Agronomy Pamphlet #79 December, 1964

ANNUAL PROGRESS REPORT



NORTHEAST RESEARCH FARM

Watertown, South Dakota

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, but was later increased to 42 acres to facilitate more experiments. 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, weed control, soil fertility, and crop variety testing have been underway for 9 crop seasons.

Evaulation of plant materials by members of the staff concerned with plant breeding are carried on at this farm. Weather conditions here aid in the natural screening of plants and the information is valuable to their research. Crambe was planted again for further observation on small plots in 1964, but will be planted with regular grain drill in 1965 on a larger acreage basis. Other introduced crops planted in 1964 were Vernonia and Sesame.

A tour is scheduled for the Garden City Farm, July 9, 1965 at 1:30 P.M., at which time the objectives of the new experiments will be discussed along with other business.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

| Member | County | Address |
|---|---|---|
| W. H. Schwanke (Chairman) | Codington | Watertown - Route 4 |
| F. Morris (Secretary) | Codington | Watertown |
| Harold Hurlbut | Clark | Raymond |
| W. Peterson | Day | Lily |
| Alfred Skovly | Deuel | Astoria |
| Lyle Kriesel | Grant | Summit |
| Oliver Heitsmeyer | Hamlin | Estelline |
| Donald Naddy | Marshall | Britton |
| Elmer Greseth | Roberts | Sisseton |

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

## BRIEF HISTORY

An annual winter meeting was held February 6, 1964 at Britton, South Dakota with the Northeast Research Farm Advisory Committee, County Extension Agents and the general public. The experiments carried on were discussed and a brief meeting of the advisors followed. Relocation of the farm at Garden City was affirmed and the move could be made when suitable.

The new research area is located on the Everett Fletcher farm 2 miles north of the Garden City turnoff, on Highway 25, and one half mile west on a township road. Flax was grown on this area in 1964 and removed by the farmer. Following removal of the crop, contour lines were laid out to aid in placement of the experiments. Soil samples and soil moisture samples were taken plus the initiation of certain phases of the experiments. The experiments on this farm are supported in part by the Farmers Union Central Exchange.

The cultural practice experiments at the Watertown farm were concluded at the end of the 1964 crop season, but adaptation studies with corn, small grain, sorghum, soybeans and grass will continue.

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## 1964 CROP SEASON

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

| | April | May | June | July | Aug. | Sept. | Oct. | Total |
|---|---|---|---|---|---|---|---|---|
| Total Rainfall in Inches | 2.39 | 1.07 | 3.62 | 2.01 | 4.22 | 0.93 | 0.04 | 14.28 |
| Departure from Long-Time Avg. | 0.33 | -1.80 | -0.08 | -0.66 | 1.44 | -0.92 | -1.12 | -2.81 |
| Avg. Monthly Temperature in Degrees F. | 42.7 | 58.2 | 63.0 | 68.1 | 65.5 | 55.8 | 49.3 | |
| Departure from Long-Time Avg. | -0.5 | 2.2 | -0.9 | -4.2 | -3.5 | -4.1 | 1.6 | |
| Frost Free Days | June 11 to September 10 = 92 days | | | | | | | |

The carryover of subsoil moisture from the 1963 season was a prime factor in increasing yields of small grain. Day time and night time temperatures remained cool through June, which helped reduce moisture loss. Rainfall during the entire crop season was below normal except for the months of April and August. Subsoil moisture at the end of the 1964 season was very low.

Temperatures remained below the long time averages, except for May. Frost may be anticipated in mid-May, but this is the first time in the history of the farm since 1956 that a frost occurred in June. Corn was hurt badly, especially in frost drainage areas. This drainage covered about 75 percent of the farm occupied by the cultural practice experiments. Freezing was severe enough to necessitate replanting all the corn in the experiments, resulting in late, wet, low yielding corn. A study of froat periods may be seen in Table 2.

* The above rainfall and temperature were taken and recorded at the Northeast Research Farm. The departure from long-time average was obtained by comparing the data taken at the farm to the long-time average at the Watertown Weather Station, Courtesy U. S. Weather Bureau, Huron, South Dakota.

Table 2. Periods of Frost and Frost Free Days Recorded at the Northeast Research Farm

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

## FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Q. S. Kingsley

### Fertility Experiment #1

Objectives of Experiment

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

Table 3. Comparison of Legumes, Commercial Nitrogen and Fallow in Increasing Yields of Spring Wheat, Corn and Flax

| Source of Nitrogen | | Yields in 1964 | | |
|---|---|---|---|---|
| | | Wheat Bu/A | Corn Bu/A | Flax Bu/A |
| 1. Oats (check plot) | 79.1 Bu/A | 28.3 | 21.2 | 16.7 |
| 2. Oats + Commercial N* | 82.5 Bu/A | 29.1 | 23.7 | 18.3 |
| 3. Alfalfa for Hay | 3.0 ton/A | 24.3 | 19.0 | 18.8 |
| 4. Red Clover for Hay | 0.6 ton/A | 32.1 | 21.8 | 18.7 |
| 5. Sweetclover for Seed | 1164.0 #/A | 25.6 | 19.7 | 19.0 |
| 6. Sweetclover Fallow | | 32.7 | 19.9 | 18.5 |
| Significance | | ** | ** | N.S. |

* For commercial fertilizer
30 lbs N/acre, 40 lbs $P_2O_5$/acre

** Differences were significant at the 5% confidence level.

N.S. Not significant at either the 1% or 5% level.

The data in table 3 are the results of 6 separate rotations, all of which have wheat in the cropping sequence followed by corn and then flax. Legumes precede the wheat except in rotations 1 and 2.

Treatment Number 1 is considered the check plot to measure nitrogen responses, therefore no commercial nitrogen or legumes were used in this rotation. In treatment 2 commercial nitrogen was used in place of legumes. Forty pounds of $P_2O_5$ per acre were applied to all plots so that possible soil deficiencies of phosphorus would not be a limiting factor. The sweetclover for fallow was plowed when 1 to 1 1/2 feet high.

Flax is used as the nurse crop in this rotation and the residual effect of the legumes are measured by wheat and corn in that order. The commercial nitrogen was applied in the fall every year and plowed in.

The late frost hurt the corn and yields are lower in all instances when compared to wheat. Moisture conserved under the sweetclover fallow treatments are favorably reflected in the wheat yield. This same trend is not apparent for corn. The need for more moisture by this long season crop rather than fertility can be noted by comparing it to the flax yields. Flax is the last crop in the cycle and yields are about the same for all treatments receiving fertility from legumes or commercial nitrogen.

