Agronomy Pamphlet 39

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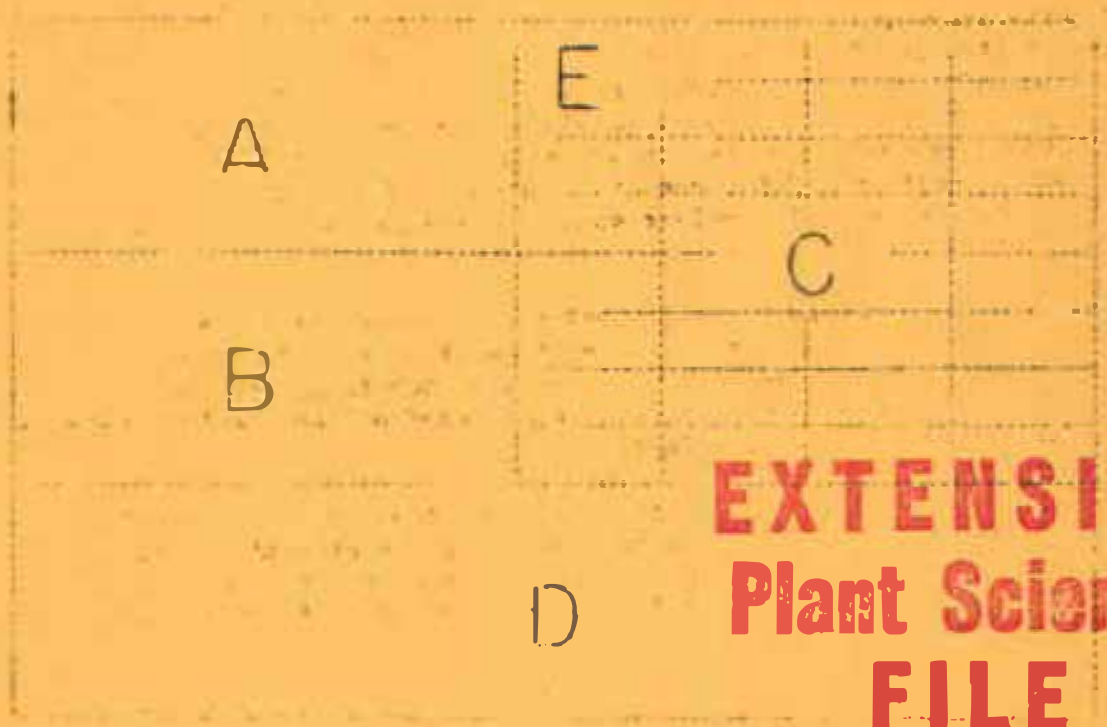
ANNUAL PROGRESS REPORT

NORTHEAST RESEARCH FARM

WATERTOWN, SOUTH DAKOTA

PLOT DIAGRAM



Experiments

A. Testing, breeding and disease control of small grains. (4.4 acres)

B. Testing, breeding and disease control of corn, soybeans and sorghum. (4.3 acres)

C. Fertility and cultural practice experiments. (11.3 acres)

D. Newly acquired land. (10.4 acres)

E. Grass and legume testing. (.66 acres)

Agronomy and Plant Pathology Departments
Agricultural Experiment Station
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Origin and History of Mobile Unit Farms

During the past several years there has been an increasing need for research work on crops and soils in the northeast and southeast areas of the state. After several meetings of the people interested in research for areas not already represented by experiment stations, plans were made to ask the State Legislature for additional appropriations for this work. Adequate funds were granted and two new Research Farms or "Mobile Units" were started in 1956. The term "Mobile Unit" was used for two reasons: (a) some of the equipment could be moved from one unit to another to prevent purchasing a full line of machinery for each location, (b) after 5 to 8 years (depending on the nature of the experiments selected) the experimental units would be moved to a new location within the area with an entirely new set of problems such as slope, drainage, fertility, soil type, etc.

In each of the two areas, meetings of interested farmers and county agents were held to set up area committees to assist the Agricultural Experiment Station in selection of the research farms and to plan the experiments. The Area Committees are composed of the county agents and one farmer from each county in the area.

After looking at several possible locations, a joint committee of farmers and college representatives selected the present farms. The amounts of land devoted to each form of agronomic research, and also the specific experiments on fertility and soil management, were selected by the respective area committees.

Each farm or unit represents a particular soil and problem area that is characteristic to that geographical region. The experimental work is performed precisely where the problems occur. Therefore, the results of these investigations are directly applicable to the regions studied, and in addition it is considerably easier for the people in these areas to observe experiments when the research is conducted near their homes.

Annual field days will be held to observe first hand the results and progress of all experiments in the field. In addition, it is planned to have a winter meeting in each area to permit the presentation and discussion of results for all people who are interested.

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ANNUAL PROGRESS REPORT
FOR NORTHEASTERN RESEARCH FARM
1956

NOTE: This is a progress report and therefore results presented are not necessarily complete nor conclusive. Any interpretation given is strictly tentative because additional data resulting from continuation of these experiments may result in conclusions different than those of any one year.

