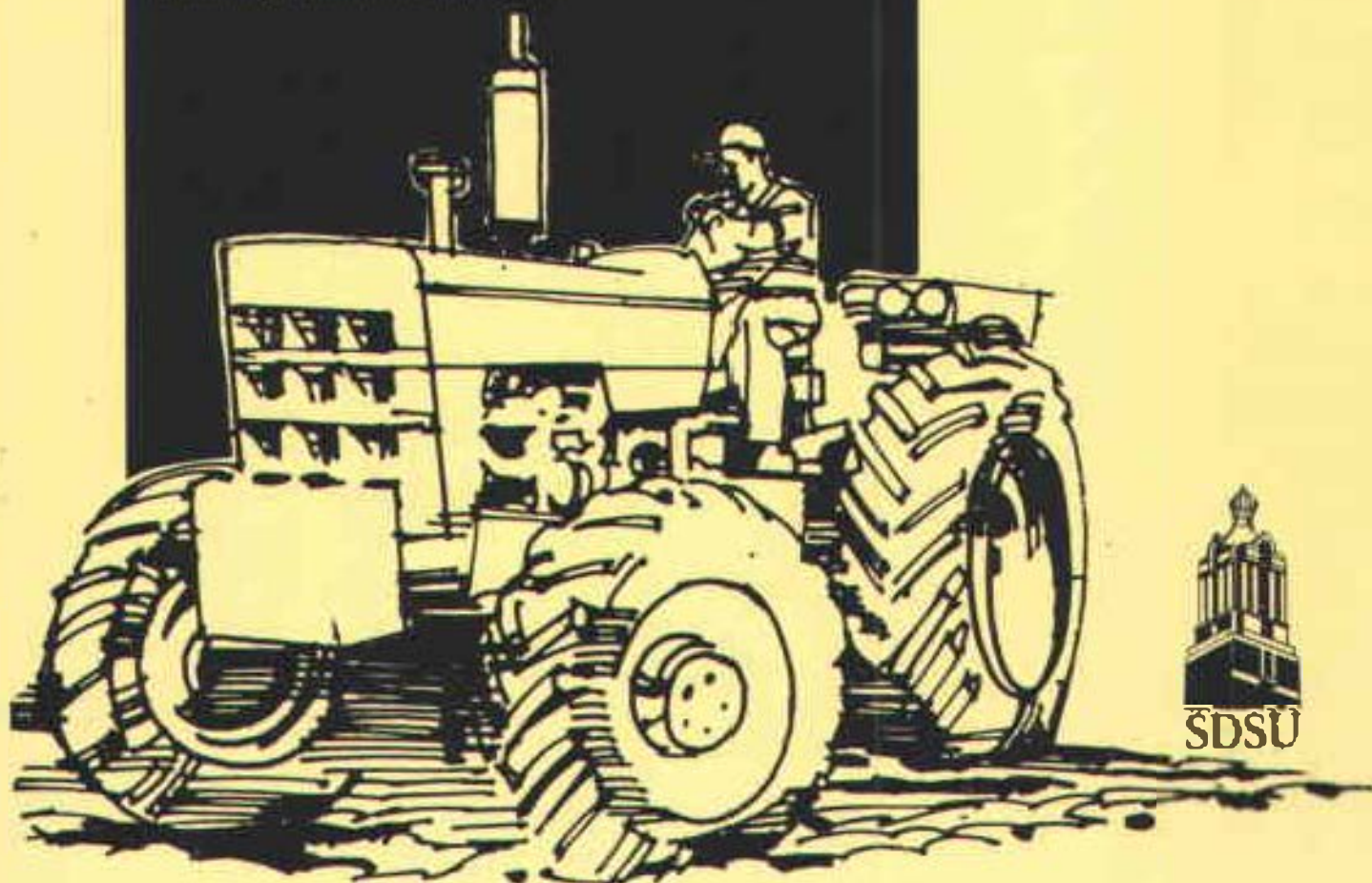


Plant Science Pamphlet No. 84  
ANNUAL PROGRESS REPORT  
February 1996

# PROGRESS REPORT 1995

**Central Crops and Soils  
Research Station**  
Highmore, South Dakota

Plant Science Department  
South Dakota State University  
Brookings, South Dakota 57007



**Z**→



N & S Roads 24', E & W Roads 20'  
All blocks 175' x 100' except Block 1000



## TABLE OF CONTENTS

	<b>Page</b>
Advisory Board.....	2
Introduction.....	3
Temperatures and Precipitation.....	5
Alfalfa Cultivar Yield Test.....	6
Spring Wheat Breeding.....	8
Winter Wheat Breeding.....	10
Effect of Pollen Source on Grain Yield in Hybrid Maize.....	13
Effect of Population x Maturity Group Interactions on the Yield of Hybrid Maize.....	14
Correlation of Phosphorous Soil Tests for Winter Wheat.....	15
Spoke Injection of Fertilizer Phosphorous for Grasses.....	21
Effect of Added Chloride to Winter Wheat.....	24
Weed Control Research.....	28
Evaluation of Cheatgrass Control in Winter Wheat.....	29
No-Till Sunflower Evaluation.....	30
No-Till Corn and Sorghum Evaluation.....	31
Field Evaluation of Woody Plant Materials.....	34

## **PROGRESS REPORT, 1995**

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 1995 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 warrantee 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 1995 results from SDSU herbicide demonstrations is available as Extension Circular 678 from your County Agent or SDSU.

**South Dakota Agricultural Experiment Station  
Brookings, South Dakota 57007**

**Dr. David Bryant, Dean**

**Dr. Fred Cholick, Director  
Agric. Exp. Sta.**

1995  
CENTRAL SUBSTATION ADVISORY BOARD  
(All advisors appointed to a 4-year term)

NAME	POSITION	ADDRESS	PHONE	COUNTY	TERM
Greg Yapp	SD St. Office	200 4th St SW, Huron 57350	353-1830		SCS
Kevin Haber	Extension Agent	Box 36, Huron 57350	352-8559	Beadle	
Scott Ingel		RR 1, Cavour 57324	352-0438	Beadle	1996-1998
Gerald Syring		Box 589, Faulkton	598-4294	Faulk	1993-1996
Keith Melius	(alternate)	HC 1 Box 47, Miranda 57438	598-4315	Faulk	
Mike Tyrrell	Extension Agent	Box 169, Courthouse, Miller 57362	853-2738	Hand	
Ken Wonnemberg	Sec., Ext. Agent	Courthouse, Pierre 57501	773-5550	Hughes	
Brad Bonhorst	Chairman	30910 SD Hwy 34, Pierre 57501	224-1156	Hughes	1995-1998
Lyle Stewart	(alternate)	30213 199th St, Blunt 57522	224-5682	Hughes	1992-1995
Jerry Johnson	Extension Agent	Box 402, Ext. Bldg, Highmore 57345	852-2515	Hyde	
Randy Hague		Highmore 57345	852-2874	Hyde	1993-1996
Jake Vilhauer	(alternate)	RR, Highmore 57345	852-2090	Hyde	1992-1995
Marcia Blecha	Extension Agent	Box 366, Wess. Springs 57382	539-9471	Jerauld	
Bruce Eilers		22007 373rd Ave., Wess. Springs 57382	539-1232	Jerauld	1993-1996
Larry Nagel		HCR 3 Box 20, Gettysburg 57442	765-9427	Potter	1993-1996
Phil Hamburger		HC 78 Box 64A, Seneca 57473	436-6201	Potter	1994-1997
Paul Weeldreyer	Extension Agent	Box 265, Onida 57564	258-2334	Sully	
Todd Yackley		HC 2 Box 614, Onida 57564	264-5465	Sully	1992-1996
Randy Johnson	(alternate)	HCR 1 Box 17, Harrold 57536	973-2419	Sully	1994-1997
Nilo Reber	Dist. Conserv.	Box 484, Highmore 57345	852-2221		SCS
Mike Volek	Central Res. Sta.	PO Box 91, Highmore 57345	852-2829		SDSU
Bob Davis	Ext. Supervisor	Ag Hall 136, Brookings 57007	688-5132		SDSU
Dale Reeves	Acting Head, PISci	Ag Hall 219, Brookings 57007	688-5123		SDSU
Brad Farber	Cen. Res. Mgr	Box 2207A, Brookings 57007	688-6139		SDSU
Fred Cholick	Dir. Exp. Sta.	Box 2207 Brookings 57007	688-4149		SDSU

## Introduction.....Brad G. Farber

As the centennial year (1999) of the Central-Crops and Soils Research Station approaches, it is interesting to look back at decades of weather observations recorded at the research farm. A publication by W. Spuhler, W. F. Lytle, and D. Moe summarizing continuous data from 1904 to 1968, notes that, "The annual precipitation averages 17.84 inches of which 14.01 inches, or 79% on the average, falls during the growing season (April-September)". This 64 year period includes more than ten years where average annual rainfall was less than 13.5 inches total. The driest year on record was 1936 with 9.85 inches recorded. Several of the driest years were during the "dirty thirties" with 1931, 1933, and 1934 all receiving less than 13.2 inches of precipitation.

