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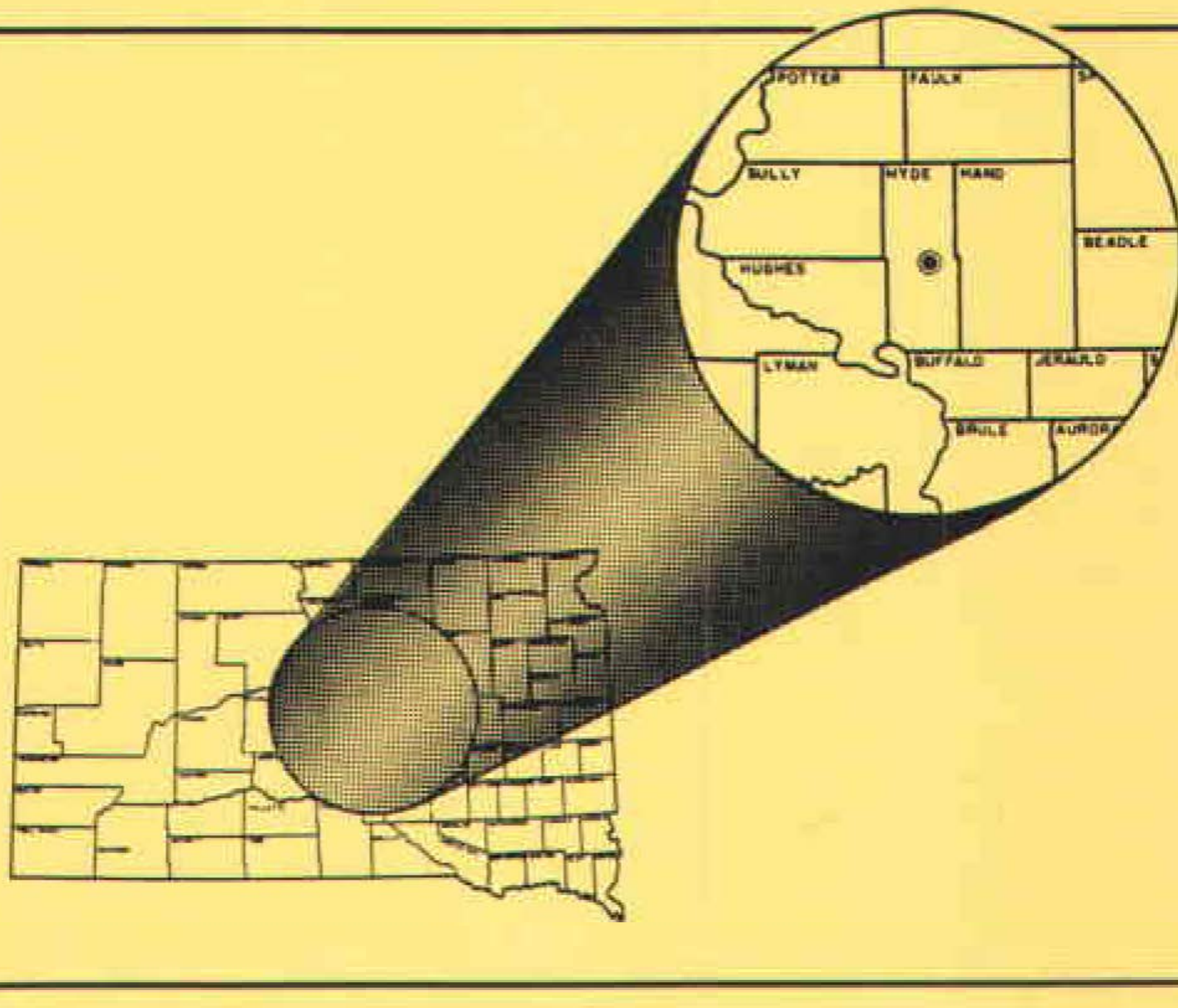
Central Crops and Soils Research Station Highmore, South Dakota



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CENTRAL CROPS AND SOILS RESEARCH STATION, 1990
HIGHMORE, SOUTH DAKOTA

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This report of the Central Crops and Soils Research Station at Highmore, South Dakota is a progress report and, therefore, the results presented are not necessarily complete nor conclusive. Any interpretation given is tentative because additional data from continuation of these experiments may produce conclusions different from those of any one year. The data presented in this report reflect the 1990 growing season.

Commercial companies and trade names are mentioned in this publication solely for the purpose of providing specific information. Mention of a company does not constitute a guarantee or warranty of its products by the Agricultural Experiment Station or an endorsement over products of other companies not mentioned.

This publication also reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and Federal agencies before they can be recommended. A complete set of 1990 results from SDSU herbicide demonstrations is available as Extension Circular 678 from your County Agent or SDSU.

South Dakota Agricultural Experiment Station
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Introduction....................................Brad G. Farber, Manager

The past year at the Central Crops and Soils Research Farm has been productive in many ways. This research farm continues to be the primary stress testing location for experimental materials, advanced breeding lines, and established crop varieties. The Highmore farm usually provides stress conditions necessary for evaluation of these materials under adverse conditions such as moisture and heat stress. This type of environment will generally differentiate between experimental lines and aid in the selection phase of breeding programs while providing an indication of yield stability over a range of environments.

Total rainfall amounts and temperatures in 1990 were very near the long-term averages (Tables 1 and 2). May through August precipitation was about one and one-half inches above normal while temperatures were about two degrees cooler for the same period. However, timing of growing season precipitation was particularly good compared to the previous two years and, when coupled with slightly cooler temperatures, helped produce an excellent crop in much of the Central region. Yields of spring and winter wheat averaged 40 and 60 bushels/acre respectively or about 40% higher than the long-term average. Corn and soybean yields at the research farm averaged 85 and 32 bushels/acre respectively.

Maintenance, repairs, and remodeling of research farm buildings continued in 1990. The main focus this past year has been on remodeling portions of the interior of the seedhouse. The office area was paneled and new flooring installed, two new modern bathrooms and a shower were added to replace an out-of-date and unsightly outhouse, and storage areas of the upstairs in the seedhouse were insulated, sheetrocked and converted into sleeping rooms for the researchers. These additions significantly modernize the seedhouse and provide functional facilities for researchers and staff at the farm. Plans for 1991 include remodeling of the meeting area in the seedhouse and general repairs to the barn.