INTRODUCTION

In the spring of 1955, money was appropriated by the State Legislature to begin new research on crops, soils and crop diseases in the northeastern part of the state. A site involving 20 acres was originally selected. It is located on the Otto Korth farm, 15 miles north of Watertown at the junction of Highways 81 and 20.

The purpose of this farm is to provide research facilities to obtain solutions of local problems in crop production and soil management. Experiments involving fertilizers, plant disease control, crop management, soil fertility, and crop variety testing have been underway for one crop season.

An additional 13 acres were acquired for new experiments which will be started in the summer of 1957. The committee of farmers and county agents representing the northeastern South Dakota counties will meet before the 1957 planting season begins, to discuss and select the experiments to be started on the newly acquired land.

1956 CROP SEASON

Table 1. Total Rainfall and Average Temperatures by Months, With Their Departures From Long Term Averages at N. E. Experimental Farm.*

	April	May	June	July	Aug.	Total
Total rainfall in inches	1.80	2.88	6.56	4.02	6.25	21.51
Departure from long-time average	-.26	+.08	+2.75	+1.18	+3.60	+7.35
Average monthly temperature in degrees	37.1	55.2	70.5	67.7	68.5	59.8
Departure from long-time average	-6.3	-0.9	+4.7	-4.9	-1.6	-1.8

Temperatures, in general, remained cool throughout the season except for part of the month of June. Crops were held back somewhat in the early part of the season by the cool temperatures, but the hot temperatures in June injured much of the small grain and restricted yields. The weather in July broke away from the hot dry pattern of June. This change came in time to benefit the corn but too late for much of the small grain. Growing conditions for corn in August were very favorable.

Precipitation, in general, was deficient early in the season but heavy rains in June, July and August brought the total to several inches above the average. These rains occurred a little too late to be of much help to small grains but their effect on corn was very favorable.

*Data Courtesy U.S. Weather Bureau, Huron, South Dakota

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

SMALL GRAIN RESEARCH

by V. A. Dirks and D. D. Harpstead

Northeastern South Dakota's eight counties are the primary cash grain area of the state. With 14% of the crop land, these counties produce 60% of the flax, 50% of the durum wheat, 31% of the barley, 20% each of the oats and rye and 10% of the spring wheat crop of South Dakota. The Northeast Research Farm in the center of these eight counties is representative of some of the most favorable conditions for small grains in this area; it also samples the range of problems associated with such a concentration of production.

The small grain research at the Northeast Station included a testing program in the crops grown in this area. This was intended to try out a wide range of different varieties - with regards to maturity, plant type and disease resistance - to provide a basis for establishing recommendations and breeding work for this area. In addition, promising strains developed in other states and in the South Dakota small grain breeding program were to be evaluated in the hope of adding to the productivity and economic stability of this area.

The scope of the tests is summarized below:

Crop	Named Varieties	New Strains From Other Breeders	South Dakota Selections
Hard Red Spring Wheat	29	14	52
Durum Wheat	10	9	1
Barley	28	8	55
Oats	45	35	10
Flax	14	5	19
Rye	9		
Winter Wheat	9		
Total	144	71	137

This makes a total of 352 strains, each tested from one to six plots per strain. In addition, an experiment was conducted on the relation between variety and planting rate in oats.

The winter grain plots were sown September 12, 1955. The winter wheat killed out completely, and killing was severe in the rye.

The spring crops were sown April 20, and the results obtained in 1956 indicate varietal responses somewhat different from those in other areas of the state. Information on varietal reaction to stem rust and leaf rust in the cereal grains, scab and bacterial black chaff on wheat, septoria on oats and spot blotch on barley was recordad; as were notes on standability and shattering. The 1956 season favored the late maturing varieties in each crop.

The results of tests on some of the small grain varieties are given in Tables 2-6.

Table 2. Percentage Winter Survival and Vigor Rating of Nine Rye Varieties at the Northeast Reeearch Farm, 1956

Variety	Direction of Rows	Average Survival Percent	Vigor Rating
Pierre	N-S	70	4
Pierre	E-W	100	3
Antelope	N-S	79	4
Caribou	N-S	68	4
Tetra Petkus	N-S	0	-
Emerald	N-S	48	5
White Soviet	N-S	45	4
Horton	N-S	46	4
Von Rumker	N-S	11	5
Adams	N-S	45	5

Plots seeded with a deep furrow drill, and plowed up after survival notes were taken.

Vigor rating: 1 best, 5 very weak.

Table 3. Flax Variety Test at the Northeast Research Farm, 1956.

