pertaining to hard red spring wheat are shown in Table 9. The yields and other data for durum wheat are shown in Table 10.

All varieties reported in tables 9 and 10 were seeded on winter wheat stubble and received 80 pounds of nitrogen per acre before spring tillage, and 15 pounds per acre of elemental phosphorous with the seed. Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis. The plots were seeded on April 17, and were harvested on July 31, 1968.

Table 9. Hard Red Spring Wheat Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Percent Protein	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1968	Av 1967-68
Red River 68	6-20	29	17.4	56.2	34.6	----
Crim	6-26	35	17.6	53.2	31.6	33.4
Manitou	6-26	32	17.2	52.8	30.0	35.0
Fortuna	6-28	34	16.9	55.8	29.1	36.0
BH 631	6-24	34	17.1	54.0	29.1	31.8
Rushmore	6-29	35	16.6	54.1	29.0	29.0
Polk	7- 2	34	17.6	51.9	28.4	32.2
Shorty	6-26	28	18.4	48.5	27.7	----
Pembina	6-27	33	17.4	52.4	27.5	27.2
Sheridan	7- 2	36	18.2	49.6	27.3	31.2
BH 632	6-26	34	16.9	51.8	27.0	27.6
Chris	6-26	34	16.9	53.9	25.0	30.7
Justin	6-30	34	16.7	47.5	24.9	25.2
Selkirk	7- 3	33	17.3	43.8	19.9	21.0
LSD(05) - 4.6 Bu/A				Mean	27.9	

Table 10. Durum Wheat Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Percent Protein	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1968	Av 1967-68
Leeds	6-25	35	20,1	52.5	15.9	32.0
Wells	6-26	36	19.1	50.6	14.8	26.8
Stewart 63	7- 3	46	19.1	51.5	13.1	23.2
Lakota	6-26	36	20.8	49.9	12.6	24.3
				Mean	14.1	

Spring Barley

Weather conditions during the spring growing season were favorable for producing good yields of barley. The above normal rainfall in June was complemented by below normal temperatures, so moisture was more than sufficient for a good crop of grain with satisfactory test weight. The incidence of foliar diseases was low.

Paragon is a new variety which was released from Manitoba, Canada, in 1968. It is a tall, loose-smut resistant, blue aleurone variety. Paragon is similar to Conquest in plant stature and disease reaction but heads several days later. It is considered a feed barley in South Dakota.

Conquest was developed and released in Canada. It is a blue aleurone barley with Parkland as one of its parents. It is accepted for malting purposes in Canada. Conquest is smooth awned, tall growing, has good straw strength, and is of medium maturity. It is susceptible to the foliar diseases of barley, moderately resistant to stem rust and resistant to loose smut.

Primus was released jointly by South Dakota Agricultural Experiment Station and Crops Research Division, Agricultural Research Service, United States Department of Agriculture. It is an early maturing, six-row, spring-type barley with long, spreading smooth awns. The kernels are medium sized, plump, free threshing, and have tightly adhering hulls and a colorless aleurone. Primus is resistant to prevalent races of stem rust but susceptible to loose smut and to leaf and head blights.

The plots were seeded in winter wheat stubble and received 80 pounds of nitrogen prior to spring tillage. Phosphorus fertilizer was applied at the rate of 15 pounds of elmental phosphorous per acre with the seed at planting time. The yields and other agronomic data are reported in table 11.

Table 11. Spring Barley Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield -Bushel/Acre 1968	Av 1967-68
Otis	6-19	27	48.0	69.4	73.5
Spartan	6-20	39	47.5	64.2	----
Primus	6-16	30	47.5	60.7	72.1
Dickson	6-22	32	43.9	59.8	82.6
Liberty	6-22	32	45.1	50.2	66.4
Larker	6-21	32	45.8	48.3	69.6
Paragon	6-28	32	42.1	45.4	----
Trophy	6-23	34	43.4	42.2	59.6
Conquest	6-21	36	44.6	39.2	55.4
LSD(05) - 6.6 Bu/A			Mean	53.3	

SPECIALTY CROP TESTING

Objective: To observe and compare various specialty crop varieties and selections for grain yield, disease resistance, new management practices, and other characteristics for area adaptability.

Sunflower Yield Trial

H. A. Geise

Sunflowers are grown as a crop for several purposes. The large-seed types are grown for whole-seed-uses in the confectionery trade. They are also preferred by some bird feeders because the large seed is less likely to attract sparrows and is less likely to be lost on the ground.

The small seeded varieties have a much thinner hull resulting in a proportionally larger meat. These thin hulled types are used primarily for their oil. Certain varieties contain over 50% high quality oil in the seed.

Sunflowers have several major problems, the most important being insects. A seed crop can be destroyed by the Sunflower Moth. The moth's larvae tunnel through the seeds leaving a mass of insect frass and strands of weblike material which cover the face of the heads. The insect injury weakens the plants so they are frequently attacked by stalk and head rots. Late maturing fields may become infected with mildew.

Two insecticides have recently been approved for control of the Head Moth on Sunflowers. Thiodan, and Methyl Parathion will both provide satisfactory control. However, the cost will vary considerably. The time to spray for these insects is when the sunflowers are beginning to bloom. At this time the plants are rather tall and brittle, which necessitates aerial application.

At present there is only one chemical herbicide cleared for use in South Dakota. This is the preplant chemical "Treflan". Treflan is decomposed by light and therefore must be thoroughly incorporated into the soil immediately after application.

Yield and other agronomic data are reported in table 12.

Table 12. Sunflower Variety Trial - South Central Research Farm

Cultivar	Date of Flowering	Height Inches	% Lodged	% Bird Damage	% Insect Damage	% Oil	Test Wt. Lbs/ Bu	Seed Yield-Lbs/A 1968*	Av 1967-68
OIL SEED TYPE									
Valley	8- 1	62	30	18	13	38.78	32.2	1405	----
T64001	7-26	54	20	10	11	---	32.5	1306	878
T56002	7-28	55	20	10	10	---	32.6	1303	888
P21ms x Ha-60	7-30	53	40	15	10	41.48	31.4	1084	736
Peredovik-66	7-28	60	22	20	11	47.81	30.1	946	----
SD 68002	7-21	55	28	30	12	---	32.9	928	----
Armavirec	7-20	53	30	25	13	43.40	30.9	928	580
VNIIMK 89.31-66	7-28	58	38	24	9	51.47	30.00	891	----
Peredovik	7-26	54	40	26	13	47.37	29.9	868	578
Smena	7.27	50	28	20	9	46.70	29.5	848	469
Lethbridge 159	7-22	56	35	30	10	42.22	31.4	784	487
VNIIMK 16.46	7-27	56	25	20	7	44.06	30.2	749	554
NK HO 1	7-30	59	35	20	19	41.22	30.5	736	449
SD 68001	7-13	47	22	3	12	---	31.7	717	----
VNIIMK 89.31	7-26	56	30	23	12	45.90	29.2	708	522
Krasnodarets	7-18	53	40	26	13	45.50	30.2	625	567
CONFECTIONERY or BIRD FEED									
Commander	7-28	56	30	19	24	---	27.5	908	598
Mingren	7-24	54	18	19	19	27.78	26.1	750	606
Lyng Hybrid 1	8- 1	53	12	10	31	---	29.2	560	----
Arrowhead	7-21	52	28	24	21	32.92	32.0	503	422
							Mean	877	

*LSD(05) - 75#/Acre

Safflower Testing

H. A. Geise

The Safflower trials conducted in 1968 consisted of varieties which had previously been tested. The plots were planted in mid-May and consisted of six rows spaced eight inches apart. Two groups of varieties were tested in 1968. Group I consisted of eleven varieties which were in Regional Trials in previous years. Group II consisted of twenty four varieties which were selected from the world collection on the basis of yield. Data from the nursery are reported in Table 13.

