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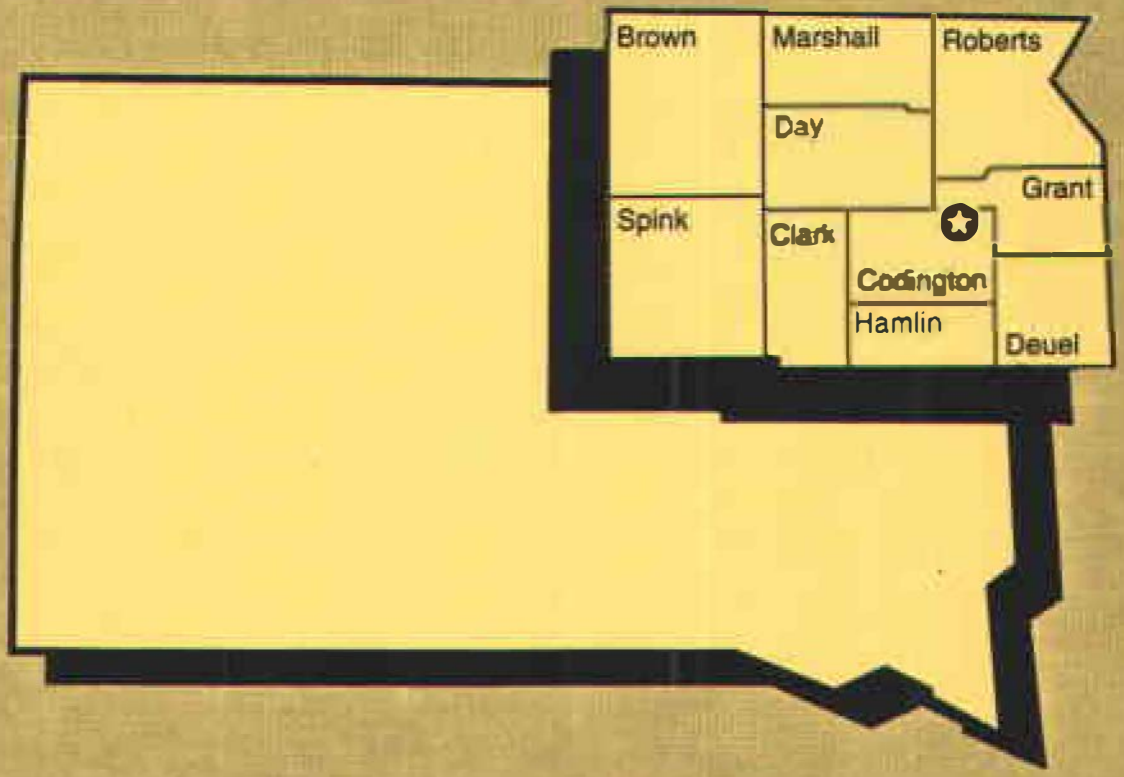
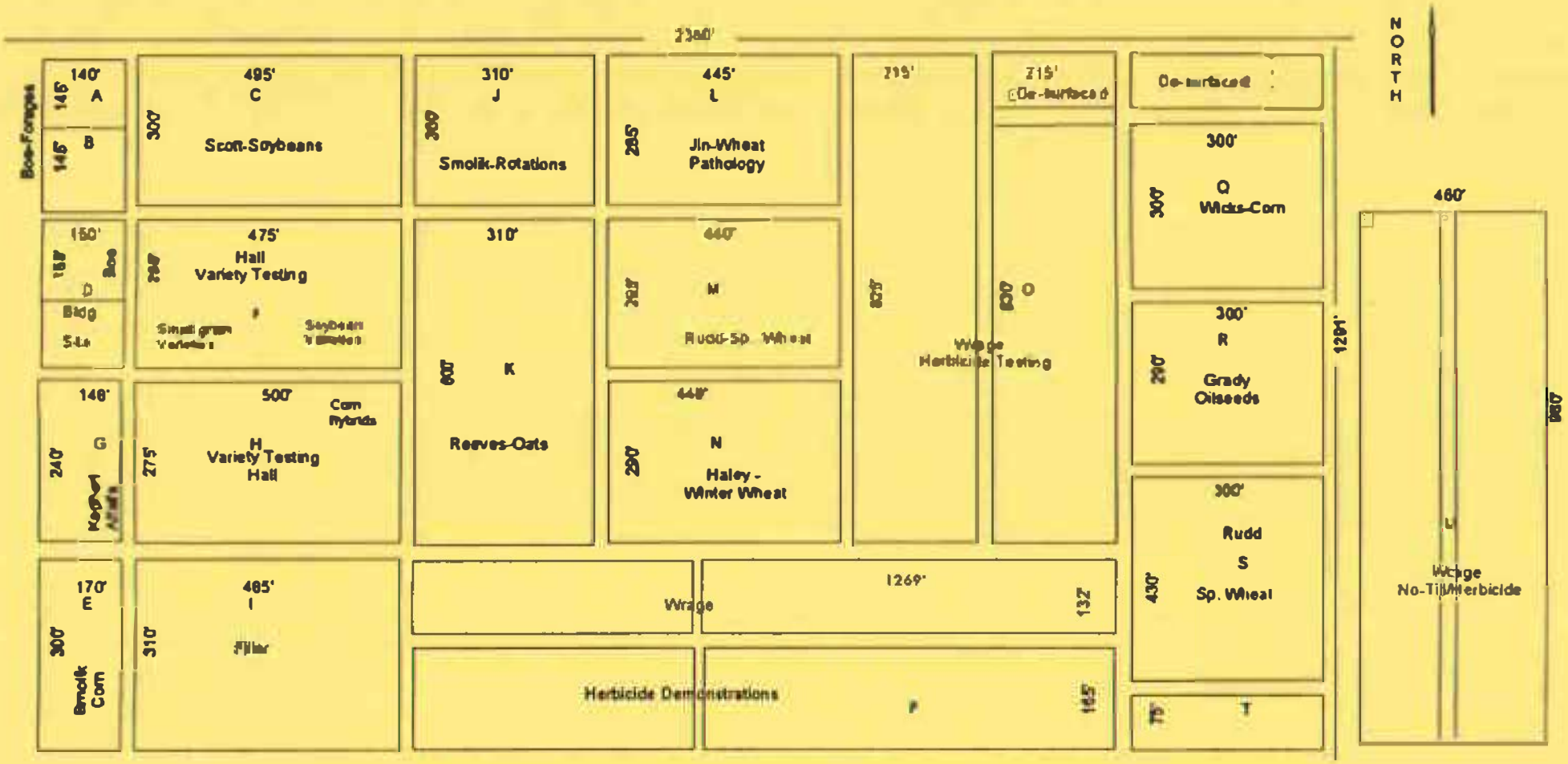
1996 Annual Progress Report