Variety	Av. Yield Bu./Acre	Pasmo 0-9*	Lodging Damage 0-9*
Marine	17.0	6	1
Sheyenne	17.8	9	6
Redwood	14.8	9	5
B-5128	15.2	9	4
Redwing	16.1	8	2
Dakota	15.9	7	3
Koto	17.0	8	4
Norland	15.5	8	3
C.I. 1478	14.3	8	3
L.S.D.	2.6		

*Scale 0-9; 0=no damage, 9 most severe.

Table 4. Spring Wheat Durum Variety Tests, Northeast Research Farm, 1956

Variety	Yield Bu/Acre	Test Weight	Height Inches	Stem Rust pct.	Leaf Rust pct.	Black Chaff Rating	Scab Injury Rating	Lodging Rating	Maturity Rating
Hard Red Spring									
Rushmore	18.1	58	27	12	40	0	5	0	3
Lee	17.9	57	28	18	T	2	8	2	2
Selkirk	23.4	56	28	T	10	0	7	0	7
Conley	20.0	58	32	0	0	6	5	0	8
Mida	17.8	58	32	40	30	2	9	2+	5
Rival	17.6	56	31	35	30	4	6+	1	6
Pilot	16.8	56	30	40	40	3	8+	1	6
Thatcher	19.6	56	26	30	60	2	8	0	3
Cadet	20.8	56	34	15	40	1	4+	0	7
Ceres	18.5	55	30	40	30	2	8	1	4
Spinkota	22.0	60	36	20	40	1	2	2	6
Marquis	12.4	51	34	80	50	0	5	0	9
N.D. 3	20.1	56	34	0	5	2+	6	0	5
Ellar	19.8	58	31	10	T	3	8+	1	5
R.R. 1935	17.6	58	28	8	T	2+	3	0	1
Henry	18.1	57	30	22	20	2	4	3	6
Durum									
Stewart	20.7	61	43	53	0	2	4-	4	9
Mindum	20.9	60	40	53	0	2+	6	2	8
Vernum	21.2	60	38	27	0	2	7-	3+	7
Nugget	18.7	57	29	27	3	2	8	1	4
Sentry	23.7	61	32	9	0	4	8-	1-	4
Yuma	22.2	58	32	0	0	1	3	1+	10
Ramsey	22.3	60	34	30	10	3	4	1-	5
Langdon	23.4	59	33	28	5	2+	5	0	5
Towner	22.9	62	42	22	10	1	4	3	7
L.S.D.	3.7								

Black chaff lodging and scab rating on 1-10 scale of increasing severity.
Maturity scale: 1 = very early; 10 = very late.

Table 5. Barley Variety Test at the Northeast Research Farm, 1956

Variety	Yield in Bushels 1956	Test Weight 1956	Spot Blotch	Stem Rust	Height Inches	Maturity
Plains	19.6	45	6	0	18	Early
Feebar	25.4	43	5	0	18	Medium
Velvon 11	27.4	43	6	50	20	Medium to late
Kindred	23.4	47	4	0	24	Medium
Spartan	27.8	50	6	50	25	Early
Odessa	28.7	48	3	15	23	Medium
Tregal	27.8	43	4	5	22	Late
Compana	20.0	45	4	5	18	Early
Mars	26.9	47	3	0	23	Early
Montcalm	36.3	43	4	30	31	Medium to late
Custer	20.3	43	7	10	19	Early
Traill	36.8	47	5	0	23	Medium
Wisconsin 38 (Barbless)	39.7	46	4	20	29	Late
Manchuria	24.4	46	2	40	28	Medium to late
Fox	35.8	48	5	0	26	Medium to late
Parkland	35.5	48	5	0	29	Medium
Liberty	35.0	47	6	0	24	Medium
S.D. 1483	20.8	43	1	0		Early
Forrest	28.8	48	3	0	27	Medium
L.S.D.	7.7					

Stem rust notes in percent; spot blotch notes on a 1-10 scale, 1 best.

Table 6. Oat Variety Test at the Northeast Research Farm, 1956

Variety	Yield Bu/Acre	Test Weight	Stem Rust Percent	Lodging Percent	Septoria Rating	Shattering Score	Maturity Rating	Height Inches
Vikota	34.5	33	10	48	3.8	2	5	25
Andrew	56.4	36	20	42	8.5	4	3	28
Dupree	44.4	37	40	55	8.0	6	2	28
Cherokee	39.3	34	40	60	10.0	8	3	27
Nemaha	31.2	36	50	42	10.0	6	3	26
Clinton	29.0	36	40	32	9.5	4	6	28
James	36.8	42	50	68	10.0	3	7	29
Marion	48.1	35	20	65	8.0	3	6	32
Branch	43.1	38	10	28	2.5	2	9	32
Ajax	43.9	33	15	65	9.5	2	8	36
Waubay	43.5	37	10	18	4.5	4	7	27
Ransom	30.2	36	0	50	6.5	6	2	26
Mo. 0-205	35.8	36	18	52	5.0	4	5	30
Sauk	58.7	35	10	38	3.0	4	8	29
Rodney	50.2	38	T	28	4.5	2	10	34
Simcoe	43.9	35	15	70	8.5	2	8	35
Minland	54.8	31	T	42	6.0	2	3	34
Newton	32.5	38	10	18	6.0	4	3	25
Garry	54.7	36	T	35	6.0	1	8	38
Jackson	40.1	38	10	28	5.5	5	7	27
Clarion	37.1	37	15	22	5.5	4	7	30
Richland	33.4	33	10	75	3.5	8	6	25
Brunker	31.0	32	10	100	10.0	3	1	26
Osage	43.8	34	15	62	5.5	5	1	26
Trojan	40.5	33	10	68	7.5	4	1	30
Burnett	48.8	39	T	42	7.0	4	8	29
Minhafer	44.7	37	8	35	6.0	4	3	28
L.S.D.	9.5							