Table 13. Safflower Variety Trial - South Central Research Farm, 1966-68

Variety	Date of 50% Bloom	Spinescense (0-5)*	Shatter (1-5)**	Height Inches	Test Wt Lbs/ Bu	Yield-Lbs/Acre 1968	Yield-Lbs/Acre Av 1966-68
Ute	7-25	4	1.2	21	39.5	1940	978
U-5	7-28	5	1.2	20	39.9	1796	---
N-10	7-26	4	1.0	20	40.2	1733	900
Gila	7-24	3	1.0	20	39.6	1710	930
A0104	7-26	5	1.8	21	39.2	1641	913
U-15	7-25	5	1.2	21	40.8	1638	---
12417	7-24	4	1.0	20	35.8	1546	815
A1049	7-27	4	1.5	19	36.5	1436	734
A101	7-25	3	1.0	21	36.6	1407	762
US 10	7-25	4	1.0	19	40.4	1209	770
Pacific 1	7-26	4	1.0	20	39.5	1096	751
SDI 85	8- 2	5	2.0	27	43.8	1873	930
SDI 38	7-25	3	1.0	24	43.0	1808	984
SDI 48	7-31	1	1.0	23	45.0	1754	---
SDI 14	7-27	5	1.0	21	44.8	1728	---
SDI 39	7-29	5	1.0	24	40.6	1656	868
SDI 37	7-28	5	1.0	23	44.6	1644	---
SDI 94	7-30	2	1.5	23	44.4	1600	---
SDI 24	7-30	1	1.2	22	40.9	1546	819
SDI 83	7-26	1	1.0	20	43.9	1525	780
SDI 10	7-24	5	1.0	23	44.2	1524	---
SDI 21	7-26	5	1.0	22	44.8	1514	---
SDI 4	7-29	1	1.0	22	41.9	1512	---
SDI 25	7-28	3	1.5	23	42.5	1503	860
SDI 12	7-25	5	1.0	21	44.0	1494	---
SDI 30	8- 1	3	1.5	25	42.5	1492	826
SDI 18	7-25	2	1.0	24	41.1	1459	743
SDI 35	7-25	2	1.5	20	43.8	1328	---
SDI 87	7-26	3	1.5	21	43.5	1328	719
SDI 40	7-24	4	1.0	20	42.0	1307	---
SDI 2	7-24	5	2.0	21	42.2	1274	---
SDI 103	8- 1	4	1.5	26	44.0	1242	792
SDI 31-1	7-28	5	1.5	23	43.0	1143	---
SDI 44	7-24	2	1.5	22	45.6	969	---
SDI 96	8- 1	3	1.5	21	44.1	784	479

*Spinescense: Scale ranges from 0 - (No Spines) to 5 - (Heavily Spined).
**Shatter: Scale ranges from 1-(No Shattering) to 5-(Completely shelled out).

Millet Testing

A. O. Lunden and H. A. Geise

Table 14. Millet Performance Trial - South Central Research Farm

Variety and Type	Date of Heading	Inches Height	Test Wt Lbs/Acre	Grain Yield Lbs/Acre
Pearl - Millex 22	--	56	--	----
Proso - White	7-22	32	58.0	1090
- Panhandle	7-12	34	56.8	860*
Foxtail - Manta	7-19	26	56.2	2480
Barnyard - Japanese	8-12	30	41.0	1040

* Low germination caused only a 50% stand

Table 15. Millet Performance Trial - Agronomy Farm, Brookings - 1968

Variety and Type	Seed Yield Lbs/Acre
German Foxtail	2050
Manta Foxtail	1690
Red Proso 1	1030
Red Proso 2	920
Crown Proso	1230
White Proso	
Selection 5243	1100
Panhandle	1060
Selection 5415	860
Selection 5569	860
Selection 5438	850
Selection 5191	800
Northrup King	770
Selection 5484	730
Selection 5597	630

SORGHUM PERFORMANCE TESTING

Sorghum Breeding

A. O. Lunden

Experimental and Regional grain sorghum test yields generally ranged from 3400 to 5100 pounds per acre (60-90 bushels) in 1968. Yield results were quite favorable in spite of slow spring growth, low summer temperatures and poor fall ripening conditions. The yields reported in Table 16 include selected entries from the 1968 experimental and regional tests.

Two advanced experimental entries, SD 25228 and SD 25265, were especially good in Nebraska, Colorado, and Kansas, and are being considered for release with probable numerical and regional designations.

Table 16. Regional and Experimental Grain Sorghum Trial - South Central Research Farm, 1968

Entry No.	Days to Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Lbs/Acre 1968	Av 1967-68
SD 441	63	50	55	3470	3750
SD 451	68	44	56	4470	4450
SD 503	70	47	57	4870	4410
RS 610	77	43	55	4150	3630
SD 25228	68	41	57	4600	4250
SD 25265	68	44	57	4530	4720
LSD(05) - 507 lbs/a			Mean	4348	

Preliminary tests of other experimental hybrids produced somewhat higher yields but these are not reported here because they were not replicated for yield tests.

Several experimental entries of extra leafy type forage sorghums were also planted and tested in a forage yield test. These are for late fall silage harvest and are handled in the same manner as silage corn. Some of these forage hybrids, which are reported in Table 20 (page 19), are very promising and at least one of being considered for release to seed producers in 1970 or 1971. Desirable features of these extra leafy forage types include: short plant stature, high sugar content of plant sap, high leaf tissue percentage, ability to produce high grain content forage or silage if favorable fall weather continues, excellent lodging resistance and good retention of leaves after frost.

Grain Sorghum Performance Testing

J. J. Bonnemann

Objective: To compare the performance of grain sorghum hybrid varieties as to yield and other agronomic characteristics.

Performance trials with grain sorghum have been conducted on a fee basis at the South Central Research Farm since 1962. The accompanying Table 17 reports the 1968 yields and agronomic data. Long term averages and other information can be found in Circular 196, 1968 Grain Sorghum Performance Trials.

Table 17. Grain Sorghum Performance Trial - South Central Research Farm, 1968.

Variety	Height Inches	% Moisture* 9/25/68	Test Wt Lbs/ Bu	Grain Yield Lbs/Acre
Nk 120	41	23.8	58.0	4820
Advance 22	44	27.1	59.0	4710
Advance 19	41	28.0	57.0	4670
ACCO Pawnee	43	23.9	58.0	4650
Sokota 445	41	31.5	57.0	4570
Pioneer 883	42	35.1+	55.0	4560
SD 503	48	26.2	57.0	4540
Frontier 338a	38	31.1	57.0	4470
Pioneer 894	38	25.5	57.0	4460
NK 133	40	35.1+	57.0	4460
Pioneer 885	40	32.3	54.0	4450
ACCO R 94	42	31.7	58.0	4430
DeKalb B-37	39	35.1+	56.0	4400
Frontier GX 410	38	35.0	53.0	4370
ACCO EX 5356	35	29.9	57.0	4320
Sokota 510	45	35.1+	51.0	4300
DeKalb DD-50	40	35.1+	53.0	4270
RS 610	42	34.5	53.0	4180
Nk 127	37	29.7	57.0	4180
Pioneer 889	35	32.7	56.0	4170
T-E 44c	42	17.7	57.0	4170
ACCO R 102	47	35.1+	51.0	4130
ACCO EX 1036	40	30.9	56.0	4090
SD 451	45	22.4	56.0	4000
ACCO EX 7250	40	34.6	57.0	3840
Frontier Grassy Grain I	43	21.8	57.0	3770
NK Mini-Milo 50	43	18.0	57.0	3620
ACCO R 1050	43	35.1+	53.0	3530
SD 441	50	20.6	55.0	3500
ACCO EX 5355	35	34.9	56.0	3460
			Mean	4235

* Varieties listed as 35.1+ contained over 35.1% moisture on Sept. 25

Sorghum Forage Testing

H. A. Geise

Objective: To compare the various forage sorghums, sudangrasses, and sorghum-sudangrass hybrids as to their adaptability, their forage production, and their forage quality.