The twilight tour of research plots was held on June 26, 1990 at 6:30 in the evening. Lunch was served prior to and after the tours. The evening was well attended and participants listened to talks on small grain varieties, diseases, herbicide evaluation trials, forage research, nitrogen management of corn, and several other topics.

The research conducted each year and included in this report involves long hours by staff from many disciplines at SDSU and the Highmore Research Farm. Their efforts in contributing to this publication each year are greatly appreciated. Support and input from area producers, ranchers, Advisory Board members and County Agents is also greatly appreciated.

If anyone has comments or suggestions pertaining to research on the farm or questions and input on any other matter, please write or call.

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Table 1. Temperatures at the Central Research Farm - 1990.

Month	1990 Average Temperatures[a] Max.	Min.	Average	Normal[b]	Departure from normal
	°F				
January	38.8	18.0	28.4	12.6	+15.8
February	35.3	14.9	25.1	19.5	+5.6
March	47.3	25.3	36.3	29.7	+6.6
April	60.8	30.8	45.8	45.7	+0.1
May	66.4	43.2	54.8	57.5	-2.7
June	79.9	54.2	67.1	67.3	-0.2
July	83.7	58.8	71.3	74.0	-2.7
August	85.3	58.8	72.1	72.7	-0.6
September	80.6	51.3	66.0	62.0	+4.0
October	64.0	34.1	49.1	50.1	-1.0
November	49.6	24.5	37.1	32.4	+4.7
December	25.4	2.9	14.2	19.9	-5.7

[a] Calculated from daily observations.
[b] 30 year average (1951-1980).

Table 2. Precipitation at the Central Research Farm - 1990.

Month	1990 Precipitation	Normal[a]	Departure from normal	Greatest amount	Date
	inches				
January	0.15	0.34	-0.19	0.10	24
February	0.35	0.57	-0.22	0.15	15
March	1.71	0.91	+0.80	0.58	14
April	2.50	2.08	+0.42	0.95	29
May	2.10	2.69	-0.59	1.50	19
June	3.55	3.28	+0.27	1.05	16
July	2.57	2.57	0.00	1.25	25
August	3.45	2.33	+1.12	2.60	23
September	0.75	1.32	-0.57	0.40	18
October	0.50	1.24	-0.74	0.50	17
November	0.20	0.53	-0.33	0.20	2
December	0.43	0.47	-0.04	0.15	2
TOTAL	18.26	18.33	-0.07		

[a] 30 year average (1951-1980).

FORAGE YIELD AND QUALITY OF SUMMER ANNUAL CROPS AS INFLUENCED BY PLANTING DATE

E.K. Twidwell, A. Boe, and K.D. Kephart

In South Dakota cool-season pastures decline in productivity during the late summer resulting in diminished forage supplies. Crops that are normally used to augment low forage supplies in late summer include annual and perennial warm-season grasa pastures, hay, and silage crops. Previous research also indicates that summer annual legumes such as cowpeas and mungbeans are adapted to South Dakota conditions and can produce adequate forage yields. At present it is not well understood how the productivity of these summer annual grasses and legumes is influenced by planting date. In drought conditions producers may be forced to plant summer annual crops in early to mid-summer and hope that they can produce adequate forage yields in a short period of time. The identification of the best species and optimum planting dates to use would be beneficial information. The objective of this study was to measure and compare the forage yield and quality of four summer annual species planted on three dates.

Materials and Methods: Cowpeas, mungbeans, soybeans, and Siberian millet were planted on May 24, June 26, and July 23. Plot size was 3.3 ft. x 10 ft. and row spacing was 10 inches. On each harvest date the center two rows of each plot were harvested for yield determination. The forage was weighed and a one pound subsample was taken for dry matter determination and future forage quality determinations. The millet planted on May 24 was harvested on July 23. The other three species were harvested on August 28. The millet planted on June 26 was harvested on August 28. The other three species were harvested on September 25. All species from the July planting were harvested on September 25.

Results and Discussion: For the May 24 planting mungbeans and millet produced similar forage yields (Table 1). Cowpeas produced significantly higher yields than mungbeans, while soybeans significantly outyielded both mungbeans and millet. For the June 26 planting cowpeas and soybeans produced at least 1 ton per acre higher yields than either mungbeans or millet. Forage yields of mungbeans and millet were similar. For the July 23 planting yields of cowpeas and millet were approximately double those of either mungbeans or soybeans. Yields obtained from this planting were considerably lower than the other plantings, indicating that a late July planting is probably not warranted except in emergencies.

This is the second year of this experiment, and results from 1990 are generally similar to those obtained in 1989. June appears to be the optimum time to plant cowpeas. Millet provides a great deal of flexibility in that it can be seeded from May to July with reasonable assurance that adequate forage yields will be produced. For optimum forage production of soybeans, they should be planted in May. Mungbeans yielded the lowest of the four species during both years of the study, and it seems that they are the least desirable as a forage crop.

Samples of these crops from both 1989 and 1990 are currently being analyzed for forage quality constituents. Results of crude protein analysis from 1989 indicate that when averaged across planting dates the crude protein content of cowpeas, mungbeans, soybeans, and millet is 26.5, 21.6, 22.9, and 13.6%, respectively.

Table 1. Forage yield of four species planted on three different dates.

	Planting date in 1990		
Species	May 24	June 26	July 23
	---------------tons per acre--------------		
Mungbeans	1.4	1.5	0.5
Soybeans	3.7	2.6	0.6
Millet	1.9	1.3	1.5
Cowpeas	2.6	3.3	1.1
LSD (0.05)		1.0	

ALFALFA CULTIVAR YIELD TEST

Edward K. Twidwell, Kevin D. Kephart, and Robin Bortnem

Two alfalfa cultivar yield experiments were conducted at the Central Crops and Soils Research Station during 1990. These tests were conducted to determine yield performance of various alfalfa cultivars and experimental lines when grown in central South Dakota.