Northeast Research Station • Watertown, South Dakota

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



Northeast Research Station (Watertown)
1996 Land Use Plans



Plot Acreage:

A	0.49	H	3.15	O	9.57
B	0.49	I	3.44	P	8.65
C	3.40	J	2.13	Q	2.08
D	0.54	K	4.27	R	2.00
E	1.20	L	3.00	S	3.00
F	3.12	M	3.00	T	0.51
G	0.86	N	2.86	U	9.72

Roadways: 25 feet wide
Acreage in farm: 80
Experimental Acreage: 68

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1997
NORTHEAST RESEARCH STATION ADVISORY BOARD

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Loyal Evjen	Summer Field Assistant		

* County Extension Agent

**SDSU Representatives

ANNUAL PROGRESS REPORT, 1996

Northeast Research Station, Watertown, South Dakota
J. D. Smolik

The first half of April was cold and dry. The second half of the month was warmer, but soil remained frozen for the entire month of April. Temperatures in May were moderate, but precipitation was well above average (Table 1). Over the month of May measurable precipitation was received on 18 days. The frequent precipitation and the slow-to-thaw soils prevented planting until late in May. The majority of the crops at the Station were planted the last 10 days of May and the first week of June.

June was warm and dry and crops developed rapidly. Precipitation in July and August was near normal and temperatures were moderate resulting in good crop development. Precipitation over the growing season (April-October) was 1.41 inches below the long-term average and number of frost-free days was above average (Table 1.)

Extensive winter-kill occurred in older stands of alfalfa at the Station and in much of eastern South Dakota. Winter wheat plots at the Station were also severely damaged, and mortality was near 100% for all varieties. Surprisingly, winter rye was also severely damaged and no yield data was collected.

Spring wheat yields were similar to those of 1995, oat yields were lower, and barley yields were considerably higher. Both corn and soybean yields were good, and were similar to the previous year. Canola yields were lower than 1995 and flax yields were higher.

Brown and Spink Counties joined the Northeast Advisory Board in 1996, and we look forward to their participation. Two well-attended tours were held in 1996. Summer tour topics included row crop herbicides, small grain varieties and disease management, flax and canola studies, starter fertilizer, corn insects, an update on spring wheat breeding, and winter-kill in alfalfa. The fall tour emphasized row crops and included discussions on soybean breeding, soybean varieties and diseases, corn and soybean herbicides, and forage crops. We thank the area Crop Improvement Associations for sponsoring the lunch following the summer tour. Thanks also to Nick Endres for providing wagons for use at the tours.

The 1997 summer tour will be held on July 9 beginning at 5pm and the fall tour on September 3 will begin at 1pm.

Note: Much of the information in this report is based on ongoing studies, and results should therefore be considered tentative. The use of trade names in this publication is not an endorsement of the product by either the Plant Science Department or the Agricultural Experiment Station.

Special thanks to Marjorie VanderWaal for her assistance in preparing this report.

Table 1. Growing Season Precipitation* Bethel 1956-1996

Year	April	May	June	July	Aug.	Sept.	Oct.	Total	Frost-Free Days
1956	1.80	2.91	6.56	4.02	6.25	0.70	2.44	24.65	125
1957	4.26	5.88	2.85	0.74	5.26	2.12	3.12	24.33	119
1958	1.41	1.49	2.65	2.88	0.57	0.81	0.18	9.79	116
1959	0.58	3.47	1.91	1.86	4.69	1.10	1.95	15.36	110
1960	1.53	3.84	4.05	0.79	1.03	1.30	1.50	14.04	123
1961	2.16	5.75	4.01	4.62	0.62	1.84	1.00	20.00	138
1962	1.39	5.48	3.98	10.36	1.88	1.39	1.11	25.60	143
1963	1.41	3.54	3.22	5.74	2.51	4.33	0.68	21.43	158
1964	2.39	1.07	3.62	2.01	4.22	0.93	0.04	14.28	82
1965	2.89	6.08	3.88	2.34	2.63	4.33	1.23	23.16	104
1966	1.49	0.77	1.88	2.19	4.59	1.53	1.52	13.97	138
1967	0.92	0.69	4.58	1.05	1.13	1.06	0.35	9.78	129
1968	3.04	2.15	3.18	2.39	1.53	2.56	2.00	16.85	132
1969	1.52	3.44	1.86	4.52	2.48	1.66	2.18	17.96	109
1970	2.00	1.98	2.07	2.29	1.00	1.66	2.01	13.01	148
1971	1.33	1.78	7.61	1.02	2.93	1.46	5.56	21.69	168
1972	1.90	7.73	2.92	6.35	2.57	0.11	1.37	22.95	172
1973	1.14	2.67	1.12	2.05	1.27	3.81	1.39	13.65	183
1974	1.22	3.37	1.45	2.09	3.70	0.22	0.91	12.96	141
1975	4.15	2.18	4.76	1.25	2.89	2.28	1.64	19.15	139
1976	1.10	1.26	1.48	0.51	0.79	1.62	0.57	7.34	144
1977	2.64	2.24	5.78	2.47	2.70	3.67	3.06	22.56	180
1978	3.38	5.15	2.26	2.08	2.43	2.32	0.53	16.15	178
1979	3.14	2.17	5.78	3.10	5.21	0.53	3.50	23.43	162
1980	0.43	3.09	4.97	1.96	3.82	0.72	0.68	15.67	150
1981	0.48	0.99	2.73	2.23	1.20	0.52	1.88	10.03	136
1982	0.35	5.50	1.37	4.05	0.64	2.73	3.11	17.75	175
1983	0.70	1.64	3.43	5.45	3.00	2.96	1.30	18.38	140
1984	2.88	1.55	7.45	1.95	3.09	1.14	4.69	22.78	147
1985	1.93	3.90	2.07	5.21	3.65	3.77	1.59	22.12	167
1986	5.55	4.64	3.62	4.14	3.11	4.19	0.13	25.38	159
1987	0.55	2.03	1.20	4.16	5.64	2.44	0.45	16.47	162
1988	0.59	2.76	0.69	0.96	4.03	2.98	0.22	12.13	144
1989	2.95	1.15	1.74	2.41	4.56	1.56	0.56	14.95	147
1990	1.04	2.26	5.13	3.73	2.58	2.16	1.78	18.68	136
1991	4.01	4.41	10.45	2.69	4.37	1.45	0.63	26.01	146
1992	0.91	1.45	7.95	3.08	0.75	3.17	0.02	17.33	154
1993	1.69	2.53	6.58	6.70	1.40	2.05	0.17	21.12	149
1994	2.48	2.12	6.11	4.65	3.67	2.47	2.11	23.61	162
1995	2.92	3.66	2.89	8.05	6.09	2.45	2.43	28.49	152
1996	0.18	4.20	1.36	3.43	2.92	2.34	2.57	17.00	154
AVG:	1.91	3.05	3.73	3.34	2.91	2.01	1.56	16.41	145

*1960-1962, 1973-1976, 1978 and 1979 data obtained from Watertown FAA station.