A multitude of forage sorghum varieties and hybrids, sorghum-sudangrass crosses, and sudangrasses were tested. The entries were scored for various characters such as leafiness, number of tillers, forage quality, and forage yield. The results of the trials are reported in Tables 18 through 20.

Table 18. Performance Trial of Forage Sorghum and Sorghum Blends - South Central Research Farm - 1968

Cultivar	Date of Heading	No. Of Tillers	No. Of Leaves	Height Inches	Percent of Plant			% Sugar in Sap	Percent* Protein	Percent D.M.	Forage Yield** Tons/Acre
					Leaf	Stem	Head				
FORAGE SORGHUM											
DeKalb FS-4	8-25	3.2	15.0	68	23	48	29	15.8	4.82	40.0	7.7
Pioneer 931	9- 1	3.8	16.5	94	26	60	14	15.4	5.64	33.3	7.3
Grace Sumax	8-17	4.2	13.5	80	23	42	35	17.2	2.77	39.1	7.2
Asgrow Beefbuilder T	8-28	4.0	16.0	80	35	50	15	17.4	5.28	33.3	7.2
Weathermaster FS445	8-25	3.8	17.0	88	27	61	12	18.4	4.77	32.0	7.0
Pioneer 936	8-25	3.5	15.5	95	32	53	15	17.2	5.80	34.0	6.9
Stockmen's FS446	8-26	3,8	15.0	88	29	57	14	18.6	4.05	32.8	6.6
Acco FS403-R	8-22	3.8	14.2	80	26	46	28	18.8	5.44	35.6	6.4
NK 315	8-17	4.0	14.8	71	26	39	35	16.8	4.92	35.7	6.1
Weathermaster FS500	8-25	3.8	16.0	85	27	48	25	18.2	4.66	32.8	5.8
NK 318S	8-20	3.8	14.5	73	27	38	35	17.3	6.56	31.9	5.5
Acco FS300-R	8-23	4.0	15.0	84	29	45	26	16.2	5.64	33.9	5.4
Advance 1071F	8-19	3.8	15.2	86	24	52	24	18.2	4.98	34.6	5.4
Asgrow Titan F	8-15	3.8	15.8	69	20	26	54	17.2	6.16	34.1	5.4
Asgrow Dino	8-29	3.0	16.2	61	39	26	35	18.6	7.44	33.1	5.2
Acco Aztec	8-17	4.0	11.5	73	20	29	51	15.8	4.56	33.8	5.2
Waconia	8-23	3.5	14.0	83	25	54	21	18.0	5.08	38.2	5.1
NK 300	8-15	4.2	14.0	59	23	18	59	15.8	7.70	33.1	4.8
NK 145	8- 5	4.8	10.5	67	16	25	59	5.5	7.08	48.5	4.8
Acco FS401-R	8-18	4.2	13.8	68	28	28	44	16.1	5.08	35.2	4.7
Asgrow Duet	8- 8	4.0	10.5	59	18	26	56	6.5	8.52	44.2	4.6
Acco FS402-R	8-19	3.8	10.5	54	29	23	48	15.1	5.54	33.8	4.2
SORGHUM BLENDS											
Acco FS400-R	8-13	4.0	13.5	41/82	29	32	39	17/11	4.59	48.1	6.8
Acco BB-44	8-15	4.0	15.8	45/80	26	27	47	6/15	6.57	36.4	5.7
GRAIN SORGHUM CHECK											
S.D. 503	8- 9	4.0	10.0	51	18	16	66	7.6	7.30	50.0	4.0

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis. LSD(01) 1.8

** Forage yields are reported on an oven-dry basis.

Note: Yield differences for Forage sorghums are significant at the 1% level

Table 19. Performance Trial of Sorghum-Sudan and Sudangrass Forages - South Central Research Farm, 1968.

Cultivar	Date of Heading	No. of Tillers	No. of Leaves	Height Inches	Percent of Plant Leaf	Stem	Head	% Sugar in Sap	Percent* Protein	Percent D.M.	Forage Yield** Tons/Acre
SORGHUM-SUDAN											
NK Sordan 67	8-18	3.5	14.5	96	22	59	19	14.2	6.26	40.0	6.0
Asgrow Grazer A	8-13	4.5	12.8	101	22	58	20	15.1	4.46	34.1	5.9
Weathermaster FS551	8- 7	4.8	12.8	100	16	52	32	13.9	3.64	48.0	5.6
NK Sordan 88	8-23	4.5	13.8	90	19	50	31	16.6	4.46	30.0	5.2
Pioneer 985	8-11	4.8	12.5	91	16	38	46	16.5	6.72	44.0	5.1
Weathermaster FS554	8-12	4.8	12.5	98	22	58	20	15.8	6.67	33.7	4.6
Pioneer 988	8-12	4.8	13.0	91	18	50	32	17.2	5.18	39.2	4.5
DeKalb SX-6	8-19	4.8	14.2	95	22	66	12	14.7	4.72	34.8	4.3
DeKalb SX-5	8-11	4.5	12.8	94	15	51	34	15.1	4.31	34.6	4.1
Frontier Hi-dan 39a	8-13	4.8	13.8	94	18	55	27	14.8	3.08	36.2	4.1
Acco SS-1	8-11	4.5	12.5	93	14	54	32	14.8	3.65	43.6	3.9
Stockmen's FS556	8-12	4.5	12.5	95	18	54	28	18.0	5.18	34.4	3.9
Pioneer 980	8-11	4.5	12.2	93	16	52	32	16.0	5.18	41.2	3.9
Grace Su-4	8- 4	4.8	11.8	89	15	53	32	15.5	7.59	42.6	3.8
Frontier Hi-dan 35	8- 7	5.0	12.8	89	17	46	37	11.8	7.64	38.8	3.8
Asgrow Astro	8- 8	5.0	13.0	89	18	49	33	14.1	5.85	36.1	3.7
Asgrow Grazer N	8- 9	5.2	12.5	89	21	58	21	18.4	5.13	31.1	3.6
Acco Sweet Sioux	8- 7	4.8	13.0	93	16	57	27	16.2	4.62	31.4	3.0
										LSD(05)	0.4
SUDANGRASS											
Acco HS-33	8- 2	6.2	10.0	85	18	59	23	11.2	2.77	44.2	4.1
Grace Trudy	8- 2	5.2	9.8	77	19	47	34	14.7	5.38	42.2	3.9
NK Trudan 4	8-13	6.0	12.8	85	23	64	13	15.7	3.75	30.7	3.4
Caladino-Monarch	8- 3	6.2	11.0	85	16	57	27	16.0	3.95	42.1	3.2
NK Trudan 2	8- 2	7.2	10.0	84	18	56	26	16.4	3.95	34.1	3.0

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.

** Forage Yields are reported on an oven-dry basis.

Note: Yield differences for Sorghum-Sudan are significant at the 1% level; Sudan yield differences are not statistically significant

Table 20. Performance Trial of South Dakota Hybrid Forage Sorghums and Silage Corn - South Central Research Farm - 1968.