During 1990 average daily temperatures were near normal throughout the growing season. Precipitation received was near normal throughout the growing season, with the exception of August during which above normal precipitation occurred.

The first study was planted in late April of 1987 and had 24 cultivars (Table 1). Two harvests were obtained from this planting with average total yields ranging from 1.39 to 1.65 T/A, with no significant differences detected among the cultivars. Second-cut yields were extremely low as the average yield was only 0.41 T/A. The three year average yields ranged from 1.19 to 1.69 T/A, with no significant cultivar differences detected.

The second experiment was planted in mid-May of 1989. Because of drought conditions present, no harvests were made on this experiment in 1989. In 1990, however, three harvests were obtained from this experiment. Average total yields ranged from 2.50 to 4.06 T/A, with significant cultivar differences detected (Table 2). Significant cultivar differences were also found within the first and third cuttings. This experiment will be conducted for two more years, and it will be interesting to see if the significant cultivar differences found this year will be present in future years.

These results are useful in the selection of alfalfa cultivars for forage production. Measurements of forage yield taken over several years of harvest are usually more useful than the average from a single harvest.

Forage yield of 24 alfalfa cultivars planted April 27, 1987 at the Central Crops and Soils Research Station, Highmore, South Dakota.

Cultivar	1988 2-Cut Total	1989 1-Cut Total	1990 Cut 1 6/20	1990 Cut 2 9/6	1990 2-Cut Total	3 Year Avg[a]	Relative Perform[b]
	----------	----------	----------	tons DM/acre	----------	----------	---%---
636	2.08	1.39	1.14	0.46	1.60	1.69	115
Mohawk	2.23	1.29	1.05	0.42	1.47	1.66	113
Saranac	2.21	1.31	1.00	0.41	1.41	1.64	112
Saranac AR	2.18	1.27	1.04	1.38	1.43	1.63	111
Iroquois	1.94	1.33	1.09	0.50	1.59	1.62	110
Vernal	1.85	1.30	1.17	0.48	1.65	1.60	109
Big 10	1.87	1.23	1.10	0.49	1.60	1.57	106
120	1.89	1.18	1.13	0.39	1.52	1.53	104
Magnum III	1.79	1.18	1.08	0.51	1.59	1.52	103
526	1.76	1.22	1.16	0.43	1.58	1.51	103
Webfoot	1.81	1.25	1.03	0.41	1.44	1.50	102
MTO S82[c]	1.65	1.24	1.24	0.35	1.59	1.49	101
MTO N82[c]	1.70	1.18	1.29	0.28	1.58	1.49	101
Blazer	1.59	1.03	1.05	0.42	1.47	1.41	96
Cimarron	1.65	1.07	1.05	0.42	1.48	1.40	95
Emerald	1.61	1.16	1.00	0.39	1.39	1.39	94
DK-135	1.70	0.99	1.02	0.44	1.46	1.39	94
WL 225	1.50	1.12	1.14	0.37	1.50	1.37	93
Clipper	1.44	1.10	1.19	0.36	1.55	1.37	93
Eagle	1.56	1.08	1.03	0.37	1.40	1.35	92
SX 424	1.61	1.01	1.01	0.39	1.39	1.34	91
Dynasty	1.42	1.14	1.00	0.43	1.43	1.33	90
532	1.48	1.06	1.02	0.40	1.42	1.32	90
SX 217	1.24	0.92	1.02	0.39	1.41	1.19	81
Average	1.74	1.17	1.09	0.41	1.50	1.47	
Maturity			5.0	6.4			
LSD (0.05)	NS[e]	NS	0.14	NS	NS	NS	

[a] Three year average based on post-establishment year yields, 1988, 1989 and 1990.

[b] % Relative Performance + ratio of cultivar 3-yr average to 3-yr average of all cultivars.

[c] Experimental line, not currently marketed.

[d] Average harvest maturity. Value based on KaLu and Fick (1983) mean-stage-by-count index.

[e] Cultivars not significantly different at the 0.05 level of probability.

Forage yield of 36 alfalfa cultivars planted May 11, 1989 at the Central Crops and Soils Research Station, Highmore, South Dakota.

Cultivar	1990 Cut 1 6/20	Cut 2 7/23	Cut 3 9/6	3-Cut Total	Relative Perform[a]
	------------------tons	DM/acre	-----------		---%---
Ultra	1.80	1.13	1.12	4.06	124
Chief	1.65	1.22	1.17	4.03	123
Flint	1.55	1.28	1.20	4.02	123
630	1.57	1.26	0.99	3.83	117
Victory	1.71	1.05	1.01	3.76	115
Sure	1.63	1.05	1.02	3.70	113
Action	1.52	1.18	0.92	3.62	110
Apollo Supreme	1.68	1.06	0.86	3.59	110
WL 225	1.61	1.00	0.92	3.53	108
VS-775[b]	1.61	0.98	0.90	3.49	106
Centurion	1.59	0.91	0.94	3.44	105
Legend	1.46	1.05	0.93	3.44	105
VS-820[b]	1.52	1.02	0.89	3.43	105
Sabre	1.56	0.99	0.86	3.40	104
WL 317	1.56	0.97	0.83	3.36	102
Dawn	1.64	0.90	0.81	3.35	102
VIP	1.83	0.86	0.64	3.33	102
5472	1.48	0.98	0.85	3.31	101
Royalty	1.60	0.94	0.75	3.29	100
Saranac AR	1.44	1.00	0.81	3.26	99
Multi-plier	1.57	0.92	0.72	3.21	98
Majestic	1.68	0.78	0.74	3.20	98
Aggressor	1.57	0.85	0.70	3.13	95
Clipper	1.41	0.84	0.87	3.12	95
H-174[b]	1.41	0.90	0.75	3.06	93
Trident II	1.34	0.78	0.80	2.92	89
526	1.59	0.74	0.58	2.92	89
636	1.53	0.72	0.66	2.91	89
Vernal	1.46	0.74	0.67	2.87	88
Arrow	1.31	0.83	0.74	2.87	87
SDHS6[b]	1.61	0.66	0.58	2.85	87
Dart	1.54	0.65	0.64	2.83	86
SDHL1[b]	1.52	0.56	0.71	2.80	85
5262	1.39	0.65	0.73	2.77	84
Cimarron VR	1.43	0.69	0.59	2.71	83
885[b]	1.29	0.68	0.53	2.50	76
Average	1.55	0.91	0.82	3.28	
Maturity[c]	5.1	5.5	7.3		
LSD (0.05)	0.25	NS	0.37	0.90	

[a] % Relative Performance = ratio of cultivar 1990 total yield to 1990 total yield of all cultivars.