Shattering score and Septoria rating on 1-10 scale, 1 best; Maturity scale - 1 = very early, 10 very late.

Table 7 shows the results of an oat rate of planting experiment. Grain samples of the new strains developed in South Dakota are being tested for quality.

Table 7. Oat Rate of Planting Test
Northeast Research Farm, 1956

Rate of Planting	Yield in Bushels Per Acre			
	Ransom	Mo. 0-205	Garry	Average
1/2 bu. per acre	19.8	26.4	28.6	24.9
1 bu. par acre	21.4	24.6	36.7	27.6
2 bu. per acre	21.6	27.1	35.0	27.9
4 bu. per acre	17.6	21.4	29.9	23.0
6 bu. per acre	16.5	18.1	29.4	21.3
Average	19.4	23.5	31.9	24.9

The differences between individual varieties given in Table 7 are significant. The 1 and 2 bushel rates are significantly higher than the other three rates. Variety-rate interaction is not significant.

The three varieties may be considered the most disease resistant varieties in their respective maturity classes.

SOYBEAN AND SORGHUM VARIETY TESTING
by C. J. Franzke

Soybean Variety Test

At the Northeast Experimental Farm in 1956, there were 32 varieties and strains of soybeans tested from Group 0 and Group I maturity range. The soybean variety test is in cooperation with the U.S. Soybean Regional Laboratory of the U.S.D.A.

Table 8. Soybean Variety Test at the Northeast Experimental Farm, 1956.

Variety	*Maturity Index	Height Inches	Bu./A.
Blackhawk	+4	41	32.0
Earlyanna	+2	39	35.0
Monroe	+1	42	30.8
Renville	0	34	38.3
Norchief	0	31	47.4
Mandarin (Otto)	0	30	36.1
Hardome	+1	36	43.4
Grant	+1	33	42.0
Flambeau	0	30	36.9
Comet	0	34	42.3
Chippewa	+2	34	42.5
Capital	+2	32	45.0

*Maturity index = Mandarin (Otto) as 0 and rating the other varieties and strains plus or minus in days.

Mandarin (Otto) matured September 27.

Table 8 lists only the named varieties which are grown commercially. The past season was ideal for soybean production. There was ample moisture and it was cool and humid. All of the varieties, except Blackhawk, were well matured by September 27. Norchief, Grant, Chippewa, Capital and Comet produced the highest yield. They are the best varieties adapted for this area.

Sorghum Variety Test

This past season a sorghum variety trial was conducted on 91 varieties, strains and hybrid grain and forage types. The test consisted of 8 named varieties of grain sorghums, 7 forage types, 25 out of the state hybrids and 51 South Dakota Experimental strains.

Table 9. Grain Sorghums Test at the Northeast Experimental Farm, 1956.

Variety	Bu./A.	Height Inches	Maturity
Reliance	13.8	44	Ripe
Norghum	13.4	46	Ripe
Eureka	13.0	57	Hard Dough
Prairie Rose	12.7	56	Hard Dough
Imp. Coes	13.4	62	Ripe
Early Kalo	13.6	51	Hard Dough
Martin	1.7	53	Soft Dough
Redbine #60	10.2	52	Soft Dough
R.S. 501	22.2	57	Late Dough

Table 9 lists only the eight commercial grain varieties and one hybrid R.S. 501. The other 24 hybrids ranged in maturity from the fertilizing stage to the very early milk stage. They were all too late in maturity to harvest and secure comparable yields. Reliance, Norghum and Imp. Coes were the only three of the commercial grain types that were out of frost danger on October 2. The other commercial varieties ranged in maturity from the hard-dough stage to the soft-dough stage.

The 51 South Dakota Experimental grain types are being evaluated for good agronomic characteristics such as maturity, yield, standability, disease and plant characters. These strains will be tested further to determine the best selections for future use.