One of the most obvious conclusions that can be drawn from the data is that Highmore (and probably most of South Dakota) is a land of extremes - extremely dry, extremely wet, extremely hot, extremely cold, extremely windy, and the list could go on. When several of these extreme conditions occur at the same time (such as an extremely hot, dry, windy day) the stresses are compounded and raising crops and livestock can become very difficult. Even though we list "averages" and "normal" precipitation and temperature values, there are very few "average" or "normal" years in South Dakota. The 1995 rainfall amount at Highmore is a good example of this. Precipitation at Highmore in 1995 was more than 13 inches greater than the 30 year period from 1961 to 1990 and set a new record of 33.04 inches for the research farm (Table 2). Other high rainfall years include: 1993 (27.21"), 1986 (27.91"), 1957 (28.80") and 1920 (27.31"). The past five years from 1991 to 1995 have averaged 26 inches per year and collectively are the wettest period on record. Combining these five years with the prior 30 year average now gives us a 35 year "annual" precipitation value of 20.57 inches per year. This is nearly 3 inches per year more than the value indicated in the 1968 summary.

What conclusions can be drawn from this information? Is the central area of South Dakota being affected by global warming as some scientists and journalists would lead us to believe? Or is this 'normal' variation in weather patterns that has been a part of farming and ranching since South Dakota was settled? I am inclined to believe that these are fluctuations in weather patterns that have occurred in past centuries and likely will occur again in the future. However, the collection of long-term climatic data at the research farm while interesting, also may provide a computer database on which future cropping decisions, inputs, potential harvest results, and a myriad of other information could be based.

\*\*\*\*\*

I would like to take this opportunity to publicly thank Mike Volek for his contributions to the farmers and ranchers of South Dakota during his 25 years of service to South Dakota State University. Mike began working at the Highmore Research Farm on March 1, 1971 as an Ag Research Technician. He has served in this capacity under five different farm managers including Frank Holmes, Harry Geise, Quentin Kingsley, Paul Weeldreyer, and currently Brad Farber.

Mike is a dedicated, hard-working individual who gets a job done no



matter what it takes. The Highmore Research Farm, through Mike's time, effort and leadership, is the best cared for research farm in South Dakota and most likely the region. The USDA Plant Materials Center in Bismarck, ND, annually call their evaluation site at the Highmore Research Farm "the garden spot" of all their 13 testing locations in the north-central region do to the weed-free manner in which it is kept.

Mike manages the day-to-day activities of the research farm, coordinates summer hourly workers, performs all routine maintenance of equipment and farm-site buildings, and has recorded data for the National Weather Service for the past 25 years. He also serves the community of Highmore as an Emergency Medical Technician and volunteer fireman and part-time police officer. Mike and his wife Dixie live at the research farm with their two daughters, Shanda and Sherise.

\*\*\*\*\*

Planting at the Highmore Research Farm was severely hampered by the previously discussed 33.04 inches of rain in 1995. Nearly 15 inches of the total amount fell in the months of April and May, preventing planting of small grains, delaying planting of row crops and flooding areas of research plots planted to winter wheat and other crops. Accordingly, the Crop Performance Testing program, Oat Research program, Spring Wheat breeding project and Soybean research project were unable to plant any of their research plots in 1995. Those projects that were able to plant and harvest plots on higher elevations of the farm have submitted reports for inclusion in this publication.

\*\*\*\*\*

The annual twilight tour scheduled in late June was also cancelled in 1995 due to the wet conditions, lack of research plots to tour, and small size of crops that eventually were planted.

\*\*\*\*\*

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.

Address correspondence to:

Dr. Fred Cholick, Director  
Agricultural Experiment Station  
South Dakota State University  
Brookings, SD 57007  
(605) 688-4149

Brad Farber, Research Farm Manager  
Box 2207A  
South Dakota State University  
Brookings, SD 57007  
(605) 688-6139

Special thanks to Nancy Kleinjan for her assistance in preparing this report.

Table 1. Temperatures at the Central Research Farm - 1995.

Month	1995 Average Temperatures <sup>a</sup>		Average	Normal <sup>b</sup>	Departure from normal
	Max.	Min.			
			°F		
January	24.8	9.1	16.9	14.3	+2.6
February	34.8	13.2	24.0	20.6	+3.4
March	41.1	21.9	31.5	32.0	-0.5
April	47.1	28.5	37.8	46.5	-8.7
May	63.8	43.4	53.6	57.9	-4.3
June	76.4	55.6	66.0	67.7	-1.7
July	85.7	59.5	72.6	74.5	-1.9
August	87.0	62.4	74.7	72.6	+2.1
September	73.3	46.3	59.8	61.8	-2.0
October	57.8	35.4	46.6	49.6	-3.0
November	39.3	19.5	29.4	32.6	-3.2
December	29.2	12.6	20.9	18.5	+2.4

<sup>a</sup> Calculated from daily observations.

<sup>b</sup> 30 year average (1961-1990).

Table 2. Precipitation at the Central Research Farm - 1995.

Month	1995		Departure from norm	Greatest	Date
	Precipitation	Normal <sup>a</sup>		amount	
			inches		
January	0.25	0.33	-0.08	0.15	12
February	0.20	0.49	-0.29	0.15	15
March	1.80	1.25	+0.55	0.60	27
April	9.08	2.32	+6.76	2.30	10
May	5.87	2.77	+3.10	1.25	13
June	2.67	3.19	-0.52	0.80	10
July	2.25	3.01	-0.76	1.50	14
August	4.23	2.32	+1.91	1.88	5
September	0.75	1.65	-0.90	0.70	5
October	5.34	1.35	+3.99	1.25	5
November	0.60	0.57	+0.03	0.30	26
December	T	0.42	-0.42	T	22
TOTAL	33.04	19.67	13.37		

<sup>a</sup> 30 year average (1961-1990).



## ALFALFA CULTIVAR YIELD TEST

K.D. Kephart, R. Bortnem, S. Selman, and A. Boe

One alfalfa cultivar yield experiment was conducted at the Central station during 1995. This study was planted May 11, 1994 and has 24 entries. Most of the alfalfa cultivars were entered by seed companies, whereas other entries were entered by plant breeders at SDSU other universities. Check entries were also included as a consistent baseline among the alfalfa variety trials in the state. The check entries are >Vernal=, >Riley=, >Baker=, and >Saranac AR=. This test was conducted to determine yield performance of alfalfa cultivars and experimental lines for use in Central South Dakota.

Four harvests were obtained from this study during 1995. Of our five locations, this was the only site where we obtained four harvests. The first harvest was delayed by about 1 week because of cool wet weather during spring of 1995. Average four-cut total yield in 1995 was 6.81 T/A; however, no significant differences were detected among cultivars for all four harvests (Table 1). Average yields for the three harvests in 1995 ranged from 1.07 T/A for the fourth harvest to 2.53 T/A for the first harvest. Yields for the public cultivars Saranac AR, Riley, and Baker ranked near the bottom.

An important role of the South Dakota Alfalfa Cultivar Yield Test is to evaluate lines that are in experimental stages of breeding programs. Companies and universities often enter promising alfalfa lines to test their suitability to stressful conditions in South Dakota. There are 4 experimental entries in the current experiment at the NE station. Results for experimental lines must be interpreted with caution. Seed for these lines are in early generations of the seed production process and natural inbreeding depression is expected as these lines are advanced to seed production stages. In essence, commercial seed derived from experimental lines may not have the same yield potential that was observed in a state variety trial.

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

Table 1. Forage yield of 24 alfalfa cultivars planted May 11, 1994, at the Central Crops and Soils Research Station, Highmore, SD.