## Fertility Experiment #2

Objectives of Experiment:

1. Determine how many years alfalfa will have an influence on yield of subsequent crops after the alfalfa is plowed under.
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. Evaluate the residual effect of legume nitrogen compared to fertilizer nitrogen applied every year.

Table 4. Residual Effect of Legumes on Grain Yields

| Preceding Crops* | Fertilizer applied 1961-1964 | 1961 Crop Flax | 1962 Crop Wheat | 1963 Crop Oats | 1964 Crop Corn |
|---|---|---|---|---|---|
| 1. Alfalfa 5 Years | 0-40-0 | 5.2 | 27.6 | 61.4 | 20.8 |
| 2. Alfalfa 4 Years | 0-40-0 | 5.3 | 27.4 | 61.8 | 19.4 |
| 3. Alfalfa 3 Years | 0-40-0 | 4.9 | 27.8 | 61.7 | 20.0 |
| 4. Alfalfa 2 Years | 0-40-0 | 6.6 | 29.2 | 65.3 | 18.8 |
| 5. Flax + alfalfa 1 Year | 0-40-0 | 4.3 | 21.2 | 41.7 | 21.9 |
| 6. Corn (1960) Check | 0-40-0 | 9.1 | 28.5 | 58.6 | 20.9 |
| 7. Corn (1960) | 40-40-0 | 10.2 | 30.5 | 68.9 | 22.3 |

Differences due to treatments were highly significant.
* For alfalfa, the year planted was counted as 1 year.

The effect on yield by wild oats in treatment 5 is more apparent when in association with small grain, but the frequent cultivations of corn reduces the loss formally attributed to it. The residual fertility of alfalfa left 3-5 years levels off the first year and some of this leveling off may be due to the lack of moisture in the subsoil. Alfalfa left for 2 years has a more beneficial effect on crops prior to corn. Treatment 7, with an annual application of 40 pounds of nitrogen, is consistently higher in yield for all crops.

## Fertility Experiment #3

Objectives of Experiment:

1. Determine whether it is best to follow alfalfa with a short season crop like small grain or a long season crop like corn when the reserve of subsoil moisture may be limited because of the large amounts of water used by the preceding alfalfa crop.

2. What is the optimum time to plow alfalfa - after the first hay crop, the second hay crop, or early the following spring?

3. Investigate the possibility of spray to kill alfalfa in late summer. This would keep the ground covered during the winter and help to control erosion. If successful it would stop transpiration losses immediately because the plant is dead. If the plants were clipped, they would remain alive and continue to allow loss of water through transpiration.

4. How to bring the land back into production after alfalfa without taking a serious yield reduction in the first cash crop.

Table 5. Effect of Time of Plowing Legumes on Yield of Flax and Corn

| 1961 Crop No Fertilizer* | Time of plowing | 1964 Crop Bu/A |
|---|---|---|
| 1. Flax + alfalfa | June 1963-after first hay crop | 20.9 Flax |
| 2. Flax + alfalfa | July 1963-after 2nd hay crop | 19.3 Flax |
| 3. Flax + alfalfa | Early in spring 1964 | 19.0 Flax |
| 4. Flax + alfalfa | Spray kill after 1st hay crop | 22.9 Flax |
| 5. Flax + alfalfa | July 1963 after 2nd hay crop | 19.7 Corn |

* 1962 - alfalfa hay, 40# $P_2O_5$/A

1963 - alfalfa hay, 60# $P_2O_5$/A

The soil cover resulting from treatment 4, reduced soil moisture loss sufficiently during 1963 to help increase the flax yield in 1964 by 2 bushels. Even though yield increases are small between treatments 1, 2 and 3, the general trend may be noticed. As stored soil moisture reduces a reduction in yield follows. The time of plowing the legume is important.

## Fertility Experiment #4

Objectives of Experiment:

1. From the standpoint of weed control and maximum yields, what is the best way to fertilize flax? Should it be broadcast and disced in, drilled with the seed, or plowed under?

2. Can method of fertilizer application influence the severity of the weed problem?

3. Is drilling the fertilizer with the seed a more efficient method of application? Is it safe to drill 40 pounds of nitrogen per acre with the seed?

4. Will the residual effect on the following crop, corn, be different for the various fertilizer application methods?

Table 6. Effect of Methods of Fertilizer Application and Weed Control on Yield of Flax

| Lbs. per acre on Flax N, $P_2O_5$, $K_2O$ | Method of Fertilizer Application on Flax | Weed Control* | Flax Bu/A | Residual Effect on Corn Bu/A |
|---|---|---|---|---|
| 0- 0-0 | None applied | No | 15.7 | 15.6 |
| 0- 0-0 | None applied | Yes | 18.9 | 18.4 |
| 20-15-0 | Drilled with seed | No | 19.7 | 19.7 |
| 20-15-0 | Drilled with seed | Yes | 15.7 | 17.2 |
| 40-30-0 | Drilled with seed | No | 16.5 | 18.4 |
| 40-30-0 | Drilled with seed | Yes | 19.4 | 15.2 |
| 40-30-0 | Plowed in | No | 15.7 | 17.8 |
| 40-30-0 | Plowed in | Yes | 21.4 | 16.0 |
| 40-30-0 | Disked in | No | 14.3 | 18.2 |
| 40-30-0 | Disked in | Yes | 18.8 | 17.1 |

* Weed control chemicals were TCA at 5 lbs. per acre and MCP at 1/4 lb. per acre.

Flax yields in this experiment are relatively high, even for the untreated plots. The treatment using 20-15-0 drilled with the seed, in this particular year, is the only one that does not show a benefit from weed control. Generally, a marked advantage may be seen by using weed control chemicals. Placement of fertilizer and the amount seem to help produce about the same amount of grain.

The corn was left after planting to observe the effects of the residual carryover from flax. The study conducted on this corn was for another purpose, but the residual effect of it definitely hurt yields. In past years, the residual effect from flax has been favorable on the following corn crop. Refer to Agronomy pamphlet #75, 1963, page 8.

## CORN AND SORGHUM FORAGE STUDIES

Q. S. Kingsley

The corn and forage sorghum varieties tested are quite well adapted to this area of the state, and this same group of entries will be used for the duration of the experiment.

Yield potential at different row spacings and plant populations is the primary objective of this study. Row spacings are important when cultivation and harvesting methods are considered. For dryland farming, an abundance of subsoil moisture is necessary when using high seeding rates as in the 20-inch row spacing.