CORN YIELD TESTING

by D. B. Shank, D. E. Kratochvil, and R. A. Moore

Description of Work Performed and Objectives

Five yield tests on corn were conducted for the purpose of obtaining information on the relative performing abilities of the various entries when grown on the Northeast Research Farm. Yields in bushels per acre and moisture percentages at the time of harvest (maturity) were taken in all cases. Notes on stalk and root lodging were also obtained but there was not a sufficient amount of either to warrant analyzing the data. The tests were as follows:

(1) Commercial hybrids with 30 entries
(2) Early single crosses with 40 entries
(3) Early double crosses with 49 entries
(4) A.E.S. 2-300 double crosses with 34 entries
(5) Three-way crosses with 73 entries

Discussion and Interpretation of Results

(1) Results obtained from the commercial test are given in Table 10. Included are 2- and 3-year averages, even though this is the first year for the Northeast Research Farm. Yield trials had been conducted on the Korth farm, site of the Northeast Farm, in 1954 and 1955 and the results are included in the averages.

In 1956 climatic conditions were favorable for corn. Temperatures were above average in June, but so was the rainfall; thus causing the corn to make a good early growth. In addition, July and August also had above normal rainfall, and as a result yields were excellent for the area. All entries averaged 45 bushels per acre in spite of the fact that some of them are not too well adapted for the short growing season which prevails at this location. The best yielding entry was a South Dakota Experimental number. Another experimental was not much lower, which indicates that perhaps hybrids better suited for this region may soon be available. Over the 3-year period, Pioneer 388 and Sokota S.D. 220 have performed the best.

Because of its elevation, the area represented by the Northeast Farm has a relatively short growing season for corn. Many of the commercial hybrids sold in this region may be regarded as quite late. This may be seen in the columns labeled "Moisture Percent" where some hybrids still have too much water to store safely, even though the last three years have been quite favorable for producing sound corn. On the other hand, some very early hybrids were placed in the trial to see how they would perform. A.E.S. 101 is an example, and it proved to be too early and therefore too low in yield potential.

In Table 10 each hybrid has been given a performance rating which ranks the entries on the basis of their relative yields and maturity. This rating was obtained by converting yields for each hybrid to percentages by comparing them to the average yield of all entries. Similar calculations were made for moisture at harvest time after first subtracting each moisture percent from 100 so that the varieties would be ranked according to their ability to produce sound, rather than soft, corn. The performance rating which appears in the table for each entry was then found as follows:

$$6(\text{yield percentage}) + 4(\text{moisture percentage})$$

The smaller the performance rating the better the hybrid performed on the basis of yield and maturity.

(2) (3) (4) These tests were on breeding material with the objective being the development of new hybrids adapted for the area. The results are not yet analyzed.

(5) The test of three-way crosses involved lines developed by the Plant Pathology Department which had been top-crossed to a single cross tester. The 1956 test of this material was carried on cooperatively by the Agronomy and Plant Pathology Departments and the discussion will be included in the Pathology section of this report.

Table 10. Corn Performance Test on Northeast Experimental Farm, 1956

Hybrid or Variety	Acre Yield Bu.	Moisture Percent	1956 Yield Bu.*	1956 Moisture Percent	1956 Performance Rating
	3-Year Average				
Pioneer 388	42	23	47	16	7
Sokota S.D. 220	41	21	41	17	22
Kingscrost KA4	40	26	49	20	6
Sokota S.D. 250	39	24	45	19	15
Gurney 90	39	27	45	22	17
Haapala H375	37	23	47	16	9
Funk G-18	34	31	41	23	27
3 yr. ave. of 7 entries	39	25	--	--	--
	2-Year Average				
S.D. Exp'tl. #16	51	13	53	15	1
S.D. Exp'tl. #18	48	14	48	16	4
Trojan P-99	48	20	51	25	5
Farmers 205	46	20	48	23	11
S.D. Exp'tl. #17	44	14	43	15	16
Funk G-11	44	16	44	14	13
Disco 101-A	44	24	45	30	25
Peavy P.V. 355	43	16	44	20	21
2 yr. ave. of 15 entries	45	18	--	--	--
Pfister P.A.G. 32	--	--	52	19	2
Cargill A95N	--	--	50	19	3
Disco 90-W	--	--	49	20	8
Nodak 301	--	--	47	16	10
Kingscrost KS5	--	--	47	26	18
Pfister P.A.G. 28	--	--	46	20	12
DeKalb 55	--	--	46	25	20
Pioneer 383	--	--	45	22	19
DeKalb 46	--	--	44	16	14
Van's Hybrid V727	--	--	43	30	28
Tomahawk 14	--	--	42	22	26
Jacques 1053-JA	--	--	42	28	29
United Hagie UH214	--	--	40	31	30
South Dakota A.E.S. 101	--	--	39	11	23
Agsco Modern 77	--	--	38	11	24
Average	--	--	45	20	--

*Differences in yield of less than 9 bushels per acre are not statistically significant.

GRASS AND LEGUME TESTING

1956 SEEDINGS

by M. W. Adams and J. G. Ross

Objectives

To determine the adaptability of various legume and grass forages to growing conditions (soil and climate) in the area served by the experimental farm. Adaptability would be measured by:

a) Ease of getting a stand
b) Stand survival
   Winter resistance
   Drought resistance
c) Yield of forage, or green manure value
d) Consistency of performance

In addition, if there are specific disease factors, such as bacterial wilt of alfalfa, or insect factors, such as the spotted alfalfa aphid, it would be desirable to have information with respect to varietal reaction to these hazards.