Cultivar	1995					% of 4-Cut Total
	Cut 1	Cut 2	Cut 3	Cut 4	4-Cut	
	6-Jun	10-Jul	16-Aug	29-Sep	Total	
	tons DM / acre ---					- % -
Magnum III	2.70	1.42	2.06	1.15	7.33	109
620	2.74	1.43	1.99	1.15	7.31	107
Magnum III-Wet	2.78	1.42	1.89	1.00	7.09	105
ICI 630	2.61	1.45	1.92	1.17	7.15	105
Proof	2.60	1.41	1.55	1.11	7.07	104
Magnum IV	2.80	1.33	1.85	1.08	7.06	104
ICI 631	2.45	1.40	1.93	1.28	7.06	104
ICI 645	2.51	1.39	1.98	1.19	7.06	104
Evolution	2.63	1.38	1.96	1.08	7.06	104
3452-ML	2.61	1.43	1.96	1.05	7.05	104
Legendairy	2.61	1.33	1.98	1.10	7.02	103
Vernal	2.53	1.42	1.83	1.05	6.82	100
MS9304 (experimental)	2.55	1.36	1.78	1.03	6.72	99
DK 122	2.50	1.32	1.81	1.07	6.71	99
MS9301 (experimental)	2.46	1.35	1.81	1.07	6.69	98
91-12 (experimental entry)	2.56	1.26	1.82	1.05	6.69	98
Saranac AR	2.47	1.33	1.76	1.03	6.60	97
Flagship 75	2.53	1.26	1.79	0.96	6.54	96
Avalanche	2.36	1.35	1.78	1.00	6.49	95
PC431 (experimental entry)	2.28	1.36	1.78	1.06	6.47	95
Defiant	2.45	1.30	1.75	0.96	6.46	95
Baker	2.39	1.27	1.67	0.97	6.29	92
Spredor 3	2.42	1.27	1.65	0.93	6.26	92
Riley	2.26	1.16	1.73	1.01	6.16	90
AVERAGE	2.53	1.35	1.85	1.07	6.81	
Maturity <sup>a</sup>	47	39	53	39		
CV (%)	10.1	9.1	10.7	12.2	8.5	
LSD (0.05)	NS <sup>c</sup>	NS	NS	NS	NS	

- (a) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly
- (b) Kalu and Fick (1983) maturity index, mean stage by count.
- (c) Yields among cultivars are not statistically different at the 0.05 level of probability.

## SPRING WHEAT BREEDING

Jackie Rudd and Brad Farber

The Highmore station is normally a site for our Advanced Yield Trial. Due to a wet spring we were only able to plant 5 sites in 1995. Highmore and Brentford were just too wet for too long and were not planted. The Advanced Yield Trial is made up of experimental lines that have completed at least 2 years of extensive testing and have all of the characteristics needed to become a new variety. We include the most widely grown varieties (Sharp, Butte 86, 2375, and Prospect) as checks. Averaged across all locations in 1995, the checks were all considerably lower yielding than the experimental lines. A portion of the data is shown in the table at the bottom of this page.

Two new spring wheat varieties from the breeding program will soon be available to producers. 'Russ', released in 1995 is a Hessian fly resistant line that is similar to Butte 86 in height and appearance and is 1 or 2 days later maturity. Russ was named in honor of Russel Hansen, a Spink County farmer who was a prominent supporter of SDSU research and grew yield trials for the breeding program until his death in 1993. SD0010 has been approved for 1996 release but is not named yet. It is an early semi-dwarf line that was developed by Pioneer Hi-Bred International. Both of these lines have excellent yield potential and wide adaptation. Russ and SD0010 have both averaged 2 bushels per acre greater grain yield than Butte 86 with a similar test weight and protein content. SD3156 is being increased with the intent to release it in 1997. It is 1 to 2 days earlier than Butte 86 with a better yield and test weight.



# SDSU Spring Wheat Breeding 1995 Advanced Yield Trial

Rank	Name	Yield (bu/a)					Day County	Average	TW lb/bu	Heading days	Ht cm
		Brookings	Groton	Watertown	Selby						
1	SD8089 <sup>(98)</sup>	59.1	72.0*	60.9*	46.9*	58.7		59.5*	59.7	177	91
2	SD8108	55.7	70.5*	53.6	42.6	62.5*		57.0	60.7	176	89
3	SD8088	59.6	59.9	58.7*	47.9*	58.5		56.9	59.8	177	89
4	SD3156 <sup>(97)</sup>	51.5	71.9*	55.7	46.1*	58.8		56.8	60.2	175	82
5	SD3225	62.8*	62.9	56.2	44.2*	57.7		56.8	60.3	178	89
6	SD0010 <sup>96</sup>	56.3	65.5	55.3	45.1*	58.1		56.1	59.9	176	79
7	SD3219	53.0	64.1	51.3	45.4*	66.3*		56.0	60.8	176	84
8	SD3249 <sup>(98)</sup>	53.5	65.3	56.5	44.8*	58.8		55.8	62.4	175	90
9	SD3161	53.4	66.4	55.5	45.4*	58.0		55.7	59.9	176	82
10	SD3248	59.9	66.5	51.3	42.8	56.0		55.3	61.4	176	89
11	SD3236 <sup>(98)</sup>	52.3	68.2*	54.3	44.0*	56.6		55.1	60.4	174	86
12	SD3186	54.1	65.3	53.2	44.6*	57.3		54.9	60.5	176	92
13	RUSS <sup>95</sup>	57.2	70.1*	55.2	41.4	50.3		54.8	60.0	177	87
27	BUTTE 86	49.8	67.3*	52.1	37.2	51.6		51.6	59.3	176	86
32	2375	51.5	54.5	49.9	40.9	53.4		50.0	60.0	178	76
34	SHARP	52.9	61.7	45.5	34.8	42.2		47.4	58.8	176	87
35	PROSPECT	47.8	57.7	49.0	35.3	46.9		47.3	59.2	178	83
36	CHRIS	38.3	42.4	38.8	27.8	29.7		35.4	57.9	179	98
Mean		53.0	64.3	52.2	40.9	54.2		52.9	60.1	176	85
LSD (.05)		2.2	5.0	3.1	4.1	5.0		1.8			
C.V. (%)		2.5	4.8	3.7	6.2	5.6		4.8			

## WINTER WHEAT BREEDING AND GENETICS

Scott D. Haley and Roy A. Schut

The Winter Wheat Breeding and Genetics Program utilizes the Highmore Research Station primarily for testing of early-generation bulk-breeding populations and evaluation of advanced-generation lines developed during the course of the breeding process. The breeding program conducts research at several other sites throughout South Dakota (Brookings, Watertown, Selby, Bison, Ideal, Wall, and the Dakota Lakes Research Station near Pierre), for both early-generation selection and determination of the potential of experimental lines for cultivar release.

The winter wheat testing conducted at the Highmore Research Station during 1995 included:

- i) The Crops Performance Testing (CPT) Variety Trial, under the overall coordination of Bob Hall (SDSU, Crops Performance Testing Program). The CPT Variety Trial included 35 entries, of which 26 were previously released varieties (including new releases from other states), 5 were elite SDSU experimental lines, and 4 were experimental lines from Nebraska. This nursery was also grown at 13 other sites in South Dakota. Prior to cultivar release, promising elite lines must be grown in the CPT nursery for three years to accurately measure the potential performance across a range of environmental conditions;
- ii) Advanced-generation experimental lines in the South Dakota Advanced Yield Trial (AYT). This nursery included 45 entries (33 SDSU experimental lines and 12 checks) and is grown at eight other sites in South Dakota and one site in Nebraska. Superior experimental lines are selected from this nursery for advancement to the CPT Variety Trial;
- iii) Early-generation  $F_2$ -bulk (112 total) and  $F_3$ -bulk (231 total) breeding populations.  $F_2$ -bulks are routinely combine-harvested and advanced to the  $F_3$  generation with little selection. Undesirable  $F_3$  populations are eliminated from the program based largely on visual observations and pedigree; desirable  $F_3$  populations are advanced to the  $F_4$  head row nursery by selecting approximately 100 heads more or less at random from each  $F_3$  population;
- iv) A winter wheat phosphorous fertilizer management trial, in cooperation with Ron Gelderman (SDSU Soil Testing Lab) and Jim Gerwing (SDSU Extension Soil Fertility Specialist).

The nursery at Highmore was planted into good moisture on 9/12/94. Fall stand establishment was excellent and, because of

the mild winter experienced during 1994-1995, most of the entries in the nurseries came through the winter with very little winterkill. Excessive spring rains, however, resulted in near-complete flooding of the CPT Variety Trial and loss of all data.

Nurseries in other parts of the field were spared the most severe effects of the flooding (e.g., total immersion). Nevertheless, the combined effects of excessive wet spring weather, retarded crop development because of very cool spring temperatures, and two periods of hot weather (one in mid-June and one in early-July) resulted in an extremely high level of variation within the remaining nurseries (a high coefficient of variability, or CV). Thus, the reliability of yield data presented in the following table should be considered as questionable and interpreted with extreme caution.