[b] Experimental line, not currently marketed.

[c] Average harvest maturity. Value based on KaLu and Fick (1983) mean-stage-by-count index.

[d] Cultivars not significantly different at the 0.05 level of probability.

NITROGEN ADDITIONS FOR CORN

R. Gelderman, S. Drymalski and M. Volek

INTRODUCTION

Approximately 50% of the total fertilizer nitrogen applied in South Dakota is used on corn. The need for efficient and profitable nitrogen recommendations for corn is apparent. The best guide available for recommending fertilizer is a soil test. Soil tests need to be correlated to field response data such as reported here.

The objective of this study is to determine the relationship of the nitrate-nitrogen soil test to yield response of corn to nitrogen fertilizer.

METHODS

The study was located on the west side of the Highmore experiment farm on a Stickney soil. These soils are deep, moderately well-drained, nearly level soils formed in glacial till. Results of soil tests from samples taken at planting are shown in Table 1.

Table 1. Soil test results of nitrogen corn study at planting, Highmore, 1990.

-------NO_3-N------- 0-24"	0-48"	O.M.	P	K	pH
-------lb/A--------		%	-------lb/A--------		
113	170	3.0	71	540	6.4

The soil tests indicated a fairly high level of available nitrogen in the top two feet with above normal levels from two to four feet. Phosphorus and potassium are considered very high. The soil is slightly acidic in reaction.

The previous crop was spring wheat. The area was fall chiseled and spring disked before planting Pioneer 3902 (85 day maturity) on 12 May 1990 at a population of approximately 17,500 plants per acre. The fertilizer rate treatments were spread on the soil surface as ammonium nitrate about four weeks after planting at the four leaf stage. The rates used were 0, 30, 60, 90, and 120 lb of actual nitrogen per acre. Each treatment was replicated four times. The plots were hand harvested for grain on 19 September 1990 by picking two center rows 20 feet each in length.

RESULTS AND DISCUSSION

Rainfall was almost average for the growing season. A total of 12.04 inches fell in the period of May-September. As a result, good corn yields were produced (Table 2).

Table 2. Grain yield as influenced by rate of nitrogen, Highmore, 1990.

Rate of N	Grain Yield* (15% moisture)
lb/A	bu/A (15% moisture)
0	79
30	91
60	92
90	86
120	85
Sign.	Non-significant (F = .45)
C.V. %	11.6

The yields were not affected by rate of nitrogen as would be expected from the available nitrogen contained in the soil at mid-June. In addition, nitrogen from breakdown of soil organic matter met the needs of the 85 bushel corn here.

These data along with many other sites will be summarized in two years to determine how soil tests can be better used to predict fertilizer N needs of corn.

OAT RESEARCH

Dale Reeves and Lon Hall

The preliminary herbicide acreening test is a cooperative effort with the oat project and the extension weed ataff to screen established varieties and promising lines for herbicide injury. Recommended and doubled rates are applied to six varieties or lines at the 3-4 leaf stage.

Although the Highmore location was non-significant for yield differences, there are a trends in the four location averages that show MCPA amine, Bronate, and the low rate of MCPA and Dicamba cause the least injury; however, this may change with the variety, location, year, or stage of plant development. Generally, MCPA amine caused the least amount of injury. Other data has shown plants are more sensitive to Bronate and Dicamba applied in the 6-7 leaf stage.

TREATMENT	HERB RATE ai lb/a	HIGHMORE YIELD bu/a	HIGHMORE TWT lb/bu	YIELD % OF CHECK HIGHMORE %	YIELD % OF CHECK 4 LOC AVG %	4 LOCATION AVERAGE YIELD bu/a	4 LOCATION AVERAGE TWT lb/a
CHECK	----	85.0	36.7	100.0	100.0	91.3	34.6
MCPA am.	0.5	84.5	37.2	99.4	100.5	91.8	34.9
MCPA am.	1.0	88.8	37.0	104.5	99.3	90.7	34.8
2,4-D am.	0.5	84.2	37.5	99.1	93.4	85.3	34.5
2,4-D am.	1.0	85.3	38.0	100.4	83.7	76.4	34.0
BRONATE	.75	86.2	36.9	101.4	98.8	90.2	34.4
BRONATE	1.0	85.6	36.3	100.7	96.9	88.5	34.1
DICAMBA+MCPA am.	.125+.25	90.0	36.8	105.9	97.9	89.4	34.1
DICAMBA+MCPA am.	.25+.5	79.3	36.2	93.3	89.2	81.4	33.5
		NS					

Herbicidal injury varies with environmental conditions, therefore, several location-years are needed to show overall effects and interactions with variety, herbicide, and environment.

The Tri-state nursery which has advanced lines from North Dakota, South Dakota, and Minnesota is grown at Brookings, Watertown, Centerville, as well as the Highmore location. The South Dakota lines are increased and purified in the same year to insure enough seed for testing across the U.S.A and Canada.

SPRING WHEAT BREEDING

F. A. Cholick and Brad G. Farber

Two yield trials grown at the Highmore Station in 1990 were the Advanced Yield Trial (AYT) and the Elite Yield Trial (EYT). Both of these trials were also grown at 8 additional sites throughout the spring wheat production area. The AYT contains experimental lines developed by the spring wheat breeding program and check varieties. These experimental lines have demonstrated potential for becoming new varieties, but more data is needed before release can occur. The EYT was made up of material donated by Pioneer International and ia at a atage of variety development comparable to lines in the AYT. The AYT had 27 experimental lines plus checks and the EYT had 17 experimental lines plus checks. Planting and harvest dates were April 4 and July 23, respectively. The seeding rate was 28 seeds per square foot and the plots were fertilized for a 45 bu/A yield goal.