Crop Performance Trials Hard Red Spring Wheat, Durum Wheat, Oat, Barley, Corn and Soybean

R.G.Hall

HARD RED SPRING WHEAT:

Test results for 1996 are shown in Table 1. Yields averaged 43 bushels for 1996 compared to 40 bushels per acre for 1994-96. The top-yielders for 1996 include 'Hamer', 'Russ', 'Verde' and the experimentals 'SD3219', 'SD3236', 'SD3249', 'SD8089' and 'SD8108' . The top-yielders for 1994-96 include '2375', 'Butte 86', 'Grandin', 'Kulm', 'Nordic', 'Oxen', 'Prospect', 'Russ', 'Sharp', 'Verde' end the experimental 'SD3156'.

The better bushel weight varieties for 1996 include '2375', 'Bacup', 'Butte 86', 'Grandin', 'Hamer', 'Kulm', 'Russ', 'Sharp', 'Trenton' and the experimentals 'SD3219', 'SD3236', 'SD3249, and'SD8108'. There are no significant differences among varieties in bushel weight over the three-year period.

DURUM SPRING WHEAT:

Test results for 1996 are shown in Table 2. Yields averaged 41 bushels for 1996 compared to 36 bushels per acre for 1994-96. There are no significant differences among the varieties tested during either 1996 or 1994-96.

The bushel weight averages for 1996 end 1994-96 are 57 and 54 pounds, respectively. There are no significant differences among varieties in bushel weight in either the 1996 or 1994-96 time periods.

OAT:

Test results for 1996 are shown in Table 3. Yields averaged 75 bushels for 1996 compared to 85 bushels per acre for 1994-96. The top-yielders for 1996 include 'Belle', 'Newdak' and 'Valley'. The top-yielders for 1994-96 include 'Belle', 'Dane', 'Jerry', 'Newdak', 'Troy', and 'Valley'. The top bushel weight oat for 1996 was 'SD92287'. There are no significant bushel weight difference among the oats tested for 1994-96.

SPRING BARLEY:

Test results for 1996 are shown in Table 4. Yields averaged 72 bushels for 1996 compared to 58 bushels per acre for 1994-96. The top-yielders for both the 1996 and 1994-96 time periods include 'Excel', 'Foster', 'Logan', 'Stander' and 'Stark'.

The better bushel weight varieties for 1996 include 'Conlon' and 'Stark'. The better bushel weight varieties over the 1994-96 periods include 'Bowman', 'Logan', and 'Stark'.

Table 1. Hard red spring wheat yield and bushel weight averages, 1994-96.

Variety	Yield - Bu/Acre		Bushel Wt - Lbs	
	1996	1994-96	1996	1994-96
2375	43	40	60	58
2398	42		59	
Bacup	36		62	
Butte 86	40	40	60	57
Chris, CK	27	29	55	54
Ernest	35		57	
Grandin	41	40	60	58
Hamer	47		60	
Keene	42		58	
Kulm	46	41	61	57
Lars	44		57	
Nordic	40	39	58	57
Norlander	40		59	
Oxen	45	43	58	57
Prospect	41	40	58	56
Russ	50	44	60	57
Sharp	46	41	60	58
Trenton	43	38	60	57
Verde	47	44	59	57
SD3156	41	42	57	56
SD3219	52		60	
SD3236	50		60	
SD3249	47		61	
SD8089	52		57	
SD8108	52		60	
Test Average:	43	40	59	57
LSD (5%):	6	5	2	NS*
CV (%):	10	8	2	3

* Value differences within a column are not significant (NS) at the 0.5% level.

Table 2. Durum wheat yield and bushel weight averages, 1994-96.

	Yield - Bu/Acre		Bushel Wt - Lbs	
Variety	1996	1994-96	1996	1994-96
Ben	35		57	
Monroe	46	38	57	54
Munich	41	35	57	53
Renville	44	37	58	54
Vic, CK	37	34	57	55
Test Average:	41	36	57	54
LSD (5%):	NS*	NS	NS	NS
CV (%):	13	12	2	3

* Value differences within a column are not significant (NS) at the 0.5% level.

Table 3. Oat yield and bushel weight averages, 1994-96.

	Yield - Bu/Acre		Bushel Wt - Lbs	
Variety	1996	1994-96	1996	1994-96
Belle	101	100	35	34
Dane	74	82	35	33
Don	50	70	34	34
Hazel	65	78	34	34
Hytest	62	69	36	37
Jerry	87	94	38	37
Jim	72		34	
Monida	48		25	
Newdak	100	102	35	34
Settler	82	80	34	34
Troy	49	85	29	32
Valley	98	96	35	35
SD91008	76		38	
SD91228	76		36	
SD92057	70		38	
SD92125	87		38	
SD92287	77		39	
Test Average:	75	85	35	34
LSD (5%):	9	21	1	NS*
	9	8	3	3

* Value differences within a column are not significant (NS) at the 5% level.

Table 4. Spring barley yield and bushel weight averages, 1994-96.

	Yield - Bu/Acre		Bushel Wt - Lbs	
Variety	1996	1994-96	1996	1994-96
Bowman	62	48	48	48
Conlon	69		49	
Excel	80	64	46	46
Foster	81	63	46	45
Gallatin	57	50	44	45
Logan	74	58	48	48
Robust	68	57	47	46
Stander	82	61	47	46
Stark	72	60	49	48
Test Average:	72	58	47	46
LSD (5%):	13	7	1	1
CV (%):	12	10	2	2

* Value differences within a column are not significant (NS) at the 0.5% level.

CORN:

Results for 1996 and 1995-96 are shown in Table 5 and 6. In the early test of 95 days relative maturity or less there are 18 hybrids in the top-yielding group for 1996. Entries had to yield 115 bushels or higher to be in the top-yielding group for 1996. Entries in sequence from Garst 8751 down to Mycogen 2420 are in the top-yielding group for 1996. There are no significant yield differences among the entries tested for the 1995-96 period. Grain moistures and bushel weight differences of more than 1 and 3 respectively, are significant for 1996. There are no significant differences in plants per acre at harvest.

In the late test (96 days relative maturity or higher) there are 21 hybrids in the top-yielding group for 1996. Entries yielding 113 bushels for higher are in the top-yielding group for 1996. Entries in sequence from Cargill 3797 down to Golden Harvest H-2377 are in the top-yielding group for 1996. Again, as in the early test,there are no significant yield differences among the entries tested for the 1995-96 period. Grain moistures and bushel weight differences of more than 2 and 4 respectively, are not significant for 1996. There are no significant differences in plants per acre at harvest.