Cultivar	Date of Heading	No. of Tillers	No. of Leaves	Height Inches	Percent of Plant			% Sugar in Sap	Percent* Protein	Percent D.M.	Forage Yield** Tons/Acre
					Leaf	Stem	Head				
LEAFY HYBRIDS											
OK 24-873	8-20	4.5	16.8	60	19	52	28	17.9	7.26	34.1	6.7
M873	8-29	4.0	16.2	63	38	40	22	18.3	7.31	31.6	6.4
M882	8-26	4.0	16.8	62	39	39	22	17.7	7.31	31.6	6.3
RB882	8-24	4.2	16.8	62	31	43	26	18.6	6.12	33.2	6.3
R873	8-16	4.0	15.8	65	25	25	50	17.2	8.30	31.2	5.6
R882	8-15	3.5	14.8	64	28	36	36	16.8	7.76	31.3	5.5
GRAIN-FORAGE SORGHUM											
SD252F	8- 5	4.2	11.5	64	15	24	61	13.5	9.62	48.9	5.4
OK 24-6	8- 2	4.2	9.2	52	18	18	64	6.5	9.75	46.9	4.2
RB6	8- 2	4.0	10.5	49	17	16	66	5.4	6.92	50.0	4.0
SILAGE CORN											
Pioneer Blend B	7-26	1.0	15.0	75	27	16	57	11.1	7.70	46.1	5.1

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.
** Yields are reported on an oven-dry basis.

CORN TESTING

Objective: To study the effects of high temperature during pollination period on the grain yield of corn varieties with varying maturities.

A study was initiated in 1968 to study the yield of corn as affected by temperatures during the period of pollination. In previous years it was noted that high temperatures with desiccating winds occur during late July and early August. This is the normal corn pollination period and as a result seed set is poor. As a method of eliminating this hazard to production, consideration was given to planting a series of varieties which ranged in maturity from early to late. A number of early varieties were obtained as well as a maturity range of 85 to 105 days. The results of the study are shown in table 21.

Table 21. Maturity Range of Corn Study - South Central Research Farm, 1968.

Variety	Maturity Index	Date of Tasseling	Percent Moisture	Grain Yield Bu/Acre
PAG SX-48	early	8- 1	18.0	99.0
PAG SX-42	early	7-27	13.8	81.3
PAG SX-47	early	7-22	15.2	72.0
Trojan TX-68	early	7-19	14.4	56.5
PAG SX-41	95	8- 3	24.1	73.7
PAG SX-62		8- 1	21.4	71.9
PAG SX-26	87	7-25	20.6	68.5
PAG SX-35	105	8- 1	35.6	67.0
PAG SX-24	85	7-23	21.2	63.9
PAG SX-36	95	8- 4	26.1	61.7
PAG SX-38	92	7-29	24.0	53.4
PAG SX-45	100	7-30	23.8	50.6
Date of Seeding - May 25,1968			Mean	68.2

Table 22. Temperature and Precipitation Data - South Central Research Farm, July 22 to August 14, 1968.

Date	Max. Temp.	Daily Prec.	Date	Max. Temp.	Daily Prec.	Date	Max. Temp.	Daily Prec.
7-22	85		7-30	82		8- 7	103	.17
7-23	89		7-31	78		8- 8	90	
7-24	73		8- 1	92		8- 9	71	1.35
7-25	90	.54	8- 2	97		8-10	71	
7-26	90	.01	8- 3	100		8-11	81	
7-27	84		8- 4	98		8-12	90	
7-28	85		8- 5	103		8-13	72	
7-29	95		8- 6	102		8-14	70	.36

GRASS TESTING

Grass Variety Trials

H. A. Geise

Objective: To determine which species and varieties of introduced grasses are best adapted to the South Central Area on the basis of their forage production.

All varieties of Smooth Bromegrass (Table 23) and Russian Wildrye (Table 24) were fertilized with 40# of nitrogen per acre.

Table 23. Smooth Bromegrass Forage Yield Trial - South Central Research Farm. (Seeded August 1958)

Variety	Forage Yield -- Tons/Acre	
	1968	9-Year Average
Southland	2.20	1.38
Lincoln	2.02	1.35
Lancaster	2.22	1.36
Homesteader	2.19	1.20
South Dakota 5	2.06	1.19
Wisconsin 55	2.68	1.14
Canadian Common	1.81	0.98

Table 24. Wildrye Variety Forage Yield Trial - South Central Research Farm, (Seeded August 1958)

Variety	Forage Yield -- Tons/Acre	
	1968	9-Year Average
Common Russian Wildrye	1.42	.84
Vinall Russian Wildrye	1.74	.94

Intermediate and tall wheatgrasses have consistently produced the highest forage yields of the wheatgrasses. Oahe, an intermediate wheatgrass, has the highest average of the groups seeded in 1958 and 1960 (Table 25). The recommended intermediate wheatgrass varieties are Oahe, Amur, and Greenar. Tall wheatgrass yields nearly as well as intermediate but it is not as palatable. Nordan crested wheatgrass although not the highest forage producer of the crested wheatgrass varieties is the most desirable from other agronomic standpoints.

Table 25. Wheatgrass Forage Yield Trial* - South Central Research Farm.

Variety	Forage Yield - Tons/Acre**			
	Seeded August 1958		Seeded August 1960	
	1968	9-Year Ave	1968	7-Year Ave
Crested Wheatgrass				
Common	.58	.90	----	----
Common Fairway	.60	.75	1.55	1.07
Mandan 2359	.94	.88	1.66	1.14
Nebraska 10	.66	.92	----	----
Nebraska 20	----	----	1.64	1.03
Nebraska 3576 Fairway	.55	.88	1.68	1.14
Nordan	.70	.94	1.66	1.19
Summit	.60	.93	----	----
Tall Wheatgrass				
Alkar	----	----	1.43	1.60
A12465	----	----	1.62	1.55
Mandan 1422	1.64	1.19	1.50	1.57
Nebraska Tall	1.67	1.02	----	----
S-64	1.44	.83	1.42	1.46
Intermediate Wheatgrass				
Amur	1.50	1.28	1.62	1.52
Greenar	1.69	1.28	1.62	1.60
Idaho #3	1.70	1.08	1.47	1.57
Idaho #4	1.59	1.34	----	----
Mandan	----	----	1.63	1.48
Nebraska 50	1.64	1.28	1.49	1.41
Oahe	1.55	1.37	1.71	1.67
Ree	1.62	1.24	1.69	1.63
Miscellaneous Wheatgrass				
P-27 (A. sibericum)	1.61	.98	1.41	1.27
Topar Pubescent(A. trichophorum)	1.75	.95	1.77	1.23
Whitmar (A. inerme)	1.72	.78	----	----

* This variety trial is fertilized with 40#/acre of Nitrogen each year.
** Absence of a yield indicates variety was not included in trial that year.

Grass Forage Production with Various Fertilizers and Row Spacings

H. A. Geise

Objectives: To determine optimum rates and ratios of fertilizers to be used in the production of grass forage. The effects of wide and narrow row spacing are also included.

Table 26. Inluence of Row Space and Fertilizer on Forage and Seed Yield of Smooth Bromegrass and Intermediate Wheatgrass.