Table 7. Performance of Annual Forages at Northeast Research Farm, 1963

Environment:

Fertilizer - 60-40-0
Population and seeding rates:
Corn: 40" rows - 12,000 per acre
20" rows - 22,000 per acre
Sorghum and Sudan
40" rows - 6# per acre
20" rows - 12# per acre
Planting date: May 25, 1964
Harvest date: Sept. 1, 1964
Approximate sorghum seeds per pound 22-25,000

Yields, Tons per Acre

| Crop | 40 in. Rows | | 20 in. Rows | |
|---|---|---|---|---|
| | Silage wt. | Air Dry wt. | Silage wt. | Air Dry wt. |
| Rancher Sorghum | 8.1 | 3.0 | 11.5 | 4.6 |
| Hybrid Sudan | 9.0 | 2.5 | 11.3 | 3.8 |
| Piper Sudan | 5.7 | 2.0 | 5.8 | 2.6 |
| S. D. 252 | 8.4 | 2.9 | 8.9 | 3.3 |
| Volkman S-100 | 7.4 | 2.3 | 8.6 | 3.1 |
| De Kalb SX-11 | 8.5 | 2.7 | 12.7 | 3.3 |
| Rox Orange | 11.9 | 3.4 | 12.8 | 3.4 |
| Frontier FS 210 | 10.4 | 2.8 | 12.0 | 2.9 |
| Hydan 37 | 8.5 | 2.4 | 9.4 | 3.2 |
| High Sugar Corn | 12.2 | 3.8 | 16.1 | 4.1 |

## STANDARD VARIETY TRIALS OF SMALL GRAINS, NORTHEAST RESEARCH FARM, 1964

J. J. Bonnemann

Small grains in the trial at the Northeast Research Farm produced satisfactory yields in 1964 even though precipitation for the season was quite limited. Lodging and diseases did not occur in damaging amounts in any of the grains under trial. The yields were achieved under good management practices at adequate fertility levels.

Several of the later maturing varieties of the type recommended for the area served by the Northeast Research Farm have good yield records. This is evident in looking at the tables following this text. Minhafer, Portage, Dodge and Clintland 60 rank highest in 4-year averages. Clintland 60 is replaced with Clintland 64 in 1965 as broader disease resistance has been incorporated into this variety.

Selkirk and Pembina have produced satisfactory yields of spring wheat acceptable for milling. The new release Crim has also performed satisfactorily. The recommended durums, Lakota and Wells, are about equal in 4-year performance.

Larker and Trophy, the recently recommended malting varieties of barley, maintained their position atop the malting type varieties.

The newly released and recommended flax varieties, Summit and Windom, maintained the superiority in yield over other flax varieties in the trials for the past four years. Only five varieties of flax are recommended for South Dakota during 1965: B-5128, Bolley, Redwood, Summit and Windom. All others have been found susceptible to either or both of two newer races of flax rust that were first isolated in Canada in 1962.

Table 8. Spring Wheat and Durum Variety Test, NE Farm, 1964

| Variety | Test Weight lb/bu | Yield, Bu/A 1964 | Yield, Bu/A 1961-64 |
|---|---|---|---|
| Wells | 57.0 | 33.5 | 28.0 |
| CI 13655 | 59.5 | 33.5 | |
| CI 13654 | 58.5 | 32.0 | |
| CI 13751 | 57.5 | 32.3 | |
| Lakota | 56.5 | 29.8 | 27.9 |
| Crim | 55.0 | 29.1 | 19.9 |
| CI 13586 | 56.5 | 28.8 | |
| Rushmore | 56.5 | 27.6 | 20.0 |
| Canthatch | 54.5 | 26.1 | 16.7 |
| Selkirk | 51.0 | 24.8 | 20.4 |
| Justin | 53.5 | 24.0 | 18.7 |
| Thatcher | 51.5 | 23.8 | 15.5 |
| Pembina | 52.5 | 23.2 | 21.2 |
| Lee | 53.0 | 23.0 | 17.5 |
| | Mean yield | 28.0 | |
| | LSD .05 | 6.7 | |

Table 9. Oat Variety Trials, Northeast Research Farm, 1964

| Variety | Test Weight lb/bu | Yield, Bu/A 1964 | Yield, Bu/A 1961-64 |
|---|---|---|---|
| Clintland 64 | 34.5 | 80.1 | |
| CI 7978 | 32.5 | 79.8 | |
| Ortley | 32.5 | 78.5 | 73.2 |
| Andrew | 32.5 | 78.2 | 72.1 |
| Brave | 32.5 | 75.5 | |
| CI 7463 | 35.0 | 74.7 | |
| Dupree | 32.0 | 74.7 | |
| Clintland 60 | 34.5 | 74.4 | 76.1 |
| Mo. 0-205 | 33.5 | 74.1 | 76.0 |
| Burnett | 34.0 | 73.5 | 72.2 |
| Minhafer | 32.5 | 72.3 | 79.4 |
| Garland | 33.0 | 71.9 | |
| Nodaway | 34.5 | 71.5 | 72.8 |
| Dodge | 34.5 | 71.0 | 75.6 |
| Portage | 30.5 | 71.0 | 77.4 |
| Coachman | 33.5 | 69.7 | |
| Lodi | 33.0 | 69.0 | |
| CI 7454 | 32.5 | 68.9 | |
| CI 7679 | 32.5 | 68.6 | |
| Tippecanoe | 34.0 | 67.6 | |
| Putnam 61 | 33.0 | 67.3 | |
| Garry | 33.5 | 67.0 | 66.5 |
| Donkee | 34.5 | 63.5 | |
| Mohawk | 33.5 | 62.1 | 71.6 |
| Neal | 35.5 | 61.7 | |
| AuSable | 35.0 | 60.0 | |
| Rodney | 35.5 | 58.3 | 64.4 |
| | Mean yield | 70.6 | |
| | LSD .05 | 11.1 | |

Table 10. Barley Variety Test, Northeast Research Farm, 1964

| Variety | Test Weight lb/bu | Yield, Bu/A 1964 | Yield, Bu/A 1961-64 |
|---|---|---|---|
| Liberty | 49.5 | 54.9 | 43.2 |
| Larker | 49.5 | 50.3 | 44.1 |
| Trophy | 47.0 | 48.8 | 42.1 |
| Traill | 47.5 | 47.8 | 41.0 |
| Betzes | 46.0 | 47.8 | 41.4 |
| Otis | 48.5 | 45.1 | |
| Parkland | 47.0 | 44.3 | 39.0 |
| Plains | 49.5 | 43.5 | |
| Feebar | 46.0 | 42.7 | |
| Custer | 47.0 | 41.8 | |
| Spartan | 45.5 | 40.3 | |
| Kindred | 46.0 | 40.0 | 33.5 |
| | Mean yield | 45.5 | |
| | LSD .05 | 5.8 | |