Treatment Means for 1995 Advanced Yield (AYT) Trial  
Highmore Research Station

Entry	Grain Yield	Test Weight
	— bu acre —	— lb bu —
Dawn	49.4	62.2
TAM-107	44.8	62.1
SD91335	44.5	62.3
SD91338	44.0	62.2
SD92167	41.0	62.6
SD92168	40.9	63.4
Seward	40.4	61.5
SD89180	39.9	62.2
SD89186	39.2	62.5
SD92203	39.0	62.2
SD92266*	38.9	62.3
SD92170	38.6	61.8
SD92191*	37.3	62.2
Arapahoe	37.2	62.7
SD92239	37.2	62.4
Karl92	37.1	62.5
Vista	37.0	62.9
Roughrider	37.0	62.7
Rose	36.9	61.7
SD92107*	36.9	62.6
Redland	36.9	62.1
SD92132	36.5	63.0
SD89153*	36.1	62.2
SD92259	35.8	61.8
SD89119*	35.3	62.1
SD92124*	35.1	63.2
SD92263	34.7	62.3
SD89205*	33.9	62.6
SD92227*	33.6	62.5
SD92256	33.3	62.4
SD92162	32.8	61.8
SD92127	32.7	63.2
SD92120	32.5	63.1
SD92178	32.2	62.1
SD92244	31.8	63.1
SD92161	31.8	62.5
Scout66	31.8	63.3
SD92135	31.6	63.0
Siouxland	30.4	62.6
SD92222	29.9	63.0
SD91192*	29.5	62.5
SD91329	29.5	62.6
SD92182	26.1	62.0
SD92174*	25.5	61.9
Alliance	22.1	62.1
Mean	35.5	62.4
LSD (0.05)	13.0	1.0
CV (%)	22.6	1.2

\* Based on average performance at other sites, this line was selected and advanced for further testing.

## EFFECT OF POLLEN SOURCE ON GRAIN YIELD IN HYBRID MAIZE

Zeno W. Wicks, III and Chris T. Mack

An experiment concerning performance of blended hybrids of similar maturities is in progress. Six different 105 day Relative Maturity hybrids were planted in replicated four-row plots. The outer two rows of each plot represent high outcrossing, where two different hybrids stand adjacent to one another. The inner two rows of each plot represent low outcrossing, where different hybrids are separated by a single row. Plots were harvested as single rows, in order to compare yield of hybrids in high vs. low outcrossing situations. The degree of outcrossing which occurs between hybrids is assessed by planting a white hybrid among five yellow hybrids, so that outcross seed can be distinguished from self seed on an ear and percent outcrossing can be calculated.

Comparison of mean yield performance of five yellow hybrids in high vs. low outcrossing situations showed no significant differences overall. Individually, Pioneer Brand hybrids 3732 and 3699 showed significantly higher yields in high vs. low outcrossing situations.

TABLE 1. Mean performance of five hybrids in high vs. low outcrossing environments.

Environment	Mean Yield (bu/ac)
High Outcross	97.1
Low Outcross	96.6

TABLE 2. Individual performance of five hybrids in high vs. low outcrossing environments.

Hybrid	Environment	Mean Yield
Pioneer Brand 3732	High Outcross	92.6
Pioneer Brand 3732	Low Outcross	87.8
Pioneer Brand 3733	High Outcross	90.5
Pioneer Brand 3733	Low Outcross	90.5
Pioneer Brand 3702	High Outcross	108.7
Pioneer Brand 3702	Low Outcross	111.1
Pioneer Brand 3699	High Outcross	102.5
Pioneer Brand 3699	Low Outcross	97.9
Golden Harvest H2404	High Outcross	91.2
Golden Harvest H2404	Low Outcross	95.9

# EFFECT OF POPULATION X MATURITY GROUP INTERACTIONS ON THE YIELD OF HYBRID MAIZE

Zeno W. Wicks, III and Troy J. Madetzke

A study concerning Genotype X Environment interactions of Hybrid Maize is progressing throughout eastern South Dakota. A total of 8 locations were evaluated in 1995. Following is a brief overview of the experiments design.

Nine commercial corn hybrids representing three maturity groups (early:89-92DRM, mid:97-100DRM, and late:112-116DRM) are planted at four different populations. The populations are; 15, 22, 29, and 36,000 plants per acre. Each variety is planted in 4-row plots, and each row is 27.5 ft. long. Only the center two rows of each plot is harvested for data. This ensures a more precise estimate of actual field conditions. Data is then calculated up to a yield per acre basis.

The experiment at the Highmore, SD was planted on May 24, 1995. Table (2) contains the harvest data from the plots in Highmore. The early maturity groups are represented by a 1, the mid-season groups by a 2, and the late season groups by a 3.

Maturity Group	Final Population	Mean Yield (Bu/Ac)
1	15000	81.8
1	22000	118.4
1	29000	110.2
1	36000	116.8
2	15000	92.8
2	22000	127.4
2	29000	123.1
2	36000	121.6
3	15000	98.4
3	22000	115.6
3	29000	104.8
3	36000	89.4



## **CORRELATION OF PHOSPHORUS SOIL TESTS FOR WINTER WHEAT**

R. Gelderman, J. Gerwing, C. Stymiest, and S. Haley

### **INTRODUCTION**

The correlation of phosphorus soil tests for spring wheat in South Dakota has been previously determined. This data shows very little yield response after soil P tests (Bray 1) reach 18-20 ppm. The data for winter wheat (Figure 1) looks similar to spring wheat. However, there is a lack of data above 15 ppm P. The purpose of this study is to obtain data to complete this correlation for the Bray 1 and Olsen soil tests for winter wheat.

### **PROCEDURE**

A number of sites with medium to high soil P test levels were needed to complete the correlation. Thirteen studies were established at the winter wheat variety testing program sites located primarily in central and western South Dakota (Figure 2). One site was not harvested because of cheatgrass competition. Another site's data was not used because of high variability due to winter kill.

Site characteristics are listed in Table 1. Soil test P levels are given in Table 2. There were 9 and 8 sites listed as high or very high for the Bray and Olsen tests, respectively. The range of soil tests was from 7-41 and 4-23 ppm for Bray and Olsen, respectively.

Phosphorus treatments consisted of 0, 25, 50, 75, and 100 lb/acre of  $P_2O_5$  (as 0-46-0). The material was applied with the seed at planting. The treatments were arranged in a randomized complete block design with four replications.

Nitrogen was applied to be sufficient for a 50-60 bushel yield goal. All other nutrients were judged to be adequate. Grain harvest was completed with a small plot combine. The area harvested for each site is given in Table 1.

### **RESULTS**

Estimated grain yields for each site is given in Table 2. In general, yields were above average for most sites. Site yield means ranged from 25 bu/acre at Hayes to 93 bu/acre at Selby.

Response to added phosphorus was seen at Watertown, Martin and Selby ( $Pr > F$  is less than 0.15). The soil P tests at Watertown were low; therefore, a yield response was expected. At Selby and

Martin, soil tests are considered high or very high and grain yield response would not normally be expected. At each site, a 10% yield increase is seen from added P. However, yields were exceptionally high at both sites and phosphorus demand was probably high. A yield response to added P was expected at Ideal. However, dry weather limited yields at this site, probably reducing plant P needs. In addition, mineralization of organic P may have been higher than normal at this site because it was no-tilled into standing alfalfa.

When the relative yields (check/maximum yields x 100) are plotted against soil tests, the 1995 data fits nicely with previous studies (Figures 3 and 4).

A casual observation of this data would indicate a critical Bray P soil test of 15-20 ppm and a critical Olsen test of 12-15 ppm. This value represents the test where additional fertilizer phosphorus will no longer give an economical yield increase. These critical soil tests agree very well with critical values for other crops. Another year of data will be added to this correlation to determine the critical level more precisely for each soil test.

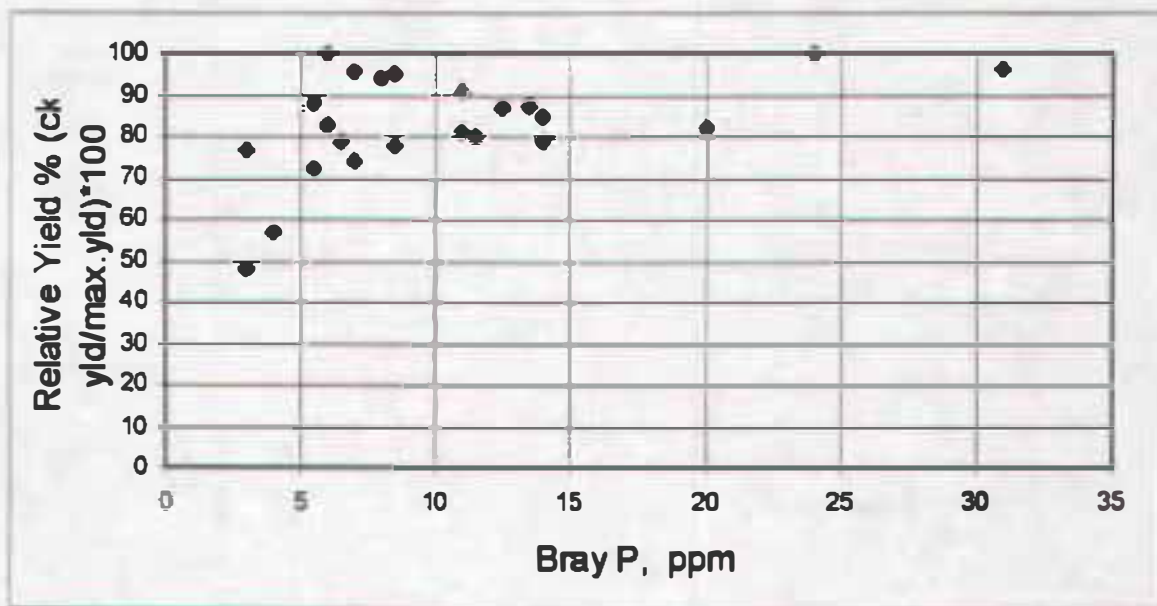


Figure 1. Correlation of Bray P soil test with relative yield of winter wheat in South Dakota, 1986 - 1994.