In 1996 the performance differences between the two relative maturity tests (early vs. late) are as expected. The late test averaged only one bushel per acre less than the early test, but the early test averaged 5% lower in grain moisture and 2 pounds higher in bushel weight. The similarity in yields and lower grain moisture and higher bushel weight of the early test was likely due to the late seeding date. The higher grain moisture and lower bushel weight of the late test was likely due to its not being as fully mature as the early test by the first killing frost.

Table 5. 1996 Corn hybrid trial, early maturity - 95 days or less.

Brand & Hybrid	Yields at 15.5% Moist. 1996 (Bu/A)	Yields at 15.5% Moist. 2-Yr (Bu/A)	1996 Grain Moist. (%)	1996 Bu. WT. (lb)	1996 Plants Per Acre	1996 Stalks Lodged (%)
Garst 8751	129	.	22	53	24120	4
Mycogen 2395	128	.	24	54	24120	2
Dekalb DK385	127	114	21	53	24120	5
Payco 516	126	.	22	49	24120	2
Domestic DX403	125	.	23	51	24120	2
Dairyland ST-1495	124	120	23	53	24120	3
Seed Mart 2088	123	.	19	55	24120	5
Pioneer P3893	122	122	22	55	24120	4
Top Farm TFSX 2101	120	.	22	52	24120	5
Kaltenberg K4400	120	118	24	50	24120	1
Domestic DX307	119	.	21	52	24120	4
Kaltenberg K4709	119	113	26	49	24120	4
Kaystar X690	118	.	19	51	24120	3
Dairyland ST-1297	118	.	26	50	24120	3
Ciba 4144	117	116	24	52	24120	2
Croplan Genetics 282	116	101	21	52	24120	2
Garst 8814	115	112	23	52	24120	3
Mycogen 2420	115	.	23	54	24120	4
ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD GROUP FOR 1996						
Dekalb DK412	114	111	22	52	24120	4
Seed Mart 2098	114	.	22	52	24120	7
Dairyland ST-1289	113	100	21	52	24120	7
Kruger K9898	113	.	26	49	24120	5
Payco 402	111	112	23	51	24120	3
Golden Harvest H-2308	110	102	22	53	24120	5
Domestic DX306	109	110	23	49	24120	3
Pioneer P3914	108	.	20	55	24120	2
NC + 1366	107	.	23	53	24120	2
Payco 407	106	.	23	54	24120	7

Table 5. 1996 Corn hybrid trial (continued), early maturity.

Brand & Hybrid	Yields at 15.5% Moist. 1996 (Bu/A)	2-YR	1996 Grain Moist. (%)	Bu. Wt. (lb)	Plants Per Acre	Stalks Lodged (%)
Mycogen 2250	104	.	22	53	24120	6
Cargill 2411FQ	103	.	23	55	24120	4
Dairyland ST-1296	102	.	25	48	24120	1
Croplan Genetics 357	100	102	25	49	24120	6
Cargill 2827	100	.	22	54	24120	4
Kruger K9600A	94	.	27	47	24120	8
Dekalb DK442	91	102	23	51	24120	4
Sands SOI 9956	87	93	25	52	24120	8
Dyna-Gro UAPX15092	83	.	23	51	24120	5
Average:	112	109	23	52	24120	4
LSD (5%):	14	NS**	1	3		4
Coef. Of Variation#:	8	10				

*Top Yield - Yields within one LSD value of highest yield.
**Differences within a column are not significant (NS).

Table 6. 1996 Corn hybrid trial, late maturity - 96 days or more.

Brand & Hybrid	Yields at 15.5% MOIST. 1996 (Bu/A)	2-yr	1996 Grain Moist. (%)	Bu. Wt. (lb)	Plants Per Acre	Stalks Lodged (%)
Cargill 3797	127	122	25	57	24120	6
Dekalb DK471	127	124	24	51	24120	5
Payco 635	127	126	27	48	24120	4
Kruger K9802A	126	.	27	50	24120	1
Sands SOI 9027	125	.	26	50	24120	2

Table 6. Corn hybrid trial (continued), late maturity.

Brand & Hybrid	Yields at 15.5% moist. 1996 (Bu/a)	Yields at 15.5% moist. 2-yr (Bu/a)	1996 Grain Moist. (%)	1996 Bu. Wt. (lb)	1996 Plants Per Acre	1996 Stalks Lodged (%)
Top Farm TFSX 2101A	121	.	23	52	24120	6
Dekalb DK493	120	121	26	49	24120	3
Mycogen AG3965	120	121	24	49	24120	3
Dairyland ST-1401	120	.	26	51	24120	2
Mycogen 2500	119	.	26	50	24120	4
Cargill 4127	119	126	27	51	24120	2
Kruger K9501A	118	.	28	49	24120	5
Payco 606	118	.	23	51	24120	5
Cargill 3677	118	120	27	50	24120	2
Golden Harvest H-2382	117	114	27	48	24120	4
Garst 8746	116	111	26	50	24120	2
Dekalb DK477	116	.	24	51	24120	2
Mycogen 4970	115	118	27	50	24120	3
Kruger K9703	114	.	29	48	24120	4
Garst 8773IT	114	.	26	53	24120	3
Golden Harvest H-2377	113	115	28	50	24120	6
ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD GROUP FOR 1996						
Dyna-Gro UAPX15094	112	.	29	53	24120	6
Kruger K9608A	111	.	29	50	24120	1
Croplan Genetics 402	110	.	26	52	24120	1
Epley EX1450	110	.	30	48	24120	4
Golden Harvest H-2339	110	.	24	55	24120	4
Top Farm TFSX 2100	108	.	28	49	24120	4
Pioneer P3730	108	106	26	51	24120	5
Kaystar KX-600	105	114	29	48	24120	6
Sands SOI 9045	104	115	37	48	24120	1
Garst 8771	104	.	24	49	24120	3

Table 6. Corn hybrid trial (continued), late maturity.

Brand & Hybrid	Yields at 15.5% moist. 1996 (Bu/a)	Yields at 15.5% moist. 2-yr (Bu/a)	1996 Grain Moist. (%)	1996 Bu. Wt. (lb)	1996 Plants Per Acre	1996 Stalks Lodged (%)
Top Farm TFSX 2103	104	105	35	49	24120	6
Payco 633	103	.	34	49	24120	5
Kruger EX-104	103	.	31	50	24120	2
Payco 546	102	.	27	49	24120	2
Payco 605	101	113	28	48	24120	4
Payco 531	101	105	30	49	24120	1
Seed Mart 2100	99	.	26	51	24120	2
Payco 636	96	.	32	49	24120	3
Kruger K9704	95	.	29	51	24120	8
Epley EX1400	91	.	27	49	24120	3
Ciba 4214	69	.	37	52	24120	6
Average:	111	116	28	50	24120	4
LSD (5%):	14	NS**	2	4		NS
Min. top yield value*:	113					
Coef. of variation#:	8	8				

*Top Yield - yields within one LSD value of highest yield.
**Dfferences within a column are not significant (NS).