The average yield in 1990 was 40 bu/A which is approximately 40% greater than the long-term average for this site. Yields ranged from 46.8 to 28.7 bu/A. The top yielding checks were Bergen, Butte 86, Prospect, Sharp, and 2375. The long-term check, Chris, was the lowest yielding line. In the AYT, 9 experimental lines were in the top yielding group with the line SD 8071 being the highest yielder. In the EYT, 6 experimental lines were in the top yield group. In both nurseries the top yielding experimental lines equaled or exceeded the yield of the best check.

This site typically provides an excellent evaluation of test weight. In 1990, Highmore was the best site of all sites for differentiating test weight among the experimental lines. For both nurseries the average test weight was 57.5 lbs/bu with a range of 51.5 to 60.3 lbs/bu. Lines with very low test weights will be discarded from future testing because either the producer or the end-user of spring wheat cannot afford to use these lines if they become varieties. Low test weights affect the producer in two ways: 1) discounts from market price or 2) rejection at the elevator. The wheat miller is also negatively affected because of a reduction in flour extraction associated with low test weight.

The Highmore site adds essential data for the selection phase of variety development. Generally, the level of environmental stress is sufficient to differentiate the experimental lines and therefore helps determine the stability of future varietiea.

SMALL GRAIN TRIALS - CORN PERFORMANCE TESTING

J. J. Bonnemann

Four small grain trials, winter wheat, spring wheat, oats, and barley, were grown at the Central Substation during the 1990 crop year.

The yields in all the trials were from good to excellent. The test weight was good for the later maturity oats and much of the spring wheat. The winter wheat and barley were farther along in their growth stages and overall quality was affected more by the hot, dry wind and lack of timely, beneficial precipitation.

Additional yield and agronomic data for the Central Substation and all small grain trials in the state are found in EC 774 (rev.), 1991 Variety Recommendations, Small Grain. This publication is available from local county extension offices or the Bulletin Room, SDSU, Brookings, SD 57007.

1990 Oat Trial, CPT, Central Substation, Highmore, SD.

	Variety Means		
Variety Name	Yield, B/A	Test Wt.	Plant Hgt.
Newdak	104.7	36.1	32
Hamilton	97.1	34.7	33
Ogle	97.0	34.0	33
Don	96.6	37.8	30
Hazel	95.2	36.3	31
Dane	92.7	33.7	34
Horicon	89.3	32.6	34
Valley	87.2	34.8	31
Porter	84.8	34.7	32
Webster	84.2	35.5	33
Burnett	83.8	36.7	38
Premier	82.5	39.2	34
Settler	82.4	36.0	34
Hytest	82.1	38.7	38
Starter	76.3	38.5	32
Sandy	76.0	36.4	37
Wright	75.6	36.8	38
Moore	75.0	35.9	36
Kelly	72.7	37.5	35
M-120	72.3	32.7	40
Trucker	71.7	38.0	34
Steele	71.0	33.7	35
Means	84.2	35.8	33
LSD (.05)	3.3		
CV - %	6.7		

1990 Barley Trial, CPT, Central Substation, Highmore, SD.

Variety Name	Variety Means Yield, B/A	Test Wt.	Plant Hgt.
Gallatin	65.0	47.6	28
Excel	56.3	46.4	28
Azure	54.4	46.5	31
Hazen	52.9	44.5	29
Robust	52.7	46.6	31
81602	51.3	46.0	31
Morex	46.5	47.0	33
Bowman	27.9	50.7	26
Means	51.5	47.3	29
LSD (.05)	3.0		
CV - %	10.2		

1990 Spring Wheat Trial, CPT, Central Substation, Highmore, SD.

Variety Name	Variety Means Yield, B/A	Test Wt.	Plant Hgt.
Norseman	40.6	58.2	28
2375	40.4	60.2	31
Nordic	40.2	60.2	29
2369	38.7	60.9	30
Prospect	38.5	58.3	32
Grandin	38.4	59.9	33
Sharp	38.2	60.9	34
Celtic	38.1	59.7	32
Telemark	37.6	57.3	26
W2502	37.3	56.7	28
Bergen	36.8	59.3	28
W2501	36.5	55.9	28
Gus	36.4	60.4	32
Butte 86	36.4	60.3	33
Stoa	35.8	59.8	35
Fjeld	35.7	58.2	29
2370	35.6	60.5	31
Shield	35.6	57.4	33
Guard	35.4	59.9	29
Vance	34.1	56.9	31
Marshall	33.6	58.6	27
Amidon	32.9	58.4	39
Minnpro	31.5	57.8	29
Chris	29.0	57.6	38
Means	36.7	59.0	31
LSD (.05)	1.2		
CV - %	5.6		

1990 Winter Wheat Trial, CPT, Central Substation, Highmore, SD.

Variety Name	Variety Means Yield, B/A	Test Wt.	Plant Hgt.
Quantum 562	70.2	56.9	35
Karl	67.3	62.4	31
Colt	66.9	59.0	30
Brule	66.9	58.5	37
Bennett	66.7	61.3	36
Quantum 542	66.4	57.7	38
Norkan	65.6	60.2	35
Siouxland 89	65.5	59.5	38
TAM 107	65.5	58.0	35
Redland	65.5	58.9	35
Arapahoe	65.0	59.7	35
Abilene	64.1	59.1	31
Dawn	63.9	58.1	35
Quantum 549	63.2	57.0	36
Cody	62.9	59.3	37
Siouxland	62.6	59.1	37
Thunderbird	61.8	60.1	33
Centura	61.5	59.1	36
TAM 200	60.9	60.7	30
Sage	60.1	61.9	38
Seward	58.0	59.5	39
Norwin	57.3	57.9	39
Lancota	53.8	60.3	37
Scout 66	51.8	58.7	38
Agassiz	49.9	60.0	40
Roughrider	49.6	61.9	37
Norstar	44.5	58.0	42
Tibor	44.3	55.3	38
Means	60.5	59.4	36
LSD (.05)	N.S.		
CV - %	6.9		

WINTER WHEAT BREEDING

Jeff Gellner and Roy Schut

Approximately 700 seven-row plots and 250 one-row plots were grown at Highmore in the 1989-90 season. Winter survival was good. This differs with Onida and Pierpont which were abandoned due to winterkill. Leaf rust was prevalent, and lodging was noted in some varieties (Sage and Scout 66). The average yield and test weight of the atandard varieties was 60.5 bu/acre and 59.3 lb/bu, respectively. The top-five yielding cultivars and two SDSU advanced lines were:

	Yield bu/acre	Test Weight lb/bu
Karl	67	62
Colt	67	59
Brule	67	59
Bennett	67	61
Norkan	66	60
SD87128	52	60
SD87143	60	59

As you can see the SD lines did not do well. These lines did better at other locations in South Dakota, especially SD87143.