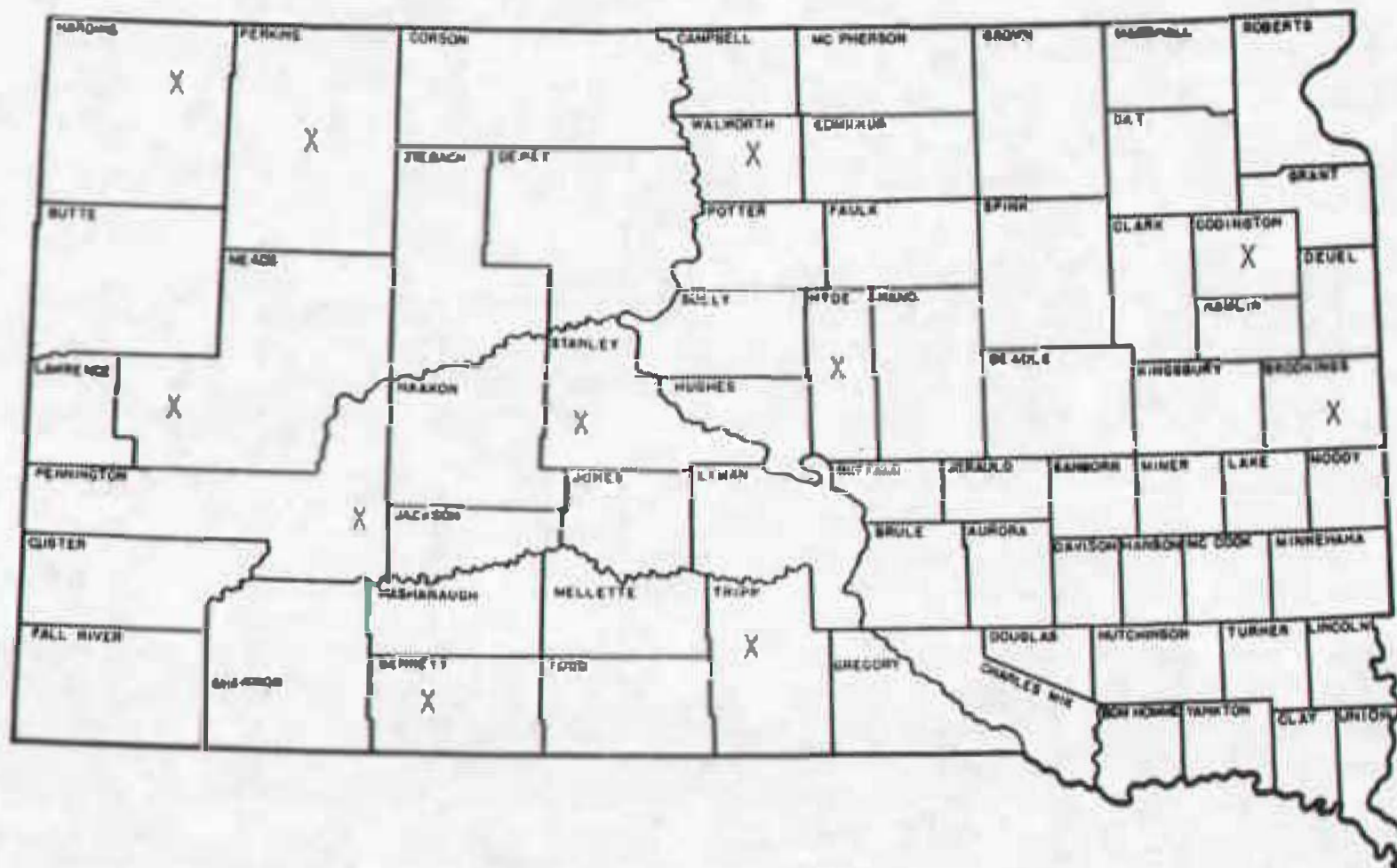


Figure 2. Location of winter wheat - phosphorus studies, South Dakota, 1995.



**Table 1. Selected characteristics of winter wheat phosphorus correlation sites, 1995.**

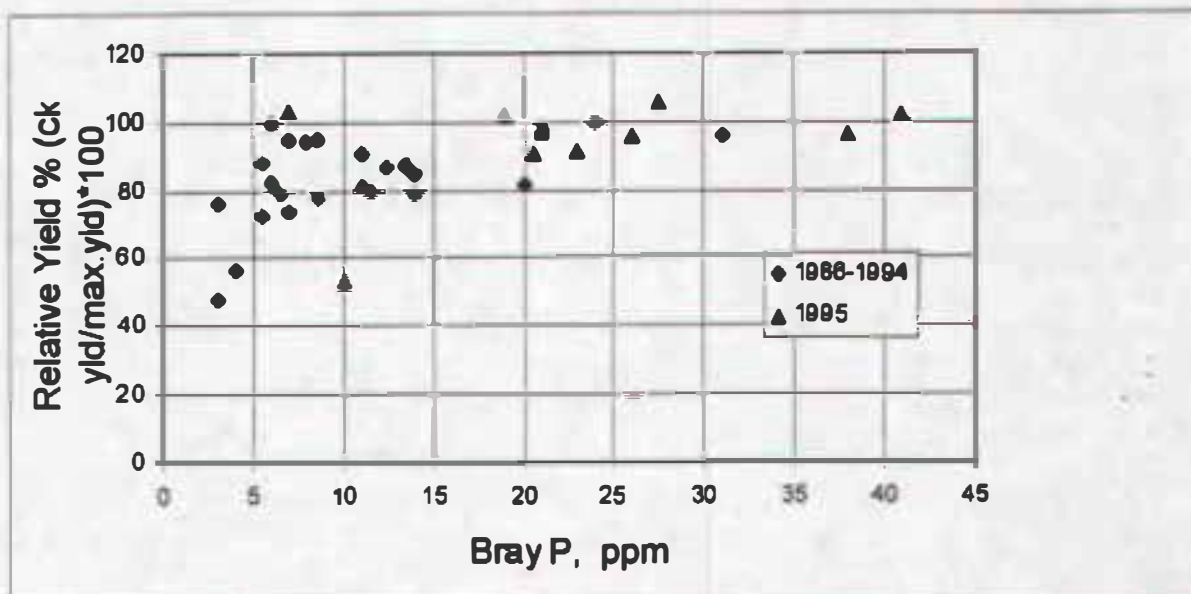
Site	County	Tillage	Soil	Parameter			
				Previous Crop	Row Width	Planting Date	Harvest Area
					inches		
Highmore	Hyde	No-till	Stickney	Fallow	7	9/12/94	4.1"x15'
Selby	Walworth	No-till	Highmore	Flax	7	9/14/95	"
Ideal	Tripp	No-till	Millboro	Alfalfa	7	9/13/94	"
Aurora	Brookings	No-till	Brandt	Fallow	7	9/19/94	"
Watertown	Codington	Chisel	Brookings	Fallow	7	9/20/95	"
Bear Butte	Meade	Surface tillage	Keith	Fallow	10	9/14-9/20	5'x25'
Bison	Perkins	"	Morton	Fallow	10	"	"
Hayes	Stanley	"	Promise	Fallow	10	"	"
Martin	Bennett	"	Keith	Fallow	10	"	"
Ralph	Harding	"	Farnuf	Fallow	10	"	"
Wall	Pennington	"	Wartman	Fallow	10	"	"

Table 2. Winter wheat grain yields due to P treatment, 1995.