Table 11. Flax Variety Test, Northeast Research Farm, 1964

| Variety | Test Weight lb/bu | Yield, Bu/A 1964 | Yield, Bu/A 1960-64 |
|---|---|---|---|
| Summit | 53.5 | 24.0 | 20.0 |
| Redwood | 53.5 | 23.3 | 16.9 |
| Windom | 53.5 | 23.3 | 20.0 |
| Arny | 54.0 | 23.1 | 17.9 |
| CI 2426 | 52.5 | 22.3 | |
| CI 1909 | 53.5 | 22.1 | |
| CI 1910 | 53.0 | 21.3 | |
| Marine 62 | 54.0 | 21.2 | |
| Linda | 52.0 | 20.7 | 16.2 |
| Bolley | 52.5 | 20.6 | 17.2 |
| B-5128 | 53.0 | 20.4 | 16.6 |
| Caldwell | 53.0 | 20.2 | |
| Marine | 53.5 | 19.2 | 16.9 |
| B-5128 (ss) | 52.5 | 18.6 | |
| Norland | 53.0 | 18.6 | 15.7 |
| De Oro | 53.0 | 18.4 | |
| Cree | 52.5 | 17.9 | |
| Amalia | 51.5 | 16.8 | |
| | Mean yield | 20.7 | |
| | LSD .05 | 2.5 | |

# CORN PERFORMANCE TRIALS, AREA D2, 1964

J. J. Bonnemann

Forty-seven hybrid corn entries were included in the 1964 corn performance trial at the Northeast Research Farm. The entries were those designated for entry by participating companies. The trials are conducted on a fee basis.

The trial was planted May 20 and harvested October 20. Germination was quite uniform but somewhat slow. Because it was slow the corn escaped serious damage from a frost on June 2. The drouth of July and early August was broken by a generous rain that permitted most entries to continue satisfactorily toward maturity. The same rainstorm was accompanied by high velocity winds causing severe root lodging.

The average yield of all entries in the trial was 35.9 bushels per acre. The average moisture content of the ear corn was 28.2 percent. For more detailed discussion and results of the trial check Circular 166, 1964 Corn Performance Trials.

Table 12. Corn Performance Trial, Area D2, Northeast Research Farm, 1964

| Variety | Performance Rating | Percent Moisture | Yield, bu/ac 1964 | Yield, bu/ac 1963-64 |
|---|---|---|---|---|
| Sokota 225 (4x) | 1 | 19.7 | 45.5 | 59.3 |
| SD Exp 39 (4x) | 4 | 25.4 | 43.9 | 67.2 |
| SD 240 (4x) | 6 | 26.9 | 43.4 | 65.0 |
| Northrup King PX 35 (2x) | 7 | 30.1 | 42.9 | |
| Pioneer 3854 (4x) | 2 | 18.0 | 42.8 | |
| Cargill 644 (4x) | 3 | 21.4 | 42.8 | |
| SD 220 (4x) | 5 | 21.0 | 42.4 | 56.7 |
| Sokota TS-50 (2x) | 8 | 25.1 | 41.2 | |
| Pioneer 3862 (4x) | 9 | 21.0 | 39.5 | 58.3 |
| Northrup King KE 475 (4x) | 11 | 23.8 | 39.4 | |
| Pioneer 385 (4x) | 18 | 30.5 | 39.2 | 65.3 |
| SD 210 (4x) | 10 | 21.6 | 39.0 | 54.3 |
| Cargill 590 (4x) | 12 | 23.1 | 38.9 | 60.2 |
| United-Hagie 1388 (2x) | 25 | 37.7 | 38.7 | |
| Northrup King PX 487 (3x) | 15 | 26.0 | 38.5 | |
| Pioneer 3812 (4x) | 14 | 24.8 | 38.4 | 63.5 |
| Sokota 255 (4x) | 13 | 22.9 | 38.2 | 63.1 |
| Northrup King KE 449 (4x) | 16 | 26.0 | 38.2 | |
| SD 248 (3x) | 17 | 25.9 | 37.8 | |
| Master F-34 (4x) | 22 | 29.0 | 37.1 | 61.4 |
| DeKalb 59 (4x) | 23 | 31.4 | 37.1 | 61.7 |
| SD 250 (4x) | 19 | 23.6 | 36.9 | 63.8 |
| Sokota 215 (4x) | 20 | 23.6 | 36.8 | 56.5 |
| Master F-30 (4x) | 21 | 23.4 | 35.7 | 57.5 |
| DeKalb 57 (4x) | 26 | 29.3 | 35.4 | 62.9 |
| Funks G-10A (4x) | 30 | 29.4 | 35.0 | 63.1 |
| Master F-70 (4x) | 31 | 30.7 | 34.9 | 60.8 |
| Funks G-15A (4x) | 24 | 25.4 | 34.7 | |
| Northrup King KE 471 (4x) | 27 | 27.9 | 34.7 | |
| DeKalb XL-325 (3x) | 36 | 35.3 | 34.5 | |
| Funks G-17A (4x) | 35 | 31.6 | 34.0 | 62.9 |
| Pioneer 3681 (4x) | 29 | 25.8 | 33.8 | |
| Master F-31A (4x) | 28 | 23.7 | 33.2 | 54.2 |
| Pioneer 384 (4x) | 32 | 27.0 | 33.1 | 58.4 |
| DeKalb XL-15 (2x) | 40 | 37.5 | 33.0 | |
| Master F-35 (4x) | 33 | 24.9 | 32.4 | 55.2 |
| Pioneer 388 (4x) | 34 | 26.0 | 32.4 | 54.2 |
| DeKalb XL-308 (3x) | 39 | 33.2 | 32.3 | |
| Pioneer 3658 (4x) | 41 | 37.5 | 32.0 | |
| Northrup King PX 481 (3x) | 37 | 28.5 | 31.9 | |
| Funks G-18A (4x) | 38 | 30.2 | 31.6 | 60.6 |
| United-Hagie 3H39 (3x) | 43 | 40.8 | 30.9 | |
| Master F-80 (4x) | 42 | 33.0 | 29.4 | |
| Funks G-4390 (2x) | 46 | 39.2 | 28.8 | |
| United-Hagie 3H30 (3x) | 45 | 33.5 | 27.7 | |
| Northrup King KE 497 (4x) | 44 | 29.3 | 26.7 | |
| United-Hagie 130 (2x) | 47 | 44.6 | 22.7 | |
| | Mean | 28.2 | 35.9 | |
| | LSD .05 | | 6.6 | |

## GRAIN SORGHUM PERFORMANCE TRAIL, AREA D2, 1964

J. J. Bonnemann

Grain Sorghum Performance Trials have been conducted by the Crop Performance Testing Activity on a fee basis for the third year at the Northeast Research Farm. The entries included are the choice of the entering producers.