Several other advanced lines in the breeding yield trials performed much better. The yield data for the top-five and the check varieties (adjusted to the average yield of the standard varieties) was:

	Yield bu/acre	Test Weight lb/bu
SD88185	69	61
SD88253	66	60
SD87127	63	62
Siouxland	62	60
SD88201	61	60
SD88192	61	60
Rose	59	60
Arapahoe	58	59
Abilene	58	57

These lines will be tested in the standard variety yield trial next year. Three of these lines (SD88185, SD88201, and SD88192) have the same pedigree: Brule/Dawn. Both Brule and Dawn have been good varieties for South Dakota in the past.

WEED CONTROL

Leon J. Wrage, Paul O. Johnson and David A. Vos

Field evaluations as part of the W.E.E.D. Project are directed toward important weed problems for major crops in the area. The station has been the primary site for herbicide evaluation on winter wheat and grain sorghum.

Plots include labeled herbicide treatments and experimental products in final stages of evaluation. Tests in 1990 on winter wheat and grain sorghum provided crop tolerance data. Data from plots provide the basis for weed control information included in extension fact sheets and presented at meetings organized by extension agents.

Data are presented for tests listed below. Weed control is based on visual evaluation compared to the untreated check. Crop effects are rates on a visual scale (0 = no injury; 100 = complete kill). Assistance of station personnel is acknowledged.

Table 1. Winter Wheat Herbicide Tolerance Late Stage
Late tansy mustard treatments.
Table 2. Cheatgrass Control in Winter Wheat
Fall and spring herbicides.
Table 3. After Harvest Weed Control
Herbicides for residual control.
Table 4. Grain Sorghum Evaluation
Preplant and Preemergence Herbicides
Table 5. Grain Sorghum Postemerge Evaluation
Experimental and new labeled treatments.
Table 6. Grain Sorghum Postemerge Screening
Crop tolerance to early and late treatments.
Table 7. Soybean Herbicide Carryover
1990 wheat response to 1989 soybean herbicides.

Table 1. Winter Wheat Herbicide Tolerance Late Stage

Planting Date: 9/13/89
Applied: 5/23/90
Evaluated: 6/6/90
Soil: Clay loam; 3.5% OM; 6.3 pH

Precipitation: 1st week 0.25 inches
2nd week 0.90 inches

Weed: Tamu = Tansy mustard
VCRR: Visual Crop Response Rating

COMMENTS: Heavy weed density. Primary objectives were to evaluate control of advanced tansy mustard and the effect on the crop. Crop yield response to weed control was limited, because the effect of competition was already determined. Favorable conditions.

Treatment	lb/A act.	% Tamu 6/6/90	% VCRR 6/6/90	Yield Bu/A	Test Wt.
Check	----	0	0	43.8	59.3
2,4-D ester	.5	42	13	44.3	59.2
2,4-D ester	1	55	28	43.2	59.6
Ally+2,4-D ester+X-77	.004+.25+.25%	48	0	42.8	59.1
Ally+2,4-D ester+X-77	.0078+.25+.25%	54	13	45.4	58.0
Ally+MCPA ester+X-77	.004+.25+.25%	60	0	47.8	59.3
Express+2,4-D ester+X-77	.0117+.25+.25%	42	0	37.8	58.3
Express+2,4-D ester+X-77	.0234+.25+.25%	50	0	43.0	59.8
Bronate	.75	82	0	37.0	61.6
Bronate	1.5	88	18	38.2	60.5
Banvel+2,4-D amine	.125+.25	25	13	37.3	58.8
Banvel+2,4-D amine	.25+.25	50	28	31.2	58.0
Curtail	.595	10	0	39.6	59.1
Harmony Extra+ 2,4-D ester+X-77	.0234+.25+.25%	45	5	36.8	60.1
Harmony Extra+ 2,4-D ester+X-77	.0468+.25+.25%	54	8	43.3	59.3
LSD (.05)		26	12	10.6	1.9

Table 2. Cheatgrass Control in Winter Wheat

Planting Date: 9/13/89
PPI&PRE: 9/13/89
FPOS: 11/2/89
Evaluated: 6/6/90
Soil: Clay loam; 3.5% OM; 6.3 pH

Precipitation: 1st week 0.00 inches
2nd week 1.72 inches

Weeds: Tamu = Tansy mustard
Dobr = Downy brome
VCRR: Visual Crop Response Rating

COMMENTS: Downy brome somewhat variable. Crop yield response to downy brome and tansy mustard control. Visual crop response rating reflects stunting and delay in maturity.

Treatment	lb/A act.	% Tamu 6/6/90	% Dobr 6/6/90	% VCRR 6/6/90	Yield Bu/A	Test Wt.
PREPLANT INCORPORATED						
Check	----	0	0	0.0	30.4	57.7
Treflan	.75	0	20	5.0	33.4	58.2
Hoelon	1.12	10	0	0.0	28.5	56.8
Treflan 10G	.75	10	40	0.0	27.3	55.0
Far-go	1.5	0	55	0.0	28.5	58.3
PREEMERGENCE						
Tycor	1	54	68	15.0	34.7	50.3
FALL POSTEMERGENCE						
Tycor	1	72	89	17.5	46.8	54.8
Tycor	1.25	86	78	20.0	46.1	52.4
Tycor+28% N	1+1 gal	79	80	0.0	52.8	55.5
Tycor+Sen/Lex	1+.125	94	90	20.0	51.2	54.9
Tycor+Sen/Lex	1.25+.25	96	94	45.0	43.2	53.3
Sen/Lex	.5	94	89	57.5	36.2	53.3
LSD (.05)		21	23	16.9	13.7	4.6

Table 3. After Harvest Weed Control

Applied: 9/13/89
Evaluated: 7/31/90
Soil: Clay loam; 3.5% OM; 6.3 pH
Precipitation:
1st week 0.00 inches
2nd week 2.30 inches

Weeds: Grft = Green foxtail
Ruth = Russian thistle

COMMENTS: Treatments applied 9/13/89 to wheat stubble. No tillage prior to 1990 evaluations. Command plus atrazine provided good control of grass and broadleaf weeds.