SOYBEAN:

Group-0 - There are 17 varieties in the top-yielding group for 1996 (Table 7). Entries yielding 49 bushels or higher are the top-yielders for 1996. Entries in sequence from Pioneer 9092 down to Kruger K0999 are the top-yielders for 1996. Entries yielding 45 bushels or higher for 1995-96 and 47 bushels or higher for 1994-96 are the top-yielders.

Group-I - There are 28 varieties in the top-yielding group for 1996 (Table 8). Entries yielding 45 bushels or higher are the top-yielders for 1996. Entries in sequence from Stine 1970 down to Mustang M-1160 are the top-yielders for 1996. Entries yielding 46 bushels for 1995-96 and 47 bushels per acre for 1994-96.are the top-yielders.

Table 7. Soybean maturity group-0 trial, seeded may 24, 1996.

--- Brand / Entry ---	Yield '96	Yield 2Yr	Yield 3Yr	1995# Prot.	1995# Oil	Ht.	1996 Ldg.# Res.	1996 Mat.$
	---	Bu/A	---	---	% ---	in.		days
Pioneer/9092	53	50	52	34.0	18.3	35	3	2
Mustang/M-0995	53	51	.	34.6	17.5	30	3	4
Stine/0653	53	51	.	36.2	16.4	29	2	- 4
Prairie Br./PB-104	52	.	.	.	.	32	2	3
ProfiSeed/PS083	51	50	.	34.2	17.5	31	3	4
Garst/D088	51	.	.	.	.	30	2	- 2
Payco/9610	51	50	.	33.6	17.9	31	3	2
Payco/9609	51	.	.	.	.	36	2	6
Kruger/K1333	50	.	.	.	.	34	3	8
Mustang/M-0998	50	.	.	.	.	32	2	3
Pioneer/9071	50	48	49	33.5	18.1	32	2	0
Kruger/K0909	49	48	52	35.6	16.8	32	2	5
Public/SL92-1233M*	49	47	50	37.0	16.6	33	2	5
Golden Harv./H-1078	49	45	.	35.2	17.1	36	3	4
Prairie Br./PB-097	49	.	.	.	.	31	3	5
Dyna-Gro/UAPX 194	49	.	.	.	.	29	2	- 2
Kruger/K0999	49	49	52	34.1	16.8	34	2	6
ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD GROUP FOR 1996								
Golden Harv./H-1082	48	47	.	36.5	16.2	28	2	- 2
Dairyland/DST0805	48	.	.	.	.	31	2	- 3
Public/Hendricks	48	47	48	35.9	17.1	35	3	5
G.Country/X3607	48	.	.	.	.	30	2	- 3
Kaltenberg/KB095	48	48	.	36.6	16.0	28	2	- 2
Public/ND(M)89-111	47	.	.	.	.	33	3	- 4
Payco/9508	47	47	.	36.4	16.3	31	3	0
Kruger/K1303+	47	.	.	.	.	35	3	9
Public/Lambert	47	45	46	35.7	17.4	33	2	2
Sands/EXP9609	47	.	.	.	.	29	2	2
Stine/0670	47	49	.	35.3	17.0	29	2	0
Kruger/K1303	47	.	.	.	.	36	3	8
Public/PARKER,I-CK*	47	45	48	35.3	16.9	32	4	8
Public/SL92-1357M*	47	.	.	.	.	31	3	5
Prairie Br./PB-127	46	.	.	.	.	35	3	8
Public/SL92-1272M*	46	46	49	36.8	16.4	36	3	3
Great Lakes/GL0735	46	46	.	35.7	16.2	30	2	- 3
DeSoy/D0808	46	47	.	35.9	17.8	32	3	6
Mustang/M-0830	45	46	50	36.2	16.4	29	2	- 2

Table 7. Soybean maturity group-0 trial, (continued)

--- Brand / Entry ---	------ Yield ----- '96	2Yr	3Yr	----- 1995# ----- Prot.	Oil	Ht.	------- 1996 ------- Ldg.# Res.	Mat.$
	------	Bu/A	------	------ %	------	in.		days
Dyna-Gro/3044	45	42	.	36.0	17.0	33	2	- 4
Prairie Br./PB-094	45	45	.	36.0	16.3	29	2	- 1
Arrowhead/8350	44	44	46	35.2	16.4	33	3	7
Public/Simpson	44	42	45	34.5	17.4	34	2	5
Payco/9606	44	.	.	.	.	34	3	1
Public/SD(N)93-5810	44	.	.	.	.	37	2	6
Mycogen/S74	44	.	.	.	.	31	2	3
Public/DAWSON,0-CK*	43	41	44	34.8	17.0	32	4	0
G.Country/TRACKER	43	44	.	36.3	16.5	26	2	- 4
G.Country/RAYDOR	43	.	.	.	.	33	2	7
Ciba/3075	43	.	.	.	.	28	2	- 4
Public/SD(N)93-5721	43	.	.	.	.	33	2	6
Dekalb/CX096	43	41	44	35.4	16.6	39	3	5
Payco/0010	43	41	44	35.8	16.6	38	3	6
Kruger/K0606+	43	.	.	.	.	33	3	3
Top Farm/TF6096	42	.	.	.	.	32	2	4
Dairyland/DSR-068	42	45	46	36.4	16.6	32	3	- 1
Northrup King/S08-80	41	.	.	.	.	35	3	7
Croplan Genet./L0946	41	.	.	.	.	36	4	6
Public/SD(N)93-6072	40	.	.	.	.	34	2	2
Arrowhead/8450	40	40	43	36.8	16.5	36	4	6
Arrowhead/8460	40	.	.	.	.	35	3	6
Public/SD93-1298	40	.	.	.	.	34	2	5
Dairyland/DSR-035	40	.	.	.	.	29	2	- 3
Mycogen/5091	40	.	.	.	.	32	2	2
Public/MC CALL,00-CK*	39	35	34	35.2	16.6	33	3	-12
Sexauer/SX-0832	38	40	43	36.3	16.6	36	3	5
Mustang/M-0880	37	40	43	34.9	17.6	32	3	7
Public/Glacier	37	.	.	.	.	27	4	-11
Sexauer/SX-0771	36	.	.	.	.	32	3	6
Croplan Genet./L0727	35	.	.	.	.	30	2	6
Public/Council	34	36	40	35.9	16.9	31	2	4
Test average:	45	45	46	35.5	16.9	32	3	2
LSD(5%) value:	4	6	5					
CV:	6	6	6					

* CK = Check variety for the indicated maturity group.

$ Earlier (-), equal to (0), or later than the check - dawson.

1 = Excellent, 5 = Poor.

Table 8. Soybean maturity group-I trial, seeded may 24, 1996.