Nineteen entries were included in the 1964 trial. Seeding was done on May 20, harveating on October 2. The first frost had occurred on September 11 and moisture in the grain of the more adapted varieties was low enough for safe storage at the time of harvest.

The yields averaged 21.4 hundred pounds per acre. Further details on this trial are presented in Circular 167 - 1964 Grain Sorghum Performance Trials.

Table 13. Grain Sorghum Performance Trial, Area D2, Northeast Research Farm, 1964

| Variety | Percent Moisture | Test Weight lb/bu | Yield, 100 lb/A 1964 | Yield, 100 lb/A 1962-64 |
|---|---|---|---|---|
| RS 501 | 18.2 | 56 | 29.9 | 30.8 |
| NK 125 | 14.8 | 54 | 29.0 | 25.9 |
| NK 133 | 24.0 | 54 | 28.9 | |
| NK 115 | 14.8 | 54 | 28.3 | |
| NK 120 | 13.0 | 54 | 27.2 | 27.9 |
| SD 502 | 13.5 | 55 | 27.1 | |
| Pawnee | 19.5 | 56 | 26.7 | |
| PAG 275 | 21.3 | 57 | 25.2 | |
| SD 503 | 15.5 | 54 | 24.8 | 29.9 |
| SD 451 | 14.4 | 53 | 23.4 | 25.8 |
| SD 441 | 16.9 | 53 | 21.2 | 25.8 |
| TE 44 | 17.2 | 49 | 19.6 | |
| DeKalb B32 | 15.3 | 53 | 19.3 | |
| PAG 304 | 16.0 | 53 | 17.8 | |
| SD 102 | 27.4 | 53 | 17.4 | 20.1 |
| PAG 410 | 17.2 | 45 | 15.7 | |
| Rocket A | 13.5 | 44 | 11.5 | |
| Asgrow H623 | 16.0 | 44 | 6.6 | |
| Comanche | 18.3 | 41 | 6.2 | |
| | | Mean yield | 21.4 | |
| | | LSD .05 | 2.2 | |

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

## WHEAT

D. G. Wells

Tests of about 3500 lines and varieties of winter wheat were made for ability to survive the winter. Most of these winter killed. Some of the survivors were used in further breeding work intended to develop hardier, early and disease resistant varieties.

An interstate cooperative test was grown of 30 strains and varieties of hard red spring wheat. Yields of the check varieties and the highest yielding experimental strain and rust notes on them follow:

| Selected entries | Stem rust % | Leaf rust % | Yield 1964 bu | Yield 3 year average bu. |
|---|---|---|---|---|
| Experimental line | 0 | trace | 35 | 34 |
| Crim | 0 | 65 | 35 | 21 |
| Pembina | 0 | 65 | 28 | 23 |
| Selkirk | 0 | 65 | 28 | 20 |
| Justin | 0 | 65 | 24 | 18 |
| Lee | 65 | 65 | 24 | 17 |
| Marquis | 100 | 100 | 10 | -- |

An interstate cooperative test was grown of 15 varieties and strains of durum wheat. Shown below are observations on rust development and yield for part of the test.

| Selected entries | Stem rust % | Leaf rust % | 1964 Bu/A | 2 year average Bu/A |
|---|---|---|---|---|
| Experimental strain | 1 | 0 | 35 | -- |
| Wells | trace | 0 | 31 | 18 |
| Lakota | trace | trace | 29 | 19 |
| Stewart 63 | 0 | 0 | 24 | -- |

## OATS AND FLAX

R. S. Albrechtsen

The Uniform Regional Flax Nurseries included promising new strains from the United States and Canada. These nurseries also included longtime checks and recently released varieties which served as standards to be compared with the new strains. This nursery was seeded at 2 different dates to allow for determination

of optimal seeding date for individual strains and to examine the effect of delayed seeding upon performance. Late maturing varieties normally perform best when seeded sufficiently early to allow them to escape the detrimental effects of heat and drought during the flowering period of the plant. Early varieties, on the other hand, may do as well or perhaps even better from a later date of seeding. Some varieties such as Windom and Summit yield well from either early or late seeding.

Varieties originating at State Experiment Stations are normally grown in these nurseries throughout the spring flax growing region of the United States and Canada for 2 to 4 years prior to release as a variety.

The 1964 Uniform Midseason Oat Performance Nursery included entries primarily from states in the North Central Regions of the United States and from Canada. These entries include superior new strains entered by the respective originating Experiment Stations plus appropriate long-time check varieties and some recently released varieties. Entries in this Nursery are primarily of the midseason to late maturity class, being as late as or later than the Clintland type oats.

This nursery is grown by cooperating agencies throughout the North Central Region. Varieties originating at State Experiment Stations in this region are normally grown in this nursery for a period of 2 to 4 years prior to release as a new variety. This makes possible the determination of areas of adaptation for newly developed varieties and serves as a basis for decision to release new varieties. Through such a cooperative testing program, varieties developed in one state may be found suitable for production in other states in the region.

Table 14. Results of the Uniform Regional Flax Nursery (Early); Watertown, 1964 (W 64 URFN-E). 1/

| Variety or Cross | Source | Height July 15 | Test wt. | Bushels per acre |
|---|---|---|---|---|
| | | In. | Lbs. | |
| Rwd. x Cryst. | Minn. | 22 | 53.5 | 24.6 |
| Turkey x Roman Winter | Texas | 17 | 53.5 | 23.8 |
| Windom | Minn. | 21 | 55.0 | 23.7 |
| Summit | So. Dak. | 21 | 53.5 | 23.6 |
| Sel. Irrad. Rwd. | Minn. | 23 | 53.5 | 23.6 |
| B-5128 x Redson | Minn. | 23 | 53.5 | 23.0 |
| Bison, $LM^3N^1$ | No. Dak. | 20 | 52.0 | 22.8 |
| Caldwell | Texas | 19 | 54.0 | 22.7 |
| Turkey x Roman Winter | Texas | 17 | 54.0 | 22.7 |
| F.V. 38697 | Canada | 22 | 54.5 | 22.3 |
| Redwood | Minn. | 22 | 53.0 | 22.1 |
| Bison | No. Dak. | 22 | 53.3 | 21.8 |
| F.V. 387 | Canada | 21 | 54.5 | 21.7 |
| Marine 62 | No. Dak. | 22 | 54.0 | 21.7 |
| Rwd. x Birio | Minn. | 22 | 52.5 | 21.6 |
| Army | Minn. | 24 | 53.5 | 21.3 |
| Redwing | Minn. | 21 | 53.5 | 20.9 |
| B-5128 | No. Dak. | 23 | 53.5 | 20.6 |
| Rwd. x Cryst. | Minn. | 23 | 53.5 | 20.4 |
| Bolley | No. Dak. | 21 | 53.0 | 19.9 |

1/ Seeded May 7, harvested July 28.