Treatment	lb/A act.	% Grft 7/31/90	% Ruth 7/31/90
Check	----	0	0
Atrazine	1	35	84
Atrazine	2	45	88
Command	1	88	40
Command+atrazine	.75+1	88	96
Pursuit	.063	45	40
Bladex	2	10	78
Sencor/Lexone	.5	20	30
Scepter	.125	15	15
LSD (.05)		27	26

Table 4. Grain Sorghum Evaluation - Preplant and Preemergence Herbicides

Planting Date: 6/6/90
SPPI&PRE: 6/6/90
Evaluated: 9/13/90
Soil: Clay loam; 3.1% OM; 6.3 pH
COMMENTS: Very light weed pressure. No crop effects were noted. Excellent growing conditions.

Precipitation: 1st week 0.60 inches
2nd week 1.70 inches
Weeds: Yeft = Yellow foxtail
Rrpw = Redroot pigweed

Treatment	lb/A act.	% Yeft 9/13/90	% Rrpw 9/13/90	Yield bu/acre 10/23/90
SHALLOW PREPLANT INCORPORATED				
Check	---	0	0	122
Atrazine	2.5	98	98	109
Lasso+atrazine	3+1	98	98	130
Dual+atrazine	2.5+1	98	98	130
Lasso	3	98	98	137
Dual	2.5	98	94	140
PREEMERGENCE				
Lasso+atrazine	2+1	98	98	129
Dual+atrazine	2+1	98	98	117
Lasso	2.5	98	98	141
Dual	2	98	98	123
Ramrod	5	98	82	129
Atrazine+Ramrod	1+4	98	98	131
Ramrod+Bladex	4+1.5	98	98	96
LSD (.05)		--	4	30

Table 5. Grain Sorghum Postemerge Evaluation

Planting Date: 6/6/90
PRE: 6/6/90
POST: 7/10/90
Evaluated: 9/13/90
Soil: Clay loam; 3.1% OM; 6.3 pH

Precipitation: 1st week 0.60 inches
2nd week 1.70 inches

Weeds: Yeft = Yellow foxtail
Rrpw = Redroot pigweed
VCRR: Visual Crop Response Rating

COMMENTS: Light yellow foxtail and moderate redroot pigweed density. Some stand and yield reduction noted for preemergence treatments. Visual crop response repreaents delayed maturity. Significant yield increase from weed control.

Treatment	lb/A act.	% VCRR 9/13	% Yeft 9/13	% Rrpw 9/13	% Stand Reduction 9/13	Yield Bu/A
PREEMERGENCE & POSTEMERGENCE						
Check	----	0.0	0	0	0.0	79.7
Ramrod&Tough+atrazine	3&.45+.6	1.7	88	98	0.0	98.0
Lasso&Tough+atrazine	3&.45+.6	6.7	95	98	0.0	103.4
Lasso&Tough+atrazine	3&.9+1	0.0	98	98	0.0	97.9
Ramrod&Laddok+COC	4&1.04+1 qt	0.0	93	98	0.0	110.9
Ramrod&Laddok+Dash	4&1.04+1 qt	0.0	90	98	0.0	105.8
Ramrod&Laddok+28% N	4&1.04+1 gal	0.0	93	98	0.0	108.1
Ramrod&Laddok+ Dash+28% N	4&1.04+1 qt+1 gal	1.7	89	98	0.0	104.0
LSD (.05)		NS	7	2	---	16.3

Table 6. Grain Sorghum Postemerge Screening

Planting Date: 6/6/90
PRE: 6/6/90
POST: 7/10/90
LPOS: 7/31/90
Evaluated: 9/13/90
Soil: Clay loam; 3.1% OM; 6.3 pH

Precipitation: 1st week 0.60 inches
2nd week 1.70 inches

Weed: Rrpw = Redroot pigweed
VCRR: Visual Crop Response Rating

COMMENTS: Very light weed pressure. AgriPro 910 C sorghum. Crop tolerance primary objective. Post treatments applied 34 days after planting. Late post 12-14 inch. Early crop response delayed heading; late crop response head sterility. Yield differences respond to herbicide treatment.

Treatment	lb/A act.	% VCRR 8/27	% Rrpw 9/13	% VCRR 9/13	Yield bu/A	3 Year Ave. % VCRR	3 Year Ave. Yield bu/A
POSTEMERGENCE							
Banvel+atrazine	.5+1	68.3	98	50.0	44.0	1.7	42.2
PREEMERGENCE & POSTEMERGENCE							
Ramrod&2,4-D ester	3&.25	3.3	98	8.3	102.0	0.6	62.3
Ramrod&2,4-D ester	3&.5	3.3	98	13.3	107.6	3.6	64.4
Ramrod&2,4-D amine	3&.5	1.7	98	3.3	122.0	0.1	70.2
Ramrod&Banvel	3&.12	11.7	95	8.3	97.0	0.4	63.4
Ramrod&Banvel	3&.25	65.0	93	40.0	56.9	2.4	47.7
Ramrod&Banvel+X-77	3&.25+.75%	63.3	98	43.3	56.6	1.9	49.9
Ramrod&Buctril	3&.375	1.7	98	0.0	108.8	0.0	65.1
Ramrod&Buctril+ atrazine	3&.25+.5	3.3	95	0.0	103.9	0.0	62.6
Ramrod&Buctril+ atrazine	3&.375+1	3.3	98	1.7	118.8	0.4	69.9
PREEMERGENCE & LATE POSTEMERGENCE							
Ramrod&2,4-D ester	3&.5	5.0	95	15.0	95.4	0.5	63.3
Ramrod&2,4-D amine	3&.5	0.0	95	10.0	98.8	0.3	63.1
Ramrod&Banvel	3&.25	81.7	89	60.0	23.2	4.4	26.3
Ramrod&Banvel+X-77	3&.25+.75%	86.7	95	65.0	23.5	6.3	22.4
Ramrod&Buctril	3&.375	11.7	94	5.0	88.3	0.2	60.5
Check	----	0.0	0	0.0	79.7	---	----
LSD (.05)		15.0	6	12.8	17.2	1.4	15.3