-- Brand / Entry ---	Yield '96	Yield 2Yr	Yield 3Yr	1995# Prot.	1995# Oil	1996 Ht.	1996 Ldg.# Res.	1996 Mat.$
	Bu/A	Bu/A	Bu/A	%	%	in.		days
Stine/1970	49	47	.	34.2	16.4	34	.	3
Kruger/K2020	49	.	.	.	.	36	.	0
Prairie Br./PB-197	49	48	.	34.3	16.0	36	.	2
Dekalb/CX145	49	48	.	35.6	16.6	32	.	- 4
Dyna-Gro/UAPX 195	49	.	.	.	.	29	.	- 7
Ciba/3103	48	48	.	35.9	16.4	32	.	- 6
Ciba/3144	47	46	50	35.6	16.9	30	.	- 1
DeSoy/D1313+	47	48	.	34.9	17.5	38	.	0
ProfiSeed/PS145	47	48	.	35.8	16.8	34	.	0
Kruger/K1929	47	.	.	.	.	37	.	1
G.Country/GOODWIN	47	.	.	.	.	32	.	0
Pioneer/9151	46	50	.	34.2	18.3	29	.	- 3
Mycogen/5143	46	.	.	.	.	35	.	- 1
Garst/D138	46	47	50	35.4	16.9	34	.	- 4
Sexauer/SX-1871	46	.	.	.	.	32	.	1
Prairie Br./PB-143	46	.	.	.	.	31	.	0
Stine/0470	46	.	.	.	.	30	.	- 7
Kruger/K1990	46	47	51	35.5	16.5	35	.	1
Kruger/K1909	46	45	49	33.3	16.4	34	.	2
Prairie Br./PB-166	46	46	.	33.9	16.3	31	.	0
Stine/1073	46	.	.	.	.	31	.	- 3
AgriPro/AP1995	45	46	.	33.0	16.7	33	.	3
Kruger/K2025	45	45	.	33.0	16.9	32	.	2
Kruger/K1414+	45	.	.	.	.	33	.	1
Sexauer/SX-1471	45	.	.	.	.	34	.	1
Public/SL92-1763M*	45	45	.	35.7	16.6	35	.	1
Sands/SOI 177	45	.	.	.	.	32	.	1
Mustang/M-1160	45	.	.	.	.	32	.	1
ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD GROUP FOR 1996								
Payco/9419	44	45	48	34.3	16.9	33	.	1
Arrowhead/8470	44	.	.	.	.	32	.	- 3
Mustang/M-1144	44	46	.	35.1	16.2	36	.	0
Kruger/K2029	44	.	.	.	.	32	.	2
Kruger/K1819	44	46	52	34.6	16.4	35	.	1
Golden Harv./H-1140	44	46	49	36.7	16.1	35	.	0
Stine/1570	44	45	50	34.4	16.7	34	.	1
Stine/1470	44	46	.	35.2	16.1	34	.	1
Stine/1980	44	.	.	.	.	31	.	3
Mustang/M-1122	44	45	49	34.4	17.3	31	.	0
Public/PARKER,I-CK*	43	45	47	35.2	16.7	36	.	0
Sexauer/SX-1432	43	44	.	35.4	16.2	38	.	- 1
Croplan Genet./L1100	43	.	.	.	.	35	.	0
G.Country/KANDI	43	.	.	.	.	33	.	0
Mycogen/111	43	46	.	34.9	17.1	32	.	- 2
Golden Harv./H-1194	43	43	.	33.6	16.6	34	.	2
Pioneer/9172	43	.	.	.	.	33	.	1

Table 8. Soybean Maturity group-I trial, (continued)

--- Brand / Entry ---	Yield '96	Yield 2Yr	Yield 3Yr	1995# Prot.	1995# Oil	Ht.	1996 Ldg.# Res.	1996 Mat.$
	Bu/A	Bu/A	Bu/A	%	%	in.		days
Pioneer/9163	43	.	.	.	.	35	.	0
Garst/D111	43	43	.	34.7	18.0	39	.	- 4
Public/SD93-1037	43	.	.	.	.	38	.	- 4
Payco/9514	43	44	.	36.5	16.4	35	.	1
Public/Hardin	43	41	44	36.4	16.3	39	.	0
Public/IA1006	42	.	.	.	.	34	.	1
Stine/1690	42	45	.	32.8	16.8	33	.	3
Dekalb/CX173	42	.	.	.	.	38	.	1
AgriPro/AP1394	42	.	.	.	.	36	.	- 6
Kruger/K1777+	42	.	.	.	.	33	.	3
G.Country/BOYD 95	42	.	.	.	.	34	.	- 4
Payco/9619	42	.	.	.	.	32	.	2
Prairie Br./PB-214E	42	.	.	.	.	34	.	3
Mycogen/5100	42	.	.	.	.	37	.	- 5
Dairyland/DSR-133	42	42	.	35.1	17.1	35	.	0
Mycogen/5181	41	.	.	.	.	31	.	0
Mustang/M-1133	41	43	.	35.3	16.9	35	.	0
Public/STURDY,II-CK*	41	41	45	34.8	16.3	35	.	2
Public/SD93-490	41	.	.	.	.	40	.	1
Dairyland/DSR-173	41	.	.	.	.	35	.	1
Public/SD93-1387	40	.	.	.	.	33	.	0
Public/DAWSON,O-CK*	40	42	40	36.0	16.8	32	.	- 7
Public/Freeborn-SCN	40	.	.	.	.	34	.	1
Dekalb/CX121	39	43	44	35.0	17.1	38	.	- 2
Public/Granite	39	41	45	34.9	16.6	35	.	3
Public/SD93-986M*	39	42	.	36.4	16.3	36	.	2
Kruger/K1716	39	.	.	.	.	33	.	2
Dairyland/DSR-178	39	40	.	33.8	16.8	38	.	2
Public/M89-936	39	.	.	.	.	39	.	- 3
Public/Bert	38	39	42	34.2	16.9	36	.	0
Public/SD93-905M*	38	.	.	.	.	36	.	2
Ehrich/1505	36	.	.	.	.	34	.	1
Public/Fairbault-SCN	36	.	.	.	.	32	.	2
Public/SD93-472	36	.	.	.	.	37	.	2
Public/SD93-60M*	35	.	.	.	.	35	.	- 3
Public/Bell-SCN	35	36	40	34.5	16.8	32	.	3
Public/Kasota	35	36	40	35.4	16.9	33	.	1
Public/SD93-574	35	.	.	.	.	40	.	1
Public/Leslie	34	34	39	34.3	17.4	34	.	2
Public/SD93-1534	34	.	.	.	.	32	.	2
Test average:	43	44	46	34.9	16.7	34	.	0
LSD(5%) Value:	4	4	5					
CV:	5	6	6					

* CK = Check variety for the indicated maturity group.
$ Earlier (-), equal to (0), or later than the check - parker.
# 1 = Excellent, 5 = Poor.