Overall mean yield = 1246 lbs. 22.2 bu. per acre

Table 15. Results of the Uniform Regional Flax Nursery (Late); Watertown, 1964. (W 64 URFN-L). 1/

| Variety or Cross | Source | Height July 16 | Test wt. | Bushels per acre |
|---|---|---|---|---|
| | | In. | Lbs. | |
| Redwing | Minn. | 21 | 54.0 | 18.2 |
| Bolley | Minn. | 26 | 51.3 | 17.8 |
| Bison, $LM^3N^1$ | No. Dak. | 25 | 51.5 | 17.7 |
| Windom | Minn. | 24 | 52.8 | 16.7 |
| Summit | So. Dak. | 24 | 52.3 | 16.3 |
| Marine 62 | No. Dak. | 23 | 52.5 | 15.5 |
| Rwd. x Birio | Minn. | 26 | 51.5 | 14.9 |
| Bison | No. Dak. | 25 | 51.8 | 14.7 |
| Turkey x Roman Winter | Texas | 20 | 52.0 | 14.0 |
| Turkey x Roman Winter | Texas | 18 | 51.8 | 13.5 |
| Caldwell | Texas | 20 | 51.0 | 11.6 |
| B-5128 | No. Dak. | 28 | 50.8 | 10.9 |
| Army | Minn. | 29 | 52.8 | 10.9 |
| Redwood | Minn. | 27 | 51.0 | 10.5 |
| B-5128 x Redson | Minn. | 27 | 49.8 | 10.4 |
| Rwd. x Cryst. | Minn. | 26 | 48.5 | 10.3 |
| Rwd. x Cryst. | Minn. | 26 | 49.8 | 9.7 |
| Sel. Irrad. Rwd. | Minn. | 28 | 49.0 | 9.5 |

1/ Seeded May 20.
Overall mean yield = 757 lbs. 13.5 bu. per acre

## WEED RESEARCH

### WILD BUCKWHEAT CONTROL IN SMALL GRAINS

Wayne G. Wright

Triplicate plots of Dodge oats, Pembina wheat and Trophy barley were treated at the 3-,4-,5- and 6-leaf stage of wild buckwheat with 1/2 and 1 oz. of Picloram and 2 and 4 oz. of Dicamba. Corresponding to the leaf stages of wild buckwheat, oats, were in the 3-,4-,5- and 5-, wheat 4-5,5-,5-,5-6, and barley 5-,6-,6-, and 6-7-leaf stage. All crops were in the early boot stage at the later date of application. Moisture was adequate at planting time, but very little was received after this and the crops were under considerable drought stress much of the growing season.

Picloram at 1/2 and 1 oz. controlled 99 percent of the wild buckwheat, except for the 1/2 oz. rate at the 5-leaf stage which controlled 80 percent. Dicamba controlled 99 percent with the 4 oz. rate except for the 5-leaf stage which showed 50 percent control. Dicamba at 2 oz. showed 60 percent control. Picloram at 1 oz. and Dicamba at 4 and 2 oz. controlled wild mustard 30, 75 and 45 percent.

Statistical analysis of data has not been completed, but there appears to be no yield reduction for either rate of Picloram except a 4 bushel reduction for the early application in barley and oats. A reduction of 8 bushel in wheat and 6 bushel in oats for both late rates of Dicamba were noted as well as a 6 bushel reduction for the late 4 oz. rate in barley. Wheat was reduced 6 bushel, barley 6 bushel and oats 4 bushel for both rates at the early application.

By June 24, for both chemicals, the above ground stem of wild buckwheat had swollen and the growing point had died. A soft fleshy tumor remained. The leaves remained green but no further growth developed. By July 17 most of the plants turned completely brown. Some wild buckwheat plants sprayed in the 5-, and 6-leaf stage had the growing point killed but still shot new leaves from the axils of the first and second leaves. These plants eventually produced some seed. The heavier rates, especially Dicamba, at the late date of application reduced the height of wheat and barley 4-5 inches and delayed maturity 3-4 days in wheat and 6-7 days in barley.

### HERBICIDE SCREENING TRIALS FOR POST DIRECTED SPRAY WEED CONTROL IN CORN

Wayne G. Wright

Description of Experiment

Various herbicides were applied July 17, 1964, in a 14 inch band when the corn was 28 inches tall and the weeds 8-10 inches tall to determine what herbicides would do an effective job of controlling weeds when applied as a post directed spray. Herbicides were applied with drop nozzles using leaf lifters to avoid injury to the bottom leaves of the corn plants. Herbicides were applied in water at 38 gallons per acre to insure complete coverage of the foliage.

Table 16. Effect of Various Herbicides on Corn and Weeds.

| Herbicide | Rate lb/A | % Crop injury | % Grass control | % Broadleaf control |
|---|---|---|---|---|
| Dicamba | 1/2 | 0 | 0 | 7 |
| Dicamba | 1 | 0 | 0 | 3 |
| Picloram | 1/4 | 0 | 0 | 40 |
| Picloram | 1/2 | 0 | 0 | 10 |
| Dalapon + 2,4-D amine | 2+3/4 | 0 | 0 | 5 |
| Ansar 184 | 3 | 47 | 95 | 66 |
| Ansar 184 * | 6 | 60 | 98 | 98 |
| Ansar 290 D * | 2.9 | 0 | 87 | 43 |
| Ansar 290 D * | 5.8 | 40 | 95 | 95 |
| S-6000 | 1/2 | 0 | 0 | 0 |
| S-6000 | 1 | 0 | 23 | 0 |
| S-6000 | 2 | 0 | 57 | 33 |
| Linuron * | 4 | 0 | 94 | 47 |
| Prometryne * | 1 | 0 | 0 | 30 |
| Prometryne * | 2 | 0 | 10 | 0 |
| Prometryne * | 4 | 0 | 90 | 23 |
| Ametryne * | 1 | 0 | 27 | 0 |
| Ametryne * | 2 | 0 | 80 | 57 |
| Ametryne * | 4 | 0 | 99 | 99 |
| GS-14260 * | 2 | 0 | 80 | 95 |
| GS-14260 * | 4 | 0 | 99 | 98 |
| GS-36393 * | 2 | 0 | 88 | 66 |
| GS-36393 * | 4 | 0 | 98 | 98 |
| Atrazine + * Liquid N | 3+80 | 0 | 17 | 63 |
| Check | | | | |

* 0.5% Surfactant (X-77) added at the rate of 1 gallon per acre.