Thus, the following nurseries were seeded on April 13, 1956.

Birdsfoot Trefoil	11 strains
Alfalfa	12 strains
Red Clover	8 strains
Sweet Clover	9 strains
Crested Wheatgrass	13 strains
Intermediate Wheatgrass	9 strains
Tall Wheatgrass	4 strains
Side Oats Grama	6 strains
Switch Grass	1 strain
Smooth Bromegrass	13 strains

Discussion and interpretation of results

The summer of 1956 was favorable for the establishment of the legumes but the grasses were not as well established. Stand establishment ratings will be made on the grasses, and where necessary new nurseries will be seeded in the spring of 1957.

The spotted alfalfa aphid was found in some 23 counties in southeastern South Dakota in late summer of 1956. We anticipate their presence again in 1957, thus special care will need to be exercised both to observe differential effects and to save the new seedings.

PLANT DISEASE CONTROL

Spring Wheat Stem Rust Trials

J. F. Hennen
Department of Plant Pathology

Objective

To determine the prevalence, distribution, and races of wheat stem rust and also to test new and promising varieties for their rust reaction.

Results

Forty varieties were examined during the milk to soft dough stages of development. The data taken for each variety were as follows: Prevalence - the percent of plants showing at least a trace of infection; Severity - the area of each plant covered by rust; and Response - the type of reaction between the rust and the plant which indicates resistance or susceptibility. These data are included in Table 11.

Summary

Stem rust of wheat developed to damaging proportions at Watertown during the summer of 1956. Susceptible varieties such as Reliance, Marquis, and Ceres had severity readings of 60 percent at the soft dough stage. This is enough rust to cause shriveling of grain, and thus reduction in yield. Only 6 of the 40 entries showed highly resistant, resistant or no rust pustules. These were Kenya Farmer, Frontana x K58-Newthatch, Lee x Frontana, R.L. 2563 x Lee, Tha. x K338AC, and Khapli. All the other entries showed at least a trace of susceptible type pustules.

Stem rust Race 15B was the most prevalent. (This is the same race of stem rust which caused an estimated $70,000,000 loss in rust damage to the wheat crops from 1952-54.) Races 29 and 56 were also present in lesser amounts.

These experiments were grown at many locations throughout the United States in the spring wheat areas by the State Agricultural Experiment Stations in cooperation with the United States Department of Agriculture. There were 40 varieties grown at the Northeast Research Farm in 1956 to determine their resistance to the strains of stem rust which appeared in the Watertown area during the 1956 season.

Table 11. Spring Wheat Uniform Rust Nursery, Watertown, South Dakota, 1956.

Variety	C.I. No.	Prevalence	Severity	Rust Response
1. Thatcher x W.38-Hope, Wis. 242	12484	100	10	S *1
2. Selkirk	13100	100	1	CS *2
3. Preston	3081	100	40	CS
4. T. timopheevi, D357-1, PI 94761-1	11651	100	Tr	CS
5. McMurachy	11876	100	40	CS
6. Frontana	12470	100	20	S
7. Ceres	6900	100	50	CS
8. Kenya Farmer	12880	100	Tr	HR *3
9. Frontana x K58-Newthatch, II-50-17	13154	0	0	0 *4
10. Rushmore	12273	100	30	CS
11. Kenya 58	12471	100	20	CS
12. Lee x Frontana, II-47-10	13201	Tr	Tr	R *5
13. 1953 x Lee, B52-91	13242	100	40	CS
14. Lee x 1831, B52-119	13243	100	5	CS
15. Rescue x 1831, B51-9	13284	100	60	CS
16. 2236 x Lee, B52-107	13286	100	30	CS
17. Pilot^2 x Thatcher, N2170	12974	100	30	CS
18. Thatcher x Rescue, B50-18	13244	100	50	CS
19. Lee x Mida sib., Ns. 3880.127	13152	100	30	S
20. Mentana		100	40	CS
21. R.L. 2563 x Lee, N.D. 1	13157	Tr	Tr	HR
22. R.L. 2563 x Lee, N.D. 3	13159	100	Tr	CS
23. Tha. x K338AC, A-5-501-3-1, N.D. 4	13000	Tr	Tr	HR
24. K338AA x Ns.3880.191, A-1-7-3, N.D. 52	13075	0	0	0
25. Yuma, Ld. 364	13245	Tr	Tr	CS
26. Ramsey, Ld. 369	13246	100	30	CS
27. Towner, Ld. 370	13247	100	30	CS
28. Langdon, Ld. 372	13165	100	10	CS
29. Nugget x P.I. 94701. Ld. 373	13248	100	30	CS
30. R.L. 3206	13141	100	30	CS
31. R.L. 3207	13142	100	30	CS
32. Sentry	13102	100	40	CS
33. St. 464	13160	100	5	CS
34. Lee	12488	100	40	CS
35. Marquis	3641	100	60	CS
36. Reliance	7370	100	60	CS
37. Mindum	5296	100	40	CS
38. Vernal	3686	100	20	CS
39. Khapli	4013	0	0	0
40. Mentana		100	40	CS

*1 S - Susceptible
*2 CS - Highly susceptible
*3 HR - Highly resistant
*4 0 - No rust infection
*5 R - Resistant

Seedling Blight of Flax

Vernyl Pederson
Department of Plant Pathology

Objective

To control seedling blight of flax.