Species	Row Space	Fertilizer* Applied	Seed Yield Lbs/A-1968	Forage Yield-Tons/A 1968	Forage Yield-Tons/A Av 1960-68
Smooth Bromegrass	6"	0-0-0	32	.50	.77
		20-0-0	56	.91	1.13
		40-0-0	61	1.06	1.25
		40-9-0	120	1.26	1.34
		40-9-0+Zn	---	1.28	----
	42"	0-0-0	114	1.09	1.16
		20-0-0	158	1.72	1.29
		40-0-0	129	1.61	1.36
		40-9-0	149	2.03	1.41
		40-9-0+Zn	---	2.12	----
Intermediate Wheatgrass	6"	0-0-0	40	.96	1.16
		20-0-0	29	1.10	1.64
		40-0-0	38	1.17	1.44
		40-9-0	69	1.10	1.47
		40-9-0+Zn	---	1.24	----
	42"	0-0-0	97	1.73	1.32
		20-0-0	129	2.06	1.47
		40-0-0	128	2.08	1.55
		40-9-0	90	2.75	1.58
		40-9-0+Zn	---	2.41	----

*Nitrogen and phosphorus fertilizers were applied as pounds of element at the rate indicated. Zinc was applied at 10 pounds per acre as zinc sulphate.

An experiment was initiated to study the effects of high nitrogen fertilizer. Ammonium nitrate was broadcast on Smooth Bromegrass sod in the fall of 1965, 1966, and again in 1967. The sod had been established in 1958 and the plants exhibited extreme nitrogen deficiency. The plots were harvested and samples analyzed for protein. The results are listed in table 27.

Table 27. Effect of Fertilizer on Protein Content, Forage Yield, and Seed Production of Smooth Bromegrass - South Central Research Farm.

Fertilizer Rate	Percent* Protein	Forage Yield-Tons/A** 1968	Forage Yield-Tons/A** Av 1966-68	Seed Yield-Lbs/Acre 1968	Seed Yield-Lbs/Acre Av 1967-68
0-0-0	6.2	1.31	.82	92	76
40-0-0	5.5	1.99	1.28	146	132
80-0-0	5.5	2.79	1.68	156	152
120-0-0	7.0	3.25	1.87	174	160
160-0-0	9.4	2.89	1.94	121	143

*Protein content calculated from Kjeldahl analysis and reported as though forage containing 12% moisture.
**Forage reported in tons per acre on oven-dry basis.

MANAGEMENT, TILLAGE AND CULTURAL PRACTICES

H. A. Geise

Comparison of Different Techniques in Growing Winter Wheat

Objective: To compare yields of winter wheat grown, (1) continuously with and without commercial nitrogen, (2) in rotation with conventional fallow or sweetclover fallow, and (3) in rotation with corn or sorghum harvested as an ensilage crop.

Yields and quality data from experiments conducted since 1966 with different management practices are reported in Table 28. Soil moisture apparently is the main limiting factor of those studied. Continuous wheat can produce slightly more grain in a two-year period than can a wheat-fallow system. The lower yield in 1968 in continuous wheat treatments with nitrogen fertilization may be due to the more complete use of soil water to grow a larger plant so that less water remains to produce grain, or it may be due to variation between plots.

Table 28. Yields of Winter Wheat from plots Having Eight Different Management Practices - South Central Research Farm.

Management Practice	1968 Test Wt Lbs/ Bu	1968 Percent Protein	1968 Yield Bu/ A	(1966-68) Av. Yield Bu/Acre
Continuous Wheat	57.4	18.7	18.8	14.5
Continuous Wheat - 40# N/Yr	55.4	15.2	16.3	13.2
Continuous Wheat - 80# N/Yr	54.8	15.6	13.1	13.9
Continuous Wheat -120# N/Yr	54.4	16.6	14.8	15.2
Winter Wheat - Fallow	57.8	14.4	27.6	21.2
Winter Wheat - Sw. Cl. Fallow	55.5	14.6	15.5	13.8
Winter Wheat - Corn (Silage)	54.6	14.9	13.3	11.0
Winter Wheat - Sorghum (Silage)	56.5	13.4	11.8	12.6
LSD (05) - 1968 - 4.0 Bu/A		Mean	16.4	

Table 29. Yields of Forage obtained from Corn and Sorghum - 1964-68.

Crop	Percent Dry Matter	Percent Protein	Forage Yield-Tons/Acre Wet	Dry	Av 1964-68
Silage Corn Pioneer S-100	25.3	7.7	9.2	2.4	3.3
Forage Sorghum Pioneer 931	30.8	5.6	12.0	3.7	4.1

Table 30. Economics of Different Techniques in Growing Winter Wheat South Central Research Farm - (1964-69)

Management Practice	Yield/Acre Bushel or Ton	Value of* Products	Income per Acre	Loss of Gain over Check
Continuous Wheat	14.5 bu	$19.43	$19.43	---
Cont. Wheat - 40#N/A/Yr	13.2 bu	$17.69	$13.29	(-$ 6.14)
Cont. Wheat - 80#N/A/Yr**	13.9 bu	$18.63	$ 9.83	(-$ 9.60)
Cont. Wheat -120#N/A/Yr**	15.2 bu	$20.37	$ 7.17	(-$12.26)
Wheat - Fallow	21.2 bu	$28.41	$14.20	(-$ 5.23)
Wheat - Sw Clover Fallow	13.8 bu	$18.49	$ 9.25	(-$10.18)
Wheat - Corn for Silage	11.0 bu	$ 7.37		
	3.4 ton	$13.60	$20.97	($ 1.54)
Wheat - Sorghum for Silage	12.6 bu	$ 8.44		
	4.0 ton	$14.00	$22.44	($ 3.01)

* Values are an average for the years indicated.
** includes only 1966-68 yields.

Methods of Summer Fallow

Objectives: To compare various fallow techniques in which the type of tillage and number of tillage operations vary.

The fallow methods listed in Table 31 have been studied for ten years. The largest grain yield in 1968 was from the treatment which received only subsurface tillage. However, all treatments which received tillage regardless of the type, had significantly higher yields than treatments using only chemicals.

Longtime averages show that best yields are from plots treated with subsurface fallow methods which destroy weeds and other plants from the time of harvest until seeding time. These implements leave the soil loose so water can be absorbed. They also leave the stubble standing to catch snow which melts and is absorbed to increase the soil moisture content.

Table 31. Yields of Winter Wheat from Plots where Six Different Fallow Practices were Compared.

Fallow Practice		Grain Yield of Winter Wheat			
Fall	Summer	Test Wt Lbs/ Bu	Percent Protein	Bu/A* 1968	Average 1959-68
1) One-Way	One-Way	57.8	13.8	23.2	16.2
2) Noble Blade	Noble Blade	56.9	15.6	25.0	17.2
3) Noble Blade	Noble Blade or 2,4-D	56.4	15.8	24.6	17.8
4) Noble-Chem**	Chemical**** Tillage	56.0	14.7	15.8	16.2
5) No Tillage	Noble Blade	56.5	15.2	21.3	16.7
6) Noble Blade**	Chemical****	54.5	16.2	15.0	14.2
			Mean	20.8	

* LSD(05) - 3.3 Bu/A
** Fall Treatment consists of 5# of Dalapon + 1/2# of 2,4-D per acre.
*** Spring Treatment consists of 1/4# of Paraquat/Acre/each of 2 applications.
****One application of 5# of Dalapon +1/2# of 2,4-D + one application of Paraquat at 1/4#/acre.