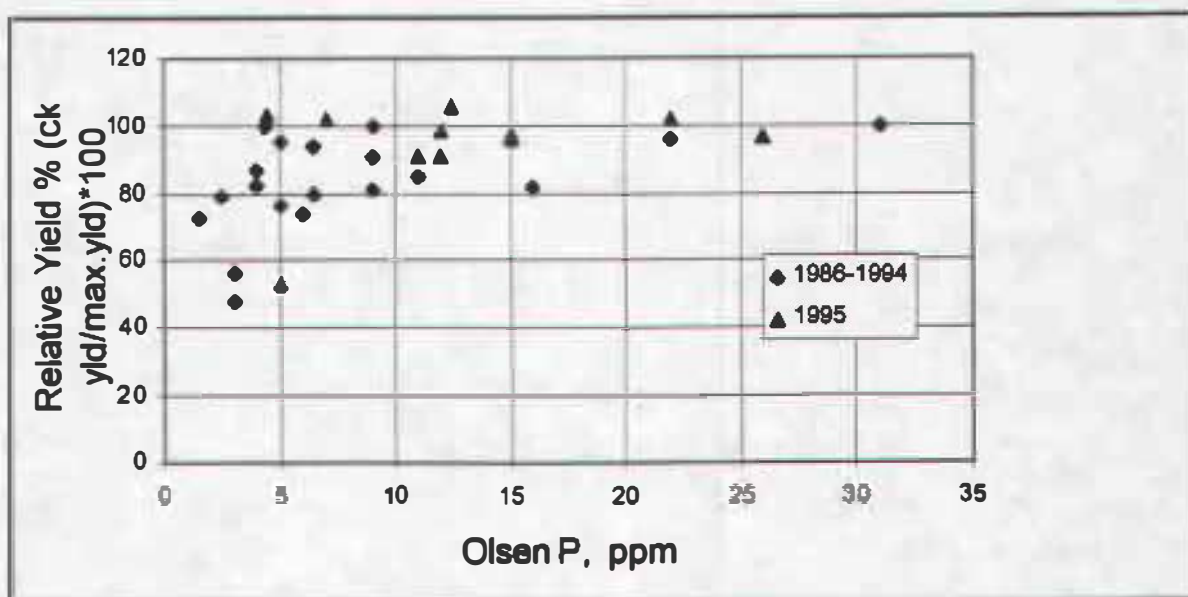
P <sub>2</sub> O <sub>5</sub> lb/acre	Site										
	High- more	Selby	Ideal	Aurora	Water- town	Bear Butte	Bison	Hayes	Martin	Ralph	Wall
	bu/acre										
0	54	88	33	58	39	64	65	24	65	34	52
25	53	91	32	55	49	66	65	25	71	36	52
50	52	93	34	57	45	65	69	25	72	35	48
75	43	95	31	55	56	66	65	26	72	36	53
100	56	97	32	59	73	65	64	24	70	34	52
$\bar{x}$	51	93	32	56	50	65	65	25	70	35	51
C.V. <sup>1</sup> %	21	5	17	8	12	7	7	9	4	6	15
Pr>F <sup>2</sup>	0.56	0.15	0.95	0.57	0.01	0.97	0.60	0.75	0.02	0.56	0.86
Bray P ppm	27.5	20.5	7.0	19.0	10.0	38	21	26	23	21	41
Olsen P ppm	12.5	12.0	4.5	7.0	5.0	26	12	15	11	15	22

<sup>1</sup>Coefficient of variation.

<sup>2</sup>Probability of greater F.



**Figure 3.** Correlation of Bray P soil test with relative yield of winter wheat in South Dakota, 1986-1995.



**Figure 4.** Correlation of Olsen P soil test with relative yield of winter wheat in South Dakota, 1986-1995.

## **SPOKE INJECTION OF FERTILIZER PHOSPHORUS FOR GRASSES**

R.H. Gelderman, J.R. Gerwing, and E.K. Twidwell

Fertilization of forage grasses with phosphorus has shown limited forage increases in South Dakota, even with low soil tests. Lack of response to added phosphorus may partially be due to fertilizer placement on established grass stands. Traditionally broadcasting fertilizer has been the only placement method available. Since P moves very little in the soil, root feeding from the added P must occur very close to the soil surface. A dry soil surface could limit P uptake by grasses, limiting any yield response to the added nutrient.

Innovation in fertilizer placement equipment in the past few years include the spoke injector. Such equipment has been studied on limited till situations but research on permanent sod has been limited. The applicator does little disturbance of the sod and can apply liquid fertilizer from 1 to 4 inches below the soil surface. This placement may increase phosphorus use efficiency on established grass.

The objective of the following study was to determine if subsurface applied P is more effective than surface applied P in established grass.

### **METHODS AND MATERIALS**

A field study utilizing nine site-years containing primarily cool-season grasses was used to evaluate placement method. Phosphorus tests at the sites were all interpreted as low or very low in South Dakota. Four of the sites had treatments applied for multiple years.

Treatment design consisted of a split-plot replicated four times. The whole plot was rate of phosphorus (0 or 60 lb  $P_2O_5$ /acre) and the placement (broadcast or spoke applied) was the split. The equipment was run empty through the spoke check. Phosphorus material used was 10-34-0. The broadcast treatment was sprayed over the surface. The subsurface treatment was injected at a 3-inch depth applied with the spoke injector at 12 inch spacings. All treatments were balanced with respect to nitrogen by broadcasting ammonium nitrate over the surface at the rate of 100 lb N/acre.

Harvests were completed by cutting and weighing forage from an area of 3 feet x 20 feet or 1.4 feet x 20 feet for the sites. A subsample of the forage was taken for dry weight and plant P analysis.



# RESULTS AND DISCUSSION

Forage yields at the sites ranged from poor because of drought to excellent with over 3 tons of dry forage per acre (Table 1). Phosphorus application influenced yield at only four site-years (where  $pr > F$  was less than 0.10). At these sites, placement of phosphorus had no influence on dry matter produced. These results indicate that a spoke subsurface placement has no advantage over broadcast applied phosphorus for grass forage production.

Table 1. Dry matter grass yields as influenced by phosphorus and P placement.

SITE	YEAR	---P <sub>2</sub> O <sub>5</sub> Rate (lb/acre)---				-----Pr > F <sup>1</sup> -----		
		---- 0 ----		-----60-----		RATE	PL <sup>3</sup>	RATE x PL
		BCT. <sup>2</sup>	SPOKE	BCT.	SPOKE			
--yield, lb/A dry matter--								
Highmore-1	93	4636	4535	4662	4079	0.5	0.29	0.47
Hughes	93	3158	2989	2838	2836	0.52	0.61	0.62
Brookings	93	3551	4109	5569	4083	0.09	0.18	0.02
Brookings	94	2456	3063	4245	3656	0.02	0.98	0.11
Highmore-2	94	2658	2641	3137	3011	0.16	0.2	0.6
Brown	94	1378	1788	1937	1727	0.18	0.36	0.02
Brookings	95	2664	2656	3993	3879	0.07	0.84	0.86
Highmore-2	95	5663	5786	6089	6022	0.49	0.93	0.75
Brown	95	3520	3550	4672	4526	0.004	0.71	0.57

<sup>1</sup>Pr > F = probability that tabular F ratio exceeds F ratio calculated by analysis of variance.

<sup>2</sup>Bct. = broadcast.

<sup>3</sup>PL = placement.

Plant P concentrations of the grass forage is given in Table 2. Phosphorus application increased forage P concentration at all but one of the site-years. Increases in forage P concentration due to P application ranged from 0.02 to 0.11 percent P. Of the eight responsive sites, placement of P influenced forage P concentration at five locations. The effect of placing the P below the soil surface compared to a broadcast application was negative at every site. It would appear that phosphorus availability to the plant is lessened with P fertilizer placed in this manner. Perhaps the placement of P in a small discrete area of the soil limits root contact and uptake of P.

Since yield and forage P concentration were not increased with subsurface placement, spoke injection of phosphorus for grass is not a recommended practice in South Dakota.

Table 2. Phosphorus concentration of grass forage as influenced by phosphorus rate and placement.

SITE	YEAR	---- P <sub>2</sub> O <sub>5</sub> Rate, lb/acre ---				----- Pr > F <sup>1</sup> -----		
		-----0-----		-----60-----		RATE	PL <sup>3</sup>	RATE x PL
		BCT <sup>2</sup> .	SPOKE	BCT.	SPOKE			
----- % P -----								
Highmore-1	93	0.113	0.111	0.176	0.152	0.01	0.02	0.007
Hughes	93	0.205	0.206	0.210	0.211	0.63	0.98	0.88
Brookings	93	0.095	0.097	0.121	0.127	0.003	0.92	0.82
Brookings	94	0.095	0.086	0.137	0.101	0.005	0.089	0.016
Highmore-2	94	0.106	0.102	0.187	0.142	0.008	0.016	0.007
Brown	94	0.102	0.103	0.170	0.140	0.0001	0.035	0.041
Brookings	95	0.122	0.106	0.168	0.161	0.13	0.82	0.59
Highmore-2	95	0.089	0.088	0.200	0.174	0.0001	0.10	0.08
Brown	95	0.080	0.092	0.167	0.162	0.0005	0.51	0.8

<sup>1</sup>Pr > F = probability that tabular F ratio exceeds F ratio calculated by analysis of variance.