No yield results are available for this experiment since it was incorporated into a rotational experiment that did not lend itself to obtaining yield data for both experiments. Many of the herbicides show excellent weed control with no apparent injury to the corn. The broadleaf weed control appears somewhat erratic. However, there were so few broadleaf weeds present before application that this should not be interpreted as a true test of the herbicides in this instance.

More work in screening herbicides for use as an emergency directed spray application for weed control in corn will be continued in 1965 with the main emphasis on time and rate of application.

# THE NATURE AND EXTENT OF COMPETITION BETWEEN WILD BUCKWHEAT AND CEREAL GRAIN

J. G. Dosland

The South Dakota Experiment Station is cooperating with other North Central states in studying competition of weeds and crops. Most of the wild buckwheat competition research was conducted in the northeastern region of the state, during the year 1964. A random survey of farmers' fields was conducted, giving an estimate of the densities and distribution of wild buckwheat in the region.

Experimental plots were located at the Northeast Research Farm. One of the objectives of this year's experimentation was to study the growth rates of wild buckwheat and cereal grain grown in competition. Information of this type is useful in helping us to understand when and how long buckwheat presents a serious competitive threat to cereal grain. Growth rates were determined by harvesting plots periodically during the growing season and finding the total weights and areas of the leaves produced by the crops and the weed.

The rate of leaf area development is a very important factor to consider when studying weed competition. The comparison of the leaf area of the weed and the leaf area of the crop gives a good estimate of capabilities of each to utilize sunlight for further growth.

The effects of fertilizer treatments upon competition was also examined during the past year. Information obtained from fertilizer experiments have value in determining the propriety of fertilizer treatments in relation to their effects upon wild buckwheat competition.

Results: From the results obtained during 1964, a few general trends will be noted.

Wild buckwheat is distributed widely throughout fields in the northeastern section of the state. Wild buckwheat was found in 93% of the wheat fields in the area. It ranked second to green and yellow foxtail in density and frequency of occurrence.

Growth of wheat with a natural infestation of 20 buckwheat per square foot resulted in a 20% reduction in the total weight of heads harvested as compared to weed-free wheat. Total weights and leaf areas of wheat grown in competition with wild buckwheat were smaller than those for weed-free wheat on all sampling dates throughout the season.

With barley growing in competition with wild buckwheat, a commonly used fertilizer treatment of 20 lb. N and 20 lb. $P_2O_5$ was found to give an increased weight production for both the barley and the wild buckwheat, when good growing conditions prevailed. In these experiments, no evidence was obtained suggesting that buckwheat responded to fertilizer greater than did the barley. Weed-free fertilized barley gave the greatest yields. The yield of fertilized barley growing in competition with wild buckwheat was greater than the yield of unfertilized barley growing in competition with wild buckwheat.

## SORGHUM AND SOYBEANS

### 1964 - WATERTOWN - SORGHUM

A. O. Lunden and C. J. Franzke (Emeritus)

Objective: Preliminary testing of South Dakota sorghum lines and hybrids.

Field plots of 24 sorghum lines and hybrids were planted for yield tests. Fair yields resulted in spite of generally unfavorable weather conditions and frost damage before complete maturity of many lines. Yields of selected lines are reported in table 17.

Table 17. Yields of Selected Experimental Sorghum Hybrids in 1964.

| Exp. No. | Yield (Bu/A) |
|---|---|
| SD 60108 | 42.8 |
| SD 60109 | 47.0 |
| SD 61010 | 47.7 |
| SD 61011 | 35.4 |
| SD 61012 | 41.8 |
| SD 61013 | 43.5 |
| SD 61015 | 44.7 |
| SD 61016 | 44.0 |
| SD 60100F | 32.1 |
| SD 60101F | 33.0 |

### 1964 - WATERTOWN - SOYBEANS

Objective: Performance testing of experimental South Dakota soybean lines and potential regional releases.

Replicated yield tests of 48 regional soybean lines and varieties and 11 experimental lines produced an average yield of only 12 bushels per acre. This was a poor year for soybeans with alternating periods of low temperature and limited rainfall coupled with an early frost causing slow development of all lines. Yields of selected lines are reported in table 18.

Table 18. Yield and Field Performance of Selected Soybean Lines.

| Line | Yield Bu/A. | Days to Maturity | Height |
|---|---|---|---|
| Grant | 11.6 | 127 | 20 |
| Merit | 11.2 | 123 | 22 |
| Norchief | 10.5 | 124 | 20 |
| M 421 | 14.0 | 124 | 20 |
| Chippewa | 13.8 | 127 | 20 |
| Chippewa 64 | 13.6 | 127 | 24 |
| A1-540 | 15.3 | 132 | 24 |
| 12-14-1B | 14.5 | 127 | 22 |
| 7-23-4 | 14.0 | 134 | 22 |

## CROP DISEASE CONTROL

### ROOT AND STALK ROT DISEASE CONTROL IN HYBRID CORN

C. M. Nagel

Approximately 200 experimental three-way corn hybrids involving one root and stalk rot resistant parent in each of the three-way hybrids were grown at the Research Farm in 1964. All hybrid entries were replicated three times in each particular experiment. Results were obtained on the over-all performance including resistance to disease, lodging, moisture and yields. As a result of these experiments, a recent release; namely, SD240, has been made available commercially to growers.

Research in progress is directed at developing a strain of corn which is resistant to disease. Over the past years, strains of corn have been developed by the Plant Pathology Department at the Main Experiment Station at Brookings.

The approximately 200 experimental hybrids that were grown at the Northeast Research Farm in 1964 were divided into four different tests and were grown on a six-acre piece of land. Only the 15 top-yielding three-way hybrids and commercial checks from each of the four experiments are presented in the following table.