Table 32. Soil Moisture Conditions as Influenced by Six Different Fallow Techniques. (1966-68)

Fallow Treatment	Total Inches of Soil Moisture (0-48")						
	Stubble Oct 48	Stubble Oct 67	Fallow May 68	Fallow Oct 68	Winter Gain*	Summer Gain**	Gain for Year***
1	12.34	12.41	13.34	14.14	.93	.80	1.73
2	12.76	13.99	14.46	15.08	.47	.62	1.09
3	12.57	14.24	14.45	14.82	.21	.37	.58
4	11.62	12.09	12.45	13.94	.36	1.49	1.85
5	11.88	13.71	14.52	15.07	.81	.55	1.36
6	11.19	11.63	12.96	13.65	1.33	.69	2.02

* Moisture accumulated in soil October 1967 to May 1968.
** Moisture loss by evaporation or plant use from May 1968 to October 1968.
***Difference between winter gains and summer loss.

Soil moisture changes have also been studied in relation to the various fallow methods. These studies indicate more soil moisture can be stored by using a good program of subsurface tillage. The most soil moisture was conserved in 1968 by the use of chemical fallow. However, the treatment which resulted in the highest moisture content in the soil was obtained by the use of subsurface implements which loosened the soil so summer rains could be absorbed, and also controlled the weeds.

Management, Methods of Seeding Sorghum, and Fertilizer Effects on a Sorghum-Spring Wheat Rotation

Objectives: To determine the effect of nitrogen fertilizer, row spacing, and planting rate on grain sorghum yields and effects of these practices on the yield of spring wheat the next year.

Yields in the sorghum-spring wheat rotation have varied among years. The spring wheat yields are usually higher from plots which have not been fertilized and had small sorghum populations the previous year.

Sorghum grain yields have usually been highest in those plots which were fertilized and seeded at the higher rates. Variations in row spacing of sorghum has caused significant differences in grain yield, with the 24 inch rows being the most productive.

Table 33. Effects of Fertilizer, Rate of Seeding, and Row Spacing of Grain Sorghum on Grain Yield of Spring Wheat and Grain Sorghum in a Sorghum-Spring Wheat Rotation, 1968.

Rate of Planting Sorghum	Sorghum Row Spacing	Fertilizer*	Spring Wheat		Grain Sorghum	
			Percent Protein	Yield Bu/ A	Test Wt Lbs/ Bu	Yield Bu/ A
2 Lbs/A	12"	0	17.5	22	56.9	1596
		N	18.0	20	56.6	1506
	24"	0	17.2	21	56.5	1898
		N	18.2	21	56.6	2190
	42"	0	18.6	17	55.7	1943
		N	18.5	16	56.8	1977
4 Lbs/A	12"	0	16.1	21	56.4	2542
		N	18.0	17	56.0	2396
	24"	0	17.6	21	56.8	2509
		N	18.0	30	56.8	3035
	42"	0	17.4	17	56.6	2206
		N	18.2	16	56.4	2458
8 Lbs/A	12"	0	16.8	33	56.1	2576
		N	16.9	30	56.6	2850
	24"	0	17.5	30	56.8	2374
		N	18.3	30	56.2	2542
	42"	0	15.6	26	56.9	2626
		N	18.6	23	56.6	2615

* "N" indicates 40# of Nitrogen per acre, "0" indicates fertilizer was not applied.

** Spring wheat yields are reported on a single sample only and are rounded to nearest whole bushel.

Effects of Date of Planting and Row Spacing on Grain Sorghum

Objective: To study the effects of planting date and row spacing on growth periods, grain quality, and grain yield of grain sorghum.

The effect of date of planting and row spacing of grain sorghum has been observed as differences in growth periods, grain quality, and grain yield. This study was conducted to measure those factors plus others which might contribute to successful production of short-season varieties.

A short season variety of grain sorghum, var. NK Mini-milo 50 was planted at four different dates throughout the growing season. At each date the plots were subdivided to include three row spacings- 6 inch, 12 inch, and 24 inch. Each row spacing was replicated four times.

The grain sorghum was seeded at 24 lbs per acre in 6-inch rows, 12 lbs per acre in the 12-inch rows, and 6 lbs per acre in the 24-inch rows. Seeding

was accomplished by using a Pony Press Drill with a basic 6-inch spacing. The plots received 60 lbs. per acre of ammonium nitrate prior to seed bed preparation, and 15 lbs. of elemental phosphorus with the seed.

Weeds were controlled by harrowing after emergence, and cultivating those plots which were planted in 12-inch and 24-inch rows. The weeds which were present were primarily Rough Pigweed and Kochia. These were removed by hand to prevent weed seed production which would affect future use of the experimental area.

Seed samples were collected at those dates shown in Table 35. These samples were threshed with an Almaco head thresher and dried at 105° Fahrenheit for 24 hours. Harvesting was completed with a self-propelled combine.

Soil temperatures (Table 37) appear to have the greatest effect on time-to-emergence and plant populations. The early planting required ten days for plants to emerge to a point where rows could be seen. This period decreased to five days for the last planting. There is an inverse relationship with soil temperature because as soil temperature increased the time from planting to emergence decreased.

The soil temperature also played a part in population per unit area. The first date of planting contained about 2.7 plants per foot of row whereas the second was considerably higher with 4.4 plants per foot of row. The later plantings, although not counted had a population as great or greater than the second planting.

The length of the period from planting to maturity decreased as planting was delayed. The first date of planting was mature in 119 days, whereas the second matured in approximately 105 days. The third and fourth dates of planting had dropped to a moisture content of 15% and 19% in 107 and 97 days, respectively, but this was primarily the result of killing frost rather than normal maturity.

Grain yields varied widely (Table 34) with the second date of planting plots having the highest yield. In comparison to the second date, yields were only about 2/3 in the first planting,and about 1/3 in the third planting. The fourth date of planting did not produce good quality seed because pollination was not completed until about two weeks before the first killing frost.

Test weight, or weight per bushel decreased as date of planting was delayed. There was also a direct relationship between test weight and protein content with protein decreasing as test weight was lowered.

Plant height increased in the wider row spacing of the earlier plantings. This was undoubtedly influenced by moisture because the sorghum grown in narrower rows of the earlier planting were showing a severe moisture stress when heading was nearly completed.

Tillering did not vary with date of planting but did show a difference with row spacing. The average number of tillers per plant in the 24-inch row was three regardless of the planting date.

Table 34. Influence of Date of Planting and Row Spacing on Grain Yield of Grain Sorghum, var. NK Mini-milo 50.

Date of Planting	Row Space	Height Inches	No. of Tillers	Percent Protein	Test Wt Lbs/ Bu	Seed Yield Lbs/Acre
May 28	6"	31.2	1	13.39	60.2	1892
	12"	38.0	1	13.64	61.4	2539
	24"	42.2	3	12.16	60.4	2647
June 20	6"	30.0	1	11.80	58.2	3004
	12"	37.0	1	10.82	59.4	3444
	24"	42.2	3	12.62	58.8	3700
July 9	6"	43.2	1	10.46	45.2	1386
	12"	45.5	1	11.03	44.9	1236
	24"	45.2	3	11.64	45.1	1128
July 19	6"	39.5	1	10.98	35.0	25
	12"	41.5	1	10.77	38.9	58
	24"	43.0	3	10.57	36.6	50

LSD(05) - 110#/acre Mean 1759

Table 35. Influence of Date of planting on Heading and Moisture Content of Seed of Grain Sorghum, var. NK Mini-milo 50.

Date of Planting	Heading Date			Moisture Content			
	1st	50%	100%	Sept 10	Sept 24	Oct 3	Oct 24
May 28	7-15	7-21	7-29	30.8	14.0	11.0	*
June 20	8- 1	8- 4	8- 9	44.0	27.7	18.0	*
July 9	8-19	8-23	8-25	**	38.4	33.5	15.0
July 19	9- 7	9-10	9-20	--	**	57.5	19.0

* Harvested - 4 October 1968

** Termination of Pollination.

Table 36. Influence of Date of Planting on Growth Stage of Grain Sorghum, var. NK Mini-milo 50.