<sup>2</sup>Bct. = broadcast.

<sup>3</sup>PL = placement.

## EFFECT OF ADDED CHLORIDE TO WINTER WHEAT

Ron Gelderman, Jim Gerwing, Clair Stymiest, and Scott Haley

### INTRODUCTION

A number of studies in South Dakota on spring wheat and barley have shown a yield response to added chloride. Work in Montana and Kansas have shown winter wheat responses to added chloride as well. The objective of these studies was to determine if yield responses from added chloride are found on winter wheat in South Dakota.

### PROCEDURE

There were two studies to answer the above objective.

#### New Underwood Study

This study was located in Pennington County near New Underwood, SD. This site is in western South Dakota on the heavy clay residual soils. This site had winter wheat (variety: Arapahoe) recropped after winter wheat under minimum till. Therefore, the potential for leaf disease was high. The soil tests at this site are given in Table 1. All nutrients are considered adequate with the exception of phosphorus which is considered low. The cooperator applied a phosphorus starter at seeding. This site had a moderate level of residual soil chloride. The chances of a grain yield response from spring wheat to added chloride is about 70% at chloride levels below 30 lb/A for a 2 foot depth. The level at this rate is 38 and 53 lb/acre for the 2 and 4 foot depths, respectively.

Table 1. Soil Tests<sup>1</sup> for chloride winter wheat studies.

Site	NO <sub>3</sub> -N		Cl		Olsen	K	pH	O.M.
	0-2'	0-3'	0-2'	0-3'	P			
	----- lb/A -----		-----		---ppm---			%
New Underwood	108	144	38	53	6.0	681	6.9	3.2
Ideal	122	---	22	---	4.5	620	7.3	3.3
Selby	90	---	17	---	12.0	557	6.3	2.8
Highmore	96	---	22	---	12.5	748	6.4	3.0
Wall	123	---	29	---	10.0	435	6.4	1.6

<sup>1</sup>New Underwood site sampled on April 4, 1995; other sites sampled in November of 1994.

Fertilizer and fungicide treatments applied at the New Underwood study are given in Table 2. All fertilizer treatments (KCl) were broadcast over the growing wheat on April 5, 1995. The wheat was beginning to break dormancy at this time. The foliar fungicide application was made at early flag leaf with a plot sprayer.

The experimental design was a randomized complete design with four replications. Plot size was 15' x 40'. Grain harvest was completed on July 17, 1995 with a small plot combine cutting a 5' x 40' area.

## RESULTS

Heavy cheatgrass competition prevented harvest of one replication. Leaf spot diseases either tan spot and/or septorial were present. This was expected because of the heavy residue and relatively moist conditions. No visual difference could be detected between treatments. Grain yields for this study are presented in Table 2.



Table 2. Influence of chloride and tilt fungicide on winter wheat grain yields and test weight, New Underwood, SD, 1995.

Chloride Rate	Yield			Test Weight		
	Tilt		Response	Tilt		
	-	+		-	+	
lb/A	--	bu/A	---	--	lb/bu	---
0	44.7	50.0	+5.3	62.9	64.0	
50	46.9	52.1	+5.2	63.1	62.3	
100	47.8	53.8	+6.0	61.4	63.2	
Response	+ 3.1	+ 3.8				

Statistics: Yield: C.V.% = 9.3; Pr > F; Cl rate = 0.45; Tilt = 0.003; Rate x Tilt = 0.99.  
Test Weight: C.V.% = 1.7; Pr > F; Cl rate = 0.22; Tilt = 0.18; Rate x Tilt = 0.15.

Yields were fair considering this was a recropped field and weed pressure was heavy. The application of tilt produced a significant yield increase of about 5 bu/A at all chloride levels. The effect of chloride was not significant. The trend for chloride was to increase yield from 2 to 4 bushels per acre, regardless of tilt treatment. These data indicate that a fungicide treatment where high disease potential exists is profitable. The application of chloride, although not significant, produced a consistent yield increase irregardless of tilt treatment.

Grain test weights were not influenced by fungicide or chloride treatments.

#### Other Chloride Studies

Four other chloride studies were established at the sites listed in Table 1. Residual chloride levels were below 30 lb/A for all sites. These sites would all be considered responsive to added

chloride using SDSU's guidelines for spring wheat. The treatments consisted of a check and a 60 lb/A chloride treatment replicated five times. The chloride treatment (KCl) was broadcast over the wheat in early spring. No other nutrients were applied to these plots. Plot size was 4' x 15' and the entire plot was harvested to estimate grain yield. The variety used was TAM 107 at all sites.

Table 3. Grain yields of winter wheat  
for chloride studies, 1995.

C1 Treatment <sup>1</sup>	Ideal	Selby	Highmore	Wall
----- bu/A -----				
Cl-	60	58	53	65
Cl+	60	58	52	68
C.V.%	5	15	19	6
Pr > F	0.99	0.94	0.87	0.21

<sup>1</sup>Cl- = check; Cl+ = 60 lb chloride per  
acre.

The results indicate no yield response to added chloride. Possible reasons include lack of disease pressure, deep profile chloride or a non-responsive variety. Spring wheat and barley studies have indicated some varieties do not respond to added chloride. Studies in Montana and Kansas have also indicated that the varietal component may be important for winter wheat as well. Additional studies will be conducted in 1996 to determine if chloride response may be variety specific.

## WEED CONTROL

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

The experiment station provides a strategic location for several weed control field evaluation and demonstration trials. The plots provide data used in the statewide weed control extension program. They are also used for field tours.

The station location has been the primary site for evaluating downy brome (cheatgrass) control in winter wheat. A block is devoted to maintaining the weed infestation and provides the winter wheat crop for comparing herbicides, including experimental products. Data are reported as part of the following tables.

Additional no-till evaluations were established in 1995. The tests provide comparative performance data for herbicides in corn, sorghum, and sunflower. Data are reported in the following tables.

The location is also used to evaluate herbicide carryover from experimental herbicides. These data are an important part of the evaluation program for potential commercial products and become a part of the data base and to define label restrictions.

The contribution of station personnel in plot area preparation and maintenance is acknowledged.

- |          |                                                  |
|----------|--------------------------------------------------|
| Table 1. | Evaluation of Cheatgrass Control in Winter Wheat |
| 2.       | No-Till Sunflower Evaluation                     |
| 3.       | No-Till Corn Evaluation                          |
| 4.       | No-Till Sorghum Evaluation                       |

**Table 1. Evaluation of Cheatgrass Control in Winter Wheat**

RCB; 3 reps

Variety: Seward

Planting Date: 9/8/94

PPI, PRE: 9/8/94

FPOS: 10/13/94

Soil: Clay loam; 2.4% O.M.; 7.2 pH

Precipitation:

PPI, PRE: 1st week 0.18 inches

2nd week 0.25 inches

FPOS: 1st week 0.65 inches

2nd week Trace

COMMENTS: Includes experimental applications. Several treatments have provided significant downy brome control in both 1994 and 1995. Crop injury noted for treatments. Experimental Sencor/Lexone improved control in combinations. Weed density 68 plants/ft<sup>2</sup> in check.

<u>Treatment</u>	<u>Product/A</u>	<u>% VCRR</u> <u>5/11/95</u>	<u>% Dobr</u> <u>5/11/95</u>	<u>% Dobr</u> <u>8/2/95</u>	<u>Yield</u> <u>bu/A</u>	<u>2-Yr Avg.</u> <u>% Dobr</u>
Check	----	0	0	0	23	0
<b><u>PREPLANT INCORPORATED</u></b>						
Hoelon	2.67 pt	7	88	68	27	73
Treflan 10G	7.5 lbs	43	57	48	19	48
Fer-go 10G	1.5 lbs	0	70	58	25	42
Sen/Lex 75DF	.67 lbs	17	82	79	25	—
<b><u>SHALLOW PREPLANT INCORPORATED</u></b>						
Treflan	1.5 pt	53	53	35	20	38
Amber	.3 oz	0	58	60	25	52
Amber	.6 oz	0	68	74	27	67
Amber+ Sen/Lex 75DF	.6 oz+ 2 oz	3	73	74	23	—
<b><u>SURFACE PREEMERGENCE</u></b>						
Treflan 10G	7.5 lbs	25	80	55	22	46
<b><u>PREEMERGENCE</u></b>						
Amber	.3 oz	0	43	48	24	42
Amber	.6 oz	0	43	37	27	41
Amber+ Sen/Lex 75DF	.6 oz+ 2 oz	0	47	50	25	—
Finesse	.3 oz	0	47	52	24	—
Finesse	.4 oz	0	57	53	24	—
<b><u>FALL POSTEMERGENCE</u></b>						
Finesse	.3 oz	0	57	53	26	—
Sen/Lex 75DF	.33 lbs	3	80	82	25	—
Sen/Lex 75DF	.67 lbs	13	92	94	28	86
Amber + X-77	.6 oz+.25%	0	58	30	25	43
Amber + Sen/Lex 75DF + X-77	.6 oz+.33 lbs+.25%	10	80	87	28	84
Amber+ Sen/Lex 75DF + X-77	.6 oz+ 1/6 lbs+.25%	3	70	72	26	—
Finesse + Sen/Lex 75DF + X-77	.4 oz+.33 lbs+.25%	13	91	92	29	—
Finesse+ Sen/Lex 75DF + X-77	.4 oz+1/6 lbs+.25%	8	87	89	29	—
LSD (.05)		11	14	13	7	16