Table 7. Soybean Herbicide Carryover

Applied: PPI: 5/25/89 Precipitation: 1989 Jun-Oct 7.84 inches
POST: 6/25/89
Soil: Clay loam; 3.6% OM; 6.3 pH
COMMENTS: Normal use and double rates of herbicides were applied in 1989 to soybeans. Evaluations are for wheat planted over the soybean stubble. No herbicides were applied to the plot area in 1990. Yields and stand loss show the effects of herbicide carryover on wheat under extremely dry conditions. Data for wheat include both winter and spring wheat. No differential response was noted between types.

Treatment	lb/A act.	% Stand Loss 6/6/90	Wheat Yield Bu/A	Test Weight lb/bu
PREPLANT INCORPORATED				
Check	----	0.0	41.3	53.4
Treflan	1	32.5	32.8	51.0
Treflan	2	85.0	18.8	51.5
Sonalan	1	0.0	36.8	55.7
Sonalan	2	27.5	38.9	56.7
Prowl	1.25	5.0	38.9	54.8
Prowl	2.5	42.5	27.6	50.8
POSTEMERGENCE				
Classic+X-77	.0117+.125%	0.0	40.3	57.5
Classic+X-77	.0234+.25%	0.0	40.8	58.6
PREPLANT INCORPORATED				
Pursuit+X-77	.063+.25%	57.5	22.4	54.0
Pursuit+X-77	.126+.5%	77.5	14.8	53.1
Scepter+X-77	.125+.125%	45.0	13.2	58.6
Scepter+X-77	.25+.25%	90.0	3.5	51.6
LSD (.05)		9.9	13.9	5.9

FIELD EVALUATION OF WOODY PLANT MATERIALS

Russell J. Haas - Plant Materials Specialist - SCS

The field evaluation site at Highmore, South Dakota, continues to be the "garden spot" of the 13 field evaluation planting sites located in North Dakota, South Dakota, and Minnesota. The excellent maintenance is reflected in the good survival and rate of growth of the trees.

Performance data from this site has been used to support the cooperative release of several tree and shrub cultivars in the past few years. The following cultivars have been released in cooperation with the Soil Conservation Service and the Agricultural Experiment Stations in North Dakota, South Dakota, and Minnesota:

'Cardan' green ash (1979)
'Oahe' hackberry (1982)
'Scarlet' Mongolian cherry (1984)
'Sakakawea' silver buffaloberry (1984)
'Centennial' cotoneaster (1987)
'McDermand' ussurian pear (1990)

In 1991, ND-20 Arnold hawthorn will be released as 'Homestead' hawthorn.

These cultivars are now in large scale production and have been well accepted and extensively used for field and/or farmstead windbreaks, wildlife, recreation, and highway rights of way plantings in the Dakotas and Minnesota. Some of these cultivars are being tested for adaptation in Montana, Wyoming, Colorado, Kansas, Nebraska, Missouri, Iowa, and on east to the coast.

Promising accessions being considered for release in the near future are:

ND-629 amur maple (1991)
SD-131 mayday (1991)
ND-83 late lilac (1992)
ND-283 Russian almond (1992)
ND-1879 honeylocust (1993)
ND-11 amur honeysuckle (1995)
ND-1134 plum (1995)

1990 ACTIVITIES

April 19 - Survival and winter injury data was recorded on the accessions planted in 1987-89. Survival of most species was very good. Replacements were made of a few trees of accessions planted 1987-89.

Seventeen new accessions were added. They include eight new selections of poplar hybrids from Dr. Richard Cunningham, USDA, ARS, Mandan, ND; two selections of 'Austree' willow; and eight accessions of small trees and shrubs from the Plant Materials Centers at Manhattan Kansas, Elsberry Missouri, Big Flats New York and Bismarck North Dakota. All trees planted were given supplemental water due to dry soil conditions at time of planting.

Minor pruning was done to remove damaged branches, basal sprouts, and to develop proper form. Several accessions had been performing poorly for several years and did not show any potential for windbreak purposes. These accessions were marked and removed during the summer:

ND-1843	Russian olive	ND-573	Cathay walnut
ND-1844	Russian olive	ND-548	manchurian walnut
ND-364	Russian olive	ND-1757	plum
ND-541	Russian olive	ND-1336	chokecherry
ND-1735	Russian olive	ND-1349	chokecherry
ND-1756	Russian olive	ND-81	sloe
ND-1170	mulberry	ND-547	butternut

September 17 - Survival and growth measurements were recorded on the accessions planted this spring and 1987-1989. Most species were in good condition. Herbicide damage was noted on green ash accessions and wind damage on several apricot accessions. ND-11 amur honeysuckle appeared to be loosing vigor due to drought stress. ND-1879 honey locust is also under stress. This could be related to the sudden lack of wind protection previously provided by the large Russian olive trees on the north side. Survival of trees planted this spring is excellent. Overall survival at this site this year was better than at any other site.

Several new accessions appear to be performing quite well and should be considered for further testing in on farm field plantings:

Accession/Cultivar	Origin/Source
'Red Wing' autumn olive	USDA, SCS, PMC, East Lansing, Michigan
'Cardinal' autumn olive	USDA, SCS, PMC, Big Flats, New York
'Freedom' honeysuckle	Univ. of Minnesota, St Paul, Minnesota
'Meadow Lark' forsythia	North Dakota State University, Fargo, ND

Two cultivars have proven not to be winter hardy and should not be recommended for planting in the northern two-thirds of South Dakota.

Accession/Cultivar	Origin
'Cling-Red' amur honeysuckle	USDA, SCS, PMC, Elsberry, Missouri
'Rem-Red' amur honeysuckle	USDA, SCS, PMC, Big Flats, New York