Results

Various experiments were conducted under field conditions in an attempt to find a practical control for this disease. A chemical seed treatment experiment was conducted to ascertain whether Rhizoctonia seedling blight of flax could be controlled. Thirteen fungicides were used as seed treatments. Six of these chemicals were applied to the soil in liquid form.

Neither seed nor soil treatment appeared to improve atands or yields on the basis of experiments conducted in 1956.

Rhizoctonia seedling blight of flax was observed to considerable extent in all of the plots. Although the number of diseased plants varied from plot to plot, there seemed to be no improvement of atands within individual plots due to any of the treatments.

Summary

This disease attacks the young seedling plants as they emerge from the soil. It kills the seedling plants very quickly and losses in stands occur. This disease usually does its damage before the plants reach a height of three inches. In one northeast county the stand in fields had losses up to 50-60 percent. Farmers plowed down about 600 acres of flax because of poor stands caused by seedling blight. The disease has been found in flax fields throughout the northeastern section of the state east of a line from Dell Rapids to Aberdeen. The loss in stands by this disease permits serious weed development in flax fields.

Control of Pasmo of Flax

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Department of Plant Pathology and
Cereal Crops Section, United States Department of Agriculture

Objective

To find sources of resistance to pasmo, a disease which attacks the leaves, stems and floral parts of flax. Pasmo causes defoliation and produces large lesions on the stems; this results in reduced total yield as well as less oil of poorer quality.

Results

Pasmo ratings were made first on leaf symptoms and later on stem symptoms of 950 selections of the World Collection of Flax. The collection represents flax obtained from all parts of the world. Of the 950 selections approximately 100 were as resistant to pasmo as Marine, the variety considered to be the most resistant. Only about 20 were more resistant than Marine, but these were very late and might have been more susceptible if they had matured before the end of the season.

Summary

The selections differed in their reaction to pasmo as well as other characters, including resistance to other diseases, date of maturity and plant height. Many of the lines were very susceptible to wilt. Some of the more pasmo resistant lines never flowered, but this is the most susceptible stage in the development of flax. Therefore, some of these lines might be more susceptible if tested when they are more mature. In cooperation with the Agronomy Department, approximately 20 of the more resistant lines are being crossed with Marine and Redwing. The resistant parents were selected in part on known characters as determined by tests conducted previously at other stations. This program will continue to search for resistant breeding material.

Corn Diseases

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Departments of Plant Pathology and Agronomy

Objective

The control of corn diseases.

Experimental results

Several important corn diseases cause losses in yield and quality each season in South Dakota. Root and stalk rot, smut, seed rot and rust are some of the common diseases which require some type of control. Such control, depending on the disease, may be accomplished, either through the use of chemicals, such as is the case of seed treatment for seed rot or through the development of disease resistant strains or inbred lines. These lines are then used in developing resistant hybrids.

Over a period of years, experiments have been conducted at the Experiment Station at Brookings to develop strains of corn which are resistant to one or more diseases. It appears from limited results that some degree of success has been achieved. These lines now are being tested in hybrid combinations to determine their effectiveness, not only in yielding ability, but particularly in the control of certain important diseases.

During 1955, 73 hybrid combinations were made in the greenhouse and in the field, and the seed produced was grown at the Watertown Research Farm in 1956. The more promising root rot resistant lines performed well in comparison to standard commercial hybrids used in the trials under the growing conditions which occurred last season. However, the results from a single season are inadequate to determine definite differences in performance; consequently, additional years results will be required to determine if these disease resistant lines are superior in yielding ability and in reducing disease losses.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

by F. E. Shubeck and Q. S. Kingsley

Fertility Experiment #1

Type of experiment

Apply fertilizer every year or once in 4 or 5 years.

Objectives of experiment

1. When there is no legume in the rotation, is it better to apply small amounts of fertilizer every year or the same amount all in one application but only once in 4 or 5 years?
2. Will this high rate of application have a burning effect on the corn?
3. Which method will give the most efficient recovery of fertilizer nutrients?

Results

Table 12. Effect of Different Fertilizer Rates on Yield of Corn.