15" vs 30" Row Spacing Effect on Corn Hybrid Yield

Zeno Wicks III and Craig Converse

Introduction: There has been an increasing interest in narrow row spacing (less than 30 inches) over the last few years. The purpose of this experiment is to evaluate 15 inch narrow rows compared to conventional 30 inch rows in South Dakota. Very little research has been done in South Dakota to determine the effectiveness of planting corn in narrower rows. Research done in the surrounding states has showed that the larger more consistent yield responses have seemed to occur in the northern cornbelt. Most studies have shown anywhere from 0-10% yield increase by narrowing corn rows down to 15 inches. This is the first year of a three year study for my graduate research project.

Methods: Five Pioneer hybrids were chosen to represent different genetic backgrounds and maturity. The study was set up as a Randomized Complete Block Design, replicated three times. Six 15 and 30 inch rows were planted in 27.5 foot rows and were thinned to a population of 25,344 plants/acre. A six row John Deer flex planter was used to plant the 15 inch rows due to the ability of the planter units to be narrowed to 15 inches. The 30 inch rows were planted with a two row John Deer Max Emerge planter because of the time involved to move the planter units and adjust the planting population. Northeast Farm was planted May 29, thinned to the correct population on July 9 and harvested on October 31, 1996.

The center four rows were harvested in the 15 inch plots and the center two rows were harvested in the 30 inch plots to represent the same amount of acres and the same number of plants. The plots were harvested with a Gleaner combine that has a 30 inch head and is equipped with an electronic weigh bucket and moisture tester. There was some difficulty in harvesting the narrow row 15 inch plots with the 30 inch head, the ears not picked up by the combine head were hand harvested and placed into the combine after each plot.

Results and Discussion: Table 1 shows the results of this experiment. There was no significant difference in the average yield or moisture content between 15 and 30 inch rows over the entire five hybrids. The 15 inch rows did have an average of 5% less stalk breakage perhaps due to increased stalk strength from having the plants at greater distances from each other.

Table 1. 1996 Harvest Information. Northeast Research Farm; Watertown SD; 1996

Hybrid	Row Spacing	%Moisture	%Broken Stalks	Yield in bu/ac
P3559	15	30.7	12	127.15
P3559	30	31.0	14	126.47
P3563	15	27.1	28	77.90
P3563	30	27.2	36	76.19
P3730	15	26.8	17	119.46
P3730	30	25.2	27	116.64
P3733	15	26.7	14	107.11
P3733	30	25.3	17	113.02
P3751	15	26.6	8	124.03
P3751	30	27.5	10	123.50
Overall	15	27.58	16	111.13
Average	30	27.24	21	111.16

Oat Research

Dale Reeves and Lon Hall

This location is usually our best yielding location for our oat trials. However, yields were lower this year due to late planting. We usually have about 1000 oat plots on the farm. In addition, we have the Mississippi Valley Barley Regional nursery with 36 entries. Cooperative studies are also done with the extension pathologist where we plant and harvest the oat and barley foliar fungicide tests.

The primary thing we look for in potential releases is the ability to consistently produce high yields and good quality grain. In order to do that, they must stand well, have good disease resistance and the ability to tolerate climatic differences. The biggest problems this year were late planting and crown (leaf) rust. Some other characteristics that we consider are Barley Yellow Dwarf resistance, protein and oil percent and hull percent.

Nine different oat tests were at this location this year. The Uniform Midseason Regional Performance Nursery had 36 entries from 11 different states. This test has some of the best lines from these various breeding programs. The highest yield was 109 bu/A while the lowest was 45. Test weights ranged from 39.1 to 27.7. The best lines in this test are the ones that get released as new varieties.

The Cooperative naked oat trial has been grown here the last few years. The biggest problems with hulless oats in this area is that most don't have resistance to crown (leaf) rust. Yields here ranged from 62 bu/A for Paul down to 0.5 for an experimental line which was quite rust susceptible. The best hulless lines yield about the same number of pounds of groats per acre as better standard varieties.

We had five experimental lines in the standard variety oat trial this year. They yielded from 70 to 87 bu/A and had test weights from 36 to 39 lbs/bu.

1996 Canola Variety Evaluations

Kathleen A. Grady

Objective: Evaluate performance of canole varieties under South Dakota growing conditions.

Methods: Canola varieties were evaluated at two northeastern South Dakota locations in 1996. Twenty Argentine (*Brassica napus*) and four Polish (*B. rapa*) varieties (Table 1) were planted at Webster, SD on April 19 and at the Watertown Northeast Research Station on May 21, 1996. The Watertown planting date was later than desired or recommended for planting canola in South Dakota, but the field was too wet to plant any earlier.

Experimental design was a randomized complete block with four replications. Plots consisted of seven rows fourteen feet long, rows spaced seven inches apart. Stands were good at both locations. The growing season in northeast South Dakota began with a surplus of topsoil and subsoil moisture and cooler than normal temperatures from planting through early June. Soil moisture was adequate for most of the remainder of the season. Temperatures remained slightly below normal except for two periods of hot, humid weather in mid and late June.

Notes were taken on days from planting to 10% flower, end of flowering, and maturity. Plant height was measured at maturity and lodging was rated on a scale of one to nine, where 1 = no lodging and 9 = all plants lodged, immediately prior to harvest.

Light hail damaged the Watertown plots after the earliest varieties had been harvested. The hail caused significant shattering of mature pods in the remaining unharvested entries. Percent shatter was estimated for each plot at both locations immediately prior to harvest. All plots were straight-combined with a Hege plot combine. Plots were harvested on several different dates due to maturity differences among varieties.

After weighing, seed from all four replications of each variety was bulked, keeping locations separate. An oil sample from the bulked seed of each variety at each location was sent to Jim Hanzel at North Dakota State University for oil analysis.

Results and Discussion: Seed yield, oil percent, days from planting to the beginning and end of flowering, maturity, plant height, lodging and shattering data for the twenty-four canola varieties are presented in Tables 2-4. The average yield across all varieties was 1819 lbs/A at Webster and 1237 lbs/A at the Watertown NE Research Station.

The yields of the later-maturing Argentine varieties were generally better than those of the earlier-maturing Polish varieties at Webster, which was planted at a normal planting date (Table 2). At Watertown, however, the Polish varieties out-yielded many of the Argentines (Table 3). This was probably due to several factors. Watertown was planted late, and late planting dates tend to favor earlier-maturing varieties. Also, the Polish varieties were harvested before the hailstorm that damaged (shattered) the remaining plots. Shattering at Watertown ranged from 0% for the Polish varieties to 66% for the variety Hudson (Table 3).

Plant heights were about five inches taller at Watertown than at Webster, and lodging and shattering were greater at Watertown (Tables 2 and 3). Plants flowered and matured quicker at Watertown, probably because of the later planting date. Oil values were similar at the two locations.

Table 1. List of canola varieties tested in 1996 South Dakota Trials.