**Table 2. No-Till Sunflower Evaluation**

RCB; 3 reps

Variety: AgriPro ST317

Planting Date: 5/23/95

PRE: 5/23/95

POST: 6/20/95

POST: 6/20/95

Soil: Clay loam; 2.4% O.M.; 7.2 pH

**COMMENTS:** Plots established in no-till wheat stubble. Moderately light foxtail pressure; good yield response to foxtail control. Yield doubled for most treatments when compared to the check. Stand was uniform but less than could have been established with commercial equipment. Test includes several experimental treatments.

Precipitation:

PRE:

1st week

2.20 inches

Grft = Green foxtail

Rrpw = Redroot pigweed

<u>Treatment</u>	<u>Product/A</u>	<u>% VCRR</u> <u>6/29/95</u>	<u>% Grft</u> <u>6/29/95</u>	<u>% Rrpw</u> <u>6/29/95</u>	<u>Yield</u> <u>lbs/acre</u>
Check	----	0	0	0	596
<b><u>PREEMERGENCE</u></b>					
Gramoxone Extra + X-77	1.5 pt+.5%	0	7	97	966
Prowl + Gramoxone Extra + X-77	3 pt+ 1.5 pt+.5%	0	86	96	1535
Prowl + Roundup + X-77	3 pt+ 1 pt+.375+.5%	0	84	82	1227
Prowl	3 pt	0	81	74	1247
Treflan + Gramoxone Extra + X-77	1 qt+ 1.5 pt+.5%	0	81	96	1598
Frontier 7.5L +	1.6 pt+				
Gramoxone Extra + X-77	+ 1.5 pt+.5%	8	98	97	1804
Acetochlor 6.4L +	2.5 pt+				
Gramoxone Extra + X-77	+ 1.5 pt+.5%	27	91	94	1634
Prowl + 2,4-D ester +	3 pt+ 1 qt+				
Gramoxone Extra + X-77	+ 1.5 pt+.5%	42	84	98	1394
<b><u>PREEMERGENCE &amp; POSTEMERGENCE</u></b>					
Gramoxone Extra + X-77&	1.5 pt+.5%&				
Poast + COC	1 pt+ 1 qt	0	95	93	1642
Gramoxone Extra + X-77&	1.5 pt+.5%&				
Assert + X-77	1.2 pt+.125%	0	62	96	1401
Gramoxone Extra + X-77&	1.5 pt+.5%&				
Poast + Assert + COC	1 pt+ 1.2 pt+ 1 qt	3	93	96	1532
LSD (.05)		8	8	5	301

**Table 4. No-Till Sorghum Evaluation**

<u>FALL</u>	<u>EARLY PREPLANT</u>	<u>PREEMERGENCE</u>	<u>POSTEMERGENCE</u>	<u>% VCRR 6/29/95</u>	<u>% Grft 6/29/95</u>	<u>% Bdfl 6/29/95</u>	<u>Yield bu/A</u>
Check				0	0	0	15
Atrazine(1.1 lb) + Dual II(2.5 pt)				0	63	97	44
Atrazine(1.1 lb)	Dual II(2.5 pt)			0	98	98	55
Atrazine(1.1 lb)		Dual II(2.5 pt)		2	98	99	57
	Dual II(2.5 pt)		Buctril(1.5 pt) + Atrazine(9 oz)	23	95	95	58
	Dual II(2.5 pt)		Atrazine(1.1 lb) + COC(1 qt)	34	94	92	50
	Dual II(2.5 pt)		Atrazine(9 oz) + Tough(1 pt) + COC(1 qt)	28	98	88	55
	Dual II(2.5 pt)		Banvel(.5 pt) + Atrazine(9 oz)	25	90	88	44
	Dual II(2.5 pt)		Banvel(.5 pt)	8	94	85	48
	Dual II(2.5 pt)		2,4-D amine(1 pt)	8	91	90	41
	Dual II(2.5 pt)		Ally(.05 oz) + 2,4-D ester(.5 pt)	42	94	89	41
	Dual II(2.5 pt)		Shotgun(2 pt)	25	95	88	49
	Dual II(2.5 pt) + Atrazine(1.1 lb)			0	98	99	58
	Lasso(3 qt) + Atrazine(1.1 lb)			3	97	97	52
	Frontier 7.5L(1.6 pt) + Atrazine(1.1 lb)			0	97	99	57
		Gramoxone Extra(1.6 pt) + X-77(.5%)	Atrazine(1.4 lb) + COC(1 qt)	0	25	97	41
		Roundup(1 pt) + X-77(.5%) + Ramrod(4 qt)	Permit(.67 oz) + X-77(.25%)	22	69	77	31
		Gramoxone Extra(1.6 pt) + X-77(.5%) + Ramrod(4 qt) + Atrazine(1.1 lb)		2	92	98	49
	LSD (.05)			14	12	8	20

## FIELD EVALUATION OF WOODY PLANT MATERIALS

Russell J. Haas - Plant Materials Specialist - USDA/ARS

### OBJECTIVES

1. Assemble and evaluate the adaptation and performance of selected woody plant materials for field and farmstead windbreaks and wildlife plantings in the Northern Great Plains.
2. Select and cooperatively release, superior cultivars for increase by commercial nurseries.

### ACTIVITIES IN 1995

140 accessions of 87 species are currently under evaluation.

May 8 - Due to extremely wet spring, planting and evaluation were three weeks behind usual. Ten accessions of eight species were added and spring survival and animal injury were noted.

October 10 - Each surviving plant of accessions planted in 1976, 1981, 1986, 1991, 1993, and 1995 was measured for crown spread and plant height; and rated for disease and insect damage, drought and cold tolerance, fruit production, survival and vigor. 9063130 river birch, 'Streamco' purpleosier willow and ND-3902 sandbar willow show superior stabilization. Photographs were taken to document performance, noted plot locations available for future plantings and replacement stakes needed and performed minor pruning. Also rogued volunteer seedlings of "tree weeds" such as mulberry, chokecherry, green ash etc. out of rows in shrub block.

### SUMMARY OF ACCOMPLISHMENTS

Based on observations and data collected at this site, the released cultivars in the following table are recommended for use in South Dakota. Numbered experimental selections will be placed in field plantings for further evaluation when planting stock becomes available.

'Cardan' green ash  
'Centennial' cotoneaster  
'Sakakawea' silver buffaloberry  
'Indigo' silky dogwood  
ND-1135 plum  
ND-21 sandbar willow  
ND-1879 honeylocust  
ND-83 late lilac  
'Streamco' purple osier willow  
9058862 tamarack

'Oahe' hackberry  
'Scarlet' mongolian cherry  
'McDermid' ussurian pear  
ND-283 Russian almond  
ND-21 nannyberry  
9047238 seabuckthorn  
9008041 false indigo  
ND-1863 honeylocust  
'Freedom' blueleaf honeysuckle  
'Meadowlark' forsythia

ND-170 cotoneaster  
'Bighorn' skunkbush sumac  
'Bighorn' skunkbush sumac  
14272 hybrid poplar  
9069081 littleleaf linden

'Midwest' manchurian crabapple  
323957 chokeberry  
323957 chokeberry  
ND-2103 highbush cranberry

This field evaluation planting was established in 1978. Data from this planting has been used to document the cooperative release of ten cultivars listed below. These are currently in large scale production and use in conservation and wildlife plantings in the Northern Great Plains. Data has also assisted nurserymen and plant researchers from several agencies determine the range of adaptation and performance of many other cultivars.

'Cardan' green ash  
'Sakakawea' silver buffaloberry  
'Centennial' cotoneaster  
'Homestead' Arnold hawthorn

'Oahe' hackberry  
'Scarlet' mongolian cherry  
'McDermid' ussurian pear  
'Regal' (ND-283) Russian almond