Date of Planting	Days to Emergence	Days from Emergence to 50% Heading	Days to Maturity* from 50% Heading
May 28	10	44	65
June 20	8	37	60 plus
July 9	6	39	62
July 19	5	48	44 plus

* Moisture content low enough for safe storage.

Table 37. Soil Temperature Measured 2 inches below the Surface of Black Fallow - South Central Research Farm, 1968

Date of Planting	Time Period	Soil Temperature @ 2 inches		
		High	Low	Mean
May 28	Preplant (5 days)	75.2	55.8	65.5
	Planting Day	74.0	58.0	66.0
	Postplant (10days)	86.1	66.0	76.0
June 20	Preplant (5 days)	83.2	67.4	75.3
	Planting Day	87.0	63.0	75.0
	Postplant (8 days)	82.9	69.9	76.4
July 9	Preplant (5 days)	94.8	74.4	84.6
	Planting Day	84.0	73.0	78.5
	Postplant (6 days)	100.8	78.7	89.8
July 19	Preplant (5 days)	102.0	79.4	90.7
	Planting Day	97.0	73.0	85.0
	Postplant (5 days)	100.8	76.8	88.8

Influence of Fertilizers on Grain Quality and Yield of Winter Wheat

Objective: To study winter wheat responses which are influenced by addition of fertilizers.

Two experiments were initiated to study the effects of fertilizing winter wheat in a Promise clay soil. The fertilizers used contained the plant nutrient elements: Nitrogen, Phosphorus, Potassium, and Sulphur. The fertilizers were placed with the seed by using a drill attachment.

The first experiment was placed on fallow land and consisted of various rates and ratios of plant food. The results of this trial (Tables 38 & 39) indicated the light rate of phosphorus (0-15-0) to be the only fertilizer that returned a moderate profit.

The second experiment was placed on winter wheat in stubble and consisted of similar fertilizer treatments. The results (Tables 40 & 41) show the only economic increase in yield was obtained by using 30 pounds of phosphorus per acre.

Table 38. Influence of Fertilizer on Winter Wheat in Fallow - South Central Research Farm, 1968.

Fertilizer Treatment	Date of Heading	Height Inches	Percent* Protein	Test Wt Lbs/ Bu	Grain Yield Bu/ Acre
0- 0- 0	6-12	38	13.6	61.0	41.2
15- 0- 0	6-13	38	13.3	62.0	42.6
30- 0- 0	6-12	40	13.2	61.7	43.2
30- 0- 0(S)	6-12	38	13.2	61.7	42.6
60- 0- 0	6-12	40	13.0	61.0	37.8
60- 0- 0(S)	6-12	39	13.2	61.5	40.6
0-15- 0	6-11	40	12.5	61.5	46.6
15-15- 0	6-11	39	13.2	61.8	47.4
30-15- 0	6-12	40	13.1	61.3	45.6
60-15- 0	6-11	38	12.8	62.3	45.0
0-30- 0	6-11	38	12.8	60.8	43.2
15-30- 0	6-11	40	13.0	62.0	47.0
30-30- 0	6-11	40	12.4	61.8	51.8
60-30- 0	6-10	38	13.0	62.0	49.2
0- 0-30	6-11	38	12.9	61.5	41.0
0- 0-60	6-11	38	12.9	61.3	39.2
30-15-30	6-11	38	13.1	61.0	43.6
30-15-60	6-11	38	13.2	61.2	35.8
LSD(05) - 6.0 bu/a				Mean -	43.6

* Percent protein reported on an oven-dry basis.
Note: All nitrogen applied in the ammonium nitrate form, except where applied as ammonium sulphate and designated by symbol (S).

Table 39. Economics of Fertilizer Applications on Fallow Winter Wheat - South Central Research Farm, 1967-68.

Rate of Application	Grain Yield Bu/A	Total Income Per Acre	Increased Profit
0- 0-0	35.5	$47.57	- - -
15- 0-0	37.8	$50.65	$ 1.43
0-15-0	37.8	$59.09	$ 8.37
15-15-0	40.4	$54.14	$ 1.77
0-30-0	39.9	$53.47	-$ 0.40
15-30-0	43.3	$58.16	$ 2.64

Note: The figures in the above table were calculated using the following prices: Wheat - $1.34 per bushel, Nitrogen Fertilizer - $.11 per lb., Phosphorus - $.21 per lb. Cost of application of fertilizer is not considered.

Table 40. Influence of Fertilizer on Winter Wheat in Stubble - South Central Research Farm, 1968.

Fertilizer Treatment	Date of Heading	Height Inches	Percent* Protein	Test Wt Lbs/ Bu	Grain Yield Bu/Acre
0- 0- 0	6-13	34	13.3	59.3	31.6
15- 0- 0	6-12	34	14.5	58.8	28.4
30- 0- 0	6-14	33	13.8	58.2	24.6
30- 0- 0(S)	6-14	33	13.3	56.5	17.6
60- 0- 0	6-11	32	13.6	57.3	24.4
60- 0- 0(S)	6-14	31	13.8	56.5	20.4
0-15- 0	6-11	34	13.3	61.2	35.6
15-15- 0	6-12	35	13.7	60.0	35.6
30-15- 0	6-11	34	13.2	60.8	32.8
60-15- 0	6-11	33	13.2	59.5	30.2
0-30- 0	6-10	33	12.9	60.8	36.8
15-30- 0	6-10	33	14.7	59.8	32.0
30-30- 0	6-11	34	13.4	59.8	32.0
60-30- 0	6-10	34	13.1	59.7	35.6
0- 0-30	6-13	34	13.7	58.2	27.6
0- 0-60	6-14	32	14.0	60.7	23.0
30-15-30	6-13	33	13.4	59.2	28.6
30-15-60	6-13	33	14.5	56.5	23.6
LSD(05) - 12.8 bu/acre				Mean	29.1

* Percent protein reported on an oven-dry basis.
Note: All nitrogen applied was in the form of ammonium nitrate except where indicated by (S). The (S) indicates nitrogen was applied as ammonium sulphate.

Table 41. Economics of Fertilizer Application on Stubble Winter Wheat South Central Research Farm, 1967-68.

Rate of Application	Grain Yield Bu/A.	Total Income per Acre	Fertilizer Profit or loss
0- 0-0	22.0	$29.48	- - - -
30- 0-0	17.4	$23.32	-$ 9.46
0-15-0	24.2	$32.43	-$ 0.20
30-15-0	25.2	$33.77	-$ 2.16
0-30-0	26.8	$35.91	$ 0.13
30-30-0	24.6	$32.96	-$ 6.12

Note: The figures in the above table were calculated using the following prices: Wheat - $1.34 per bushel, Nitrogen - $.11 per lb., Phosphorus - $.21 per lb. Cost of application of fertilizer is not considered.

CROP DISEASE CONTROL

Plant Pathology Department

Chemical Rust Control in Winter Wheat

G. W. Buchenau

Experiments to control stem and leaf rust of wheat were continued at the South Central Research Farm, using commercially available fungicides in 1968. Similar experiments were conducted on the Gus Snyder farm near Pierre.

Very light stem rust and moderately severe leafrust development characterized the 1968 rust season. In other respects, the season was excellant for wheat although wheat streak mosaic and an unidentified leaf necrosis reduced yield, especially at the Presho station. At both locations the fungicide Dithane M-45 was applied at a rate of 2 lb/acre per application using ground equipment on 6 row x 30 foot plots.