Treatment Pounds Per Acre N	P_2O_5	K_2O	Yield in Bushels Per Acre
0	0	0	35.6
40	20	0	47.9
80	40	0	50.6
120	60	0	51.6
160	80	0	54.9
200	100	0	54.9
L.S.D. at 5% level			5.3

Discussion and interpretation of results

The fertilizer was broadcasted in the spring and then plowed under. The nitrogen and phosphate carriers were ammonium nitrate and treble super phosphate. South Dakota 220 was the variety of corn used. It was checked in rows 3'6" x 3'6" and thinned to a uniform stand of 3 stalks per hill giving a population of 10,668 plants per acre.

A definite yield increase was obtained for even the lowest rate of fertilizer application. It was interesting to note that the highest yield obtained was about 55 bushels per acre on the plots receiving unusually large quantities of fertilizer. There was no apparent burning effect from fertilizer on any of the plots. Next year it will be possible to begin measuring fertilizer carry over for the various rates of application.

Fertility Experiment #2

Type of experiment

Influence of legume on crop yields.

Objectives of experiment

1. Compare efficiency of alfalfa, red clover and biennial sweet clover for increasing grain yields.
2. Compare commercial nitrogen to legume nitrogen as a means of increasing crop yields.
3. Will a sweet clover fallow treatment increase grain yields, or reduce risks enough to justify its adoption?

Results

No results comparing efficiency of legumes can be given because 1956 was the first crop year of the experiment. The legumes were planted in 1956 and their influence on grain yields will begin to show up next year.

Discussion

A blanket application of 20 lbs. of P_2O_5 in the form of treble super phosphate was applied to each plot. On those plots receiving commercial nitrogen, 30 lbs. of N in the form of ammonium nitrate was applied. The 30 pound rate was selected because it was estimated that the legumes would return a comparable amount to the soil. The fertilizer was broadcasted in the spring on top of fall plowing and then harrowed in.

The amount of soil moisture in these plots was determined in the fall of 1956 after frost had killed the legume vegetation. The reason for doing this was to find out if legumes will deplete the soil of moisture reserves to such an extent that subsequent crop yields will be affected.

Fertility Experiment #3

Type of experiment

Measure residual effects of legumes on small grains yields.

Objectives of experiment

1. Determine how long a 1, 2, 3 and 4 year old alfalfa sod will have an influence on yield of subsequent crops.
2. Should nitrogen fertilizer be applied to the 2nd, 3rd, or 4th grain crop after alfalfa to obtain maximum yields that the rainfall and climate will permit?
3. To increase grain yields, is it better to depend on the effects of residual legume nitrogen or to omit the legume and apply commercial nitrogen each year?

Results

No results can be given because 1956 was the first crop year of the experiment, and the effect of legumes will not show up until next year.

Discussion

Forty pounds of phosphate will be applied to each plot each year. The cropping sequence following alfalfa will be flax, spring wheat, oats and corn. Vernal was the variety of alfalfa used.

Each year a new stand of alfalfa will be started on new plots, and all the old stands in the experiment will be maintained. This procedure will be continued until 1960 when all the alfalfa will be plowed under and the residual fertility will be measured by planting each plot to grain crops for several years and recording the yield increases. The residual effect of alfalfa will be compared to annual applications of commercial nitrogen on the grain crops beginning in 1960, after the alfalfa has been plowed.

Fertility Experiment #4

Type of experiment

Establishing stands and obtaining seed crops of bromegrass and alfalfa.

Objectives of experiment

1. Will fertilizer aid in obtaining stands of bromegrass and alfalfa?
2. Compare stands of bromegrass and alfalfa when seeded with a nurse crop to stands obtained when seeded without a nurse crop.
3. Will the seed yield of bromegrass and alfalfa be greater if the plantings are made in wide spaced rows and cultivated?
4. Is the application of supplemental nitrogen necessary to obtain maximum bromegrass seed yields when the brome is planted in rows and cultivated?

Discussion

The effect of fertilizer on establishing stands of bromegrass and alfalfa will be measured in the spring of 1957 by taking stand counts of the plants that survived the winter.

The effect of a flax nurse crop compared to no nurse crop for establishing stands of alfalfa will also be evaluated in the spring of 1957.

The experiment was set up to determine the advisability of using a flax nurse crop for establishing stands of bromegrass also, but because of the adverse conditions in the spring this cannot be done. The bromegrass seedlings were dying rapidly, so the decision was made to cut the nurse crop in an attempt to conserve moisture and save the brome seedlings. Many of them died anyway so some of the plots were reseeded. This prevented getting data on value of nurse crop, but the plots will be in good shape in 1957 to go ahead with the primary objective - evaluation of row spacings and intertillage for obtaining bromegrass seed crops.

Three different row spacings were used; 7 inches, 21 inches and 35 inches.

On those plots receiving fertilizer, 100 lbs. per acre of 11-48-0 was applied to the bromegrass plots and 100 lbs. per acre of 0-48-0 was applied to the alfalfa plots. The fertilizer was broadcasted in the spring on top of fall plowing and disced in.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

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