The plots were planted on May 21 and harvested October 22. Yield performance of three-way experimental root and stalk rot resistant corn hybrids in comparison to five commercial adapted hybrids grown at the Northeast Research Farm in 1964.

Experiment # 1.

| Expt'l hybrid or commercial check | Yield Bu/A | Moisture at harvest |
|---|---|---|
| Expt'l 1 | 50.9 | 20.9 |
| " 2 | 45.0 | 18.5 |
| " 3 | 44.3 | 17.7 |
| " 4 | 44.1 | 18.1 |
| " 5 | 44.4 | 23.1 |
| " 6 | 42.9 | 18.9 |
| " 7 | 42.7 | 20.8 |
| SD240 | 43.1 | 24.0 |
| Expt'l 8 | 41.9 | 20.5 |
| " 9 | 41.0 | 19.7 |
| SD 210 | 40.9 | 19.5 |
| Expt'l 10 | 41.5 | 21.8 |
| " 11 | 41.3 | 21.4 |
| SD220 | 41.0 | 20.5 |
| Expt'l 12 | 41.1 | 21.1 |

Differences of less than 7.1 Bu/A are not significant differences.

Experiment # 2.

| Expt'l hybrid or commercial check | Yield Bu/A | Moisture at harvest |
|---|---|---|
| Expt'l 1 | 58.0 | 20.5 |
| " 2 | 48.4 | 17.3 |
| " 3 | 48.6 | 18.7 |
| P388 | 47.2 | 16.2 |
| Expt'l 4 | 46.1 | 15.0 |
| SD240 | 48.1 | 20.9 |
| Expt'l 5 | 49.0 | 24.5 |
| " 6 | 48.7 | 24.0 |
| SD210 | 45.9 | 18.7 |
| Expt'l 7 | 45.7 | 20.3 |
| " 8 | 43.9 | 16.0 |
| " 9 | 44.5 | 18.3 |
| " 10 | 45.7 | 24.5 |
| " 11 | 45.6 | 24.8 |
| " 12 | 43.6 | 20.1 |

Differences of less than 6.32 Bu/A are not significant differences

Experiment # 3.

| | | |
|---|---|---|
| Expt'l 1 | 48.1 | 20.3 |
| " 2 | 49.1 | 23.6 |
| " 3 | 48.4 | 24.5 |
| " 4 | 45.7 | 16.8 |
| " 5 | 47.9 | 24.8 |
| " 6 | 45.5 | 19.8 |
| " 7 | 45.9 | 21.8 |
| " 8 | 45.7 | 23.4 |
| " 9 | 44.5 | 21.9 |
| SD220 | 43.5 | 20.6 |
| SD210 | 42.7 | 19.6 |
| Expt'l 10 | 43.4 | 23.1 |
| " 11 | 40.6 | 15.9 |
| " 12 | 44.7 | 28.2 |
| " 13 | 42.6 | 22.7 |

Differences of less than 5.32 Bu/A are not significant differences

Experiment # 4.

| Expt'l hybrid or commercial check | Yield Bu/A | Moisture at harvest |
|---|---|---|
| Expt'l 1 | 57.1 | 22.0 |
| SD240 | 51.5 | 20.1 |
| Expt'l 2 | 49.2 | 20.3 |
| SD220 | 48.2 | 18.3 |
| Expt'l 3 | 47.6 | 20.1 |
| " 4 | 47.9 | 20.9 |
| " 5 | 45.3 | 15.5 |
| SD210 | 46.2 | 18.8 |
| Expt'l 6 | 46.8 | 22.1 |
| " 7 | 47.1 | 23.0 |
| " 8 | 45.5 | 18.6 |
| " 9 | 46.5 | 21.9 |
| " 10 | 46.6 | 22.3 |
| " 11 | 46.5 | 22.4 |
| " 12 | 44.4 | 16.6 |

Differences of less than 6.18 Bu/A are not significant differences

## SOIL TREATMENT EFFECTS ON WINTERKILLING OF WHEAT

### NORTHEAST SUBSTATION, WATERTOWN

G. W. Buchenau

Plant diseases previously have been associated with winterkilling of winter wheat in eastern South Dakota. Experiments at the Northeast Research Farm were designed to duplicate previous results, particularly those in which a soil fumigant, chloropicrin (tear gas), has strikingly reduced winterkilling.

Chloropicrin acts as a soil biocide capable of killing all life in treated soil. Furthermore, it increases soil fertility, partially through the nitrogen it contains and partially by making nutrients available to plants from the soil microorganisms it has killed. As a result, it is difficult to evaluate the effects of chloropicrin on winterkill; are they due to the death of disease-causing microorganisms and insects, soil fertility, or combinations of these factors resulting from chloropicrin treatment?

Chloropicrin was compared with a number of other chemicals in the 1964 tests. It was hoped that some of these materials would provide the same effects as chloropicrin and, subsequently, lead to a better explanation of why winterkilling occurs and how it might be better prevented. However, the data show that chloropicrin decreased winterkilling; but none of the other materials tested, either alone or with chloropicrin, were particularly effective (Table 19).

Table 19. Effect of preplant soil treatments and spring foliage sprays on winter survival and yield of Pawnee winter wheat at Watertown, 1964.

| Treatment | Dosage | Winter Kill % | Yield bu. |
|---|---|---|---|
| Chloropicrin | 320 lbs./acre | 30 | 11.1 |
| Chloropicrin + Sodium Pentachlorophenate | 320 lbs./acre + 20 lbs./acre | 48 | 9.5 |
| Chloropicrin + Soil Treater X | 320 lbs./acre + 43.5 lbs./acre | 47 | 8.1 |
| 19-19-0 | 600 gms./420 ft.$^2$ | 60 | 5.6 |
| Pentachlorophenate | 20 lbs./acre | 62 | 4.8 |
| Tetrachloronitroanisole (TCNA) 50% W.P. | 8 lbs./acre | 58 | 4.4 |
| Soil Treater X | 43.5 lbs./acre | 65 | 4.4 |
| Cyprex | 43.5 lbs./acre | 85 | 4.1 |
| Manzate D (applied 24 April) | 3 lbs./acre in 50 gal. | 70 | 3.9 |
| Check (no treatment) | | 70 | 3.7 |
| Sodium Pentachlorophenate | 20 lbs./acre | 72 | 3.1 |
| Puratized Agricultural Spray (applied 24 April) | 1 tsp./gal. at 50 gal./acre | 77 | 3.1 |
| | $LSD_{05}$ | 26 | 3.9 |