Presho:

Leaf rust control was generally reflected by higher yields, although in some cases yield increase was not proportional to the degree of rust control obtained (Table 42). Sprays applied at jointing and heading resulted in a profit. The unusual amount of yield variation that occurred in these plots obscures further interpretation of the 1968 data.

Pierre:

The spray plots located near Pierre were characterized by excellent and uniform spring stands and low levels of disease other than leaf rust. The data show that moderate levels of rust control resulted in good yield increases and acceptable profits, except where more than three applications were used, (Table 43). Of the two-application schedules, jointing and heading applications were most profitable, thus supporting the Presho data. These benefits from spraying are considered conservative since fungicides are usually most effective when applied to large fields.

Data from experiments such as these, continued over a period of years, constitute the basis for a rust forecasting-spray advisory system currently being developed. Such a system, it is hoped, will enable a grower to predict in advance whether spraying for rust will be profitable or not in a given season.

Table 42. Rust Control, Yield Increase and Profits from Fungicidal Sprays with Dithane M-45 on Omaha and Lancer Winter Wheat at Presho, 1968

Time of Application a/	No. Appl.	Yield Increase bu/A	% Rust Control c/ %	Profit d/ $	Return on Spray Investment e/
		OMAHA			
Tillering, jointing, & 10 days later	4	9.9	84	-0.13	Loss
Tillering, jointing & heading	3	5.4	81	-2.73	Loss
Jointing, heading & 10 days later	3	3.9	74	-4.68	Loss
Heading & 10 days later	(2)	4.5	29	-0.65	Loss
Check (unsprayed)	0	0 (36.4) b/	0	0.00	--
		LANCER			
Tillering, jointing, heading & 10 days later	(4)	8.0	75	-2.47	Loss
Tillering, jointing & heading	(3)	6.8	70	-0.91	Loss
Jointing & heading	(2)	6.9	66	+2.47	38%
Check (unsprayed)		0 (31.2) b/	0	0.00	--

a/ Tillering - 1 node visible, 16 May: Jointing - 2 nodes visible, 29 May: Heading - awns visible, 11 June.

b/ Yield increase over unsprayed check. Actual yield of check shown in brackets.

c/ Rust control based on top 3 leaves, 30 days after leaf emergence. 100% = complete control.

d/ Profit based on wheat price of $1.30/bu and subtracting chemical and application costs of $3.25/acre per application.

e/ Calculated as money invested in a bank.

Table 43. Rust Control, Yield Increase, and Profits from Fungicidal Sprays with Dithane M-45 on Hume Winter Wheat near Pierre, S.D., 1968.

Time of Application a/	No. Appl.	Yield Increase Bu/Acre b/	% Rust Control c/	Profit $ d/	Return on Spray Investment e/
Tillering, jointing, heading, & heading + 10 days	4	10.0	57	0	Even
Jointing, heading & 10 days later	3	9.8	55	+2.99	31
Jointing & heading	2	8.8	46	+4.94	76
Heading & 10 days later	2	6.2	47	+1.56	24
Check (unsprayed)	0	0 (54.2)	0		--

a/ Tillering - 1 node visible, 17 May: Jointing - 2 nodes visible, 29 May; Heading - awns visible, 11 June.

b/ Yield increase over unsprayed check. Check yield 54.2 bu/a.

c/ 100% = perfect control of rust. Based on top 3 leaves, 30 days after leaf emergence.

d/ Profit based on wheat $1.30 per bushel and subtracting chemical and application costs of $3.25/acre per application.

e/ Calculated as money invested in a bank.

Control of Mosaic of Winter Wheat

Wayne S. Gardner

At the South Central Research Farm in 1968, the date-of-planting experiment indicated that wheat streak mosaic virus was controlled best and winter wheat made the highest yields when the crop was planted on September 14 (Table 44). Mosaic was severe in the early planted plots, and considerable mosaic was present even in the later planted wheat. Later developing symptoms and shrivelled grain at all dates suggested that mosaic was spread by wheat curl mites from early planted plots to later planted plots. It appeared that the virus moved between adjacent plots but did not move to a nearby wheat variety plot.

The nine-year average for experiments at South Central Research Farm (Table 44) indicated that winter wheat yields were highest if planted on September 14th. This date remains as the recommended date for planting winter wheat to control wheat mosaic.

Inoculation experiments were conducted at Brookings in winter wheat plots. Height, yield, and bushel weight were reduced both from fall and from spring infection of Wheat Streak Mosaic. Grain from the virus-inoculated wheat was shrivelled like that observed in the natural mosaic infections at Presho.

Another experiment on date-of-planting winter wheat was established at Highmore. The results of that planting were different from those at the Presho station (Table 45). The later plantings made better yields at Highmore, and there was less shrivelled grain and less mosaic.

Winter kill was most severe in the August 15th planting at Highmore, and on October 4th at Presho. Adequate moisture was present during the growing season at both stations, and wheat yields were related to the presence or absence of mosaic in the plots.

Table 44. Effect of Planting Date on Control of Wheat Streak Mosaic, Height and Yield of Hume Winter Wheat - South Central Research Farm, 1968.

Date of Planting	Percent* Mosaic	Height Inches	Yield Bu/ A	9 Year Average 1960-68	
				% Mosaic	Yield-Bu/A.
August 15	98	22	9	55	12
August 25	89	23	12	47	16
September 4	37	33	24	16	22
September 14	26	33	27	6	25
September 24	15	29	17	3	22
October 4	2	21	7	1	17

LSD(05) - 5.7 Bu/A

* May 16, 1968

Table 45. Effects of Planting Date on the Control of Wheat Streak Mosaic, Height, and Yield of Hume Winter Wheat at Central Substation, Highmore, South Dakota, 1968.

Date of Planting	Percent Mosaic* Infection	Plant Height Inches	Grain Yield Bu/Acre
August 15	60	21	7
August 25	69	23	18
September 4	48	24	20
September 14	23	27	31
September 24	2	32	37
October 4	0	34	32

LSD(05) - 3.1 Bu/A

Wheat Streak Mosaic Virus in Field Corn in South Dakota

Wayne S. Gardner

Wheat Streak Mosaic virus (WSMV) was recovered from field corn at the Presho station both in 1967 and 1968. Volunteer corn plants showing virus symptoms and growing beside the winter wheat date-of-planting plots were transplanted to pots and moved to the greenhouse. WSMV was recovered from corn leaves by mechanical transmission to wheat. Wheat curl mites moved from the corn to wheat that was planted in the same pot and the wheat developed curled leaves and mosaic symptoms. The virus was also recovered from small corn plants growing in border rows beside the winter wheat date-of-planting plots. These are the first records of corn being naturally infected with WSMV in South Dakota.

Results of experiments and observations indicate that most corn hybrids are resistant or immune to WSMV, and there is no reason now to suspect that mosaic will be a problem in South Dakota corn fields.

Both in 1967 and 1968, a light amount of kernel red streak was observed on corn at Presho. This disease is caused by the feeding of the wheat curl mite on the seed coat of developing corn kernels. The red discoloration is thought to be due to a toxin secreted by the mite during its feeding process.

The presence of the wheat curl mite and WSMV on corn suggests that this crop may be important on the oversummering of both mites and mosaic. In the spring the mites develop on wheat and move to corn after the wheat harvest. Again when corn is harvested in the fall the mites could move back to fall planted wheat. Since corn is not extensively planted in the winter wheat region in South Dakota, there seems little likelihood that wheat mosaic epidemics now result from the planting of these two crops.