Variety	Company entering
Hudson (M1-9099)	AgriProgress Inc., PO Box 2499, Morden, Manitoba, ROG 170
PF 7041 191	AgriProgress Inc., PO Box 2499, Morden, Manitoba, ROG 170
Mari	Brett-Young Seeds Ltd.,PO Box 99, St. Norbert, MB, R3V 1L5
OAC Springfield	Cloutier Agra Seeds Inc., 3497 Pembina Hwy., Winnipeg, MB R3V 1A4
HN 9460	Hungnong Seed America, 3065 Pacheco Pass Hwy., Gilray, CA 95020
HN 9520	Hungnong Seed America, 3065 Pacheco Pass Hwy., Gilray, CA 95020
HN 9523	Hungnong Seed America, 3065 Pacheco Pass Hwy., Gilray, CA 95020
Ebony	Limagrain Canada, 411 Downey Rd Unit 4, Saskatoon, Sask. S7N 4L8
Pearl	Limagrain Canada, 411 Downey Rd Unit 4, Saskatoon, Sask. S7N 4L8
LG 3260	Limagrain Canada, 411 Downey Rd Unit 4, Saskatoon, Sask. S7N 4L8
LG 3310	Limagrain Canada, 411 Downey Rd Unit 4, Saskatoon, Sask. S7N 4L8
LG 3369	Limagrain Canada, 411 Downey Rd Unit 4, Saskatoon, Sask. S7N 4L8
PSL 121	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
PSL 124	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
PSL 9403	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
Sponsor	Svalof Weibull Seed, 208 St. David Street, Lindsay, Ontario K9V 5Z4
Hyola 308	Zeneca Seeds, Unit 6-75 Scurfield Blvd, Winnipeg, Manitoba R3Y 1P6
Hyola 330	Zeneca Seeds, Unit 6-75 Scurfield Blvd, Winnipeg, Manitoba R3Y 1P6
Hyola 401	Zeneca Seeds, Unit 6-75 Scurfield Blvd, Winnipeg, Manitoba R3Y 1P6
Hyola 420	Zeneca Seeds, Unit 6-75 Scurfield Blvd, Winnipeg, Manitoba R3Y 1P6
BOR 4105	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
Hysyn 110	Zeneca Seeds, Unit 6-75 Scurfield Blvd, Winnipeg, Manitoba R3Y 1P6
Tobin	Check
Reward	Check

Table 2. Results of the 1996 canola variety trial grown at Webster, SD.

Entry No.	Variety	Seed Yield (lbs/A)	Yield Rank	Oil (%)	Days from planting to: 10% Flwr	End Flwr	Maturity	Plant Height (in.)	Lodging (1-9)	Shatter (%)
Brassica napus (Argentine) varieties:										
1	Hudson (M1-9099)	1578	21	42.1	56	73	102	31	2.3	21.3
2	PF 7041 191	1647	17	41.6	58	74	106	35	2.0	1.8
3	Mari	2105	5	41.8	60	74	104	37	1.5	3.8
4	OAC Springfield	1644	18	42.0	56	72	104	35	2.8	3.5
5	HN 9460	2212	1	43.8	58	74	105	35	2.0	3.5
6	HN 9520	1942	9	41.1	56	75	104	33	2.3	11.3
7	HN 9523	1955	8	41.8	59	76	106	35	2.5	3.0
8	Ebony	2174	3	42.7	60	76	109	37	1.8	3.3
9	Pearl	1708	15	40.7	59	78	107	37	2.5	11.0
10	LG 3260	1654	16	43.5	58	73	103	33	3.0	5.3
11	LG 3310	1921	10	42.0	57	75	105	34	2.3	4.3
12	LG 3369	1570	22	44.1	57	73	105	35	3.0	2.5
13	PSL 121	2024	6	40.9	59	77	108	30	3.3	5.0
14	PSL 124	2022	7	41.1	59	77	106	36	1.3	2.5
15	PSL 9403	1750	13	41.9	62	78	110	38	3.5	4.5
16	Sponsor	2197	2	41.3	59	75	105	37	1.5	1.0
17	Hyola 308	1734	14	41.0	52	70	93	31	3.3	10.0
18	Hyola 330	2115	4	40.6	55	70	103	31	2.8	4.5
19	Hyola 401	1845	12	42.2	55	71	102	30	2.3	5.0
20	Hyola 420	1901	11	41.8	55	71	102	34	2.5	7.8
B. rapa (Polish) varieties:										
21	BOR 4105	1587	20	39.8	49	69	88	34	2.5	0.0
22	Hysyn 110	1598	19	40.8	49	69	87	31	3.0	0.0
23	Tobin	1403	23	40.0	50	70	89	32	2.3	0.0
24	Reward	1385	24	41.8	49	69	89	33	4.0	0.0
	Mean	1819		41.7	56	73	102	34	2.5	4.8
	LSD .05	333			1	1	2	3	1.3	5.0
	C.V.	13.0			1.0	1.0	1.5	5.6	37.2	74.3

Planted on April 19, 1996.

Table 3. Results of the 1996 canola variety trial grown at the Watertown Northeast Research Station.

Entry No.	Variety	Seed Yield (lbs/A)	Yield Rank	Oil (%)	Days from planting to: 10% Flwr	End Flwr	Maturity	Plant Height (in.)	Lodging (1-9)	Shatter (%)
B. napus (Argentine) varieties:										
1	Hudson (M1-9099)	848	24	40.8	40	60	85	38	2.5	66.3
2	PF 7041 191	1341	8	42.1	42	64	89	40	5.3	8.0
3	Mari	1228	13	41.8	45	68	91	44	4.3	6.8
4	OAC Springfield	869	22	42.1	39	59	87	36	5.5	23.8
5	HN 9460	1126	15	42.2	42	71	94	46	6.3	4.0
6	HN 9520	959	21	39.5	39	70	91	38	5.5	20.8
7	HN 9523	1304	9	41.3	40	70	95	40	6.0	3.8
8	Ebony	1509	5	43.8	43	65	91	41	3.5	4.5
9	Pearl	1116	17	40.9	42	66	88	43	5.3	16.3
10	LG 3260	851	23	41.3	39	59	86	35	4.0	46.3
11	LG 3310	1035	19	41.7	42	66	89	39	6.0	17.5
12	LG 3369	1288	10	43.0	40	61	90	40	5.5	6.0
13	PSL 121	1509	6	41.6	40	62	88	37	3.3	8.0
14	PSL 124	1279	11	41.6	42	64	89	43	3.5	9.5
15	PSL 9403	1233	12	43.3	43	66	91	39	3.5	2.5
16	Sponsor	1556	4	41.9	43	66	91	45	3.0	3.3
17	Hyola 308	1593	2	41.0	36	55	81	33	5.3	4.8
18	Hyola 330	1102	18	42.2	38	55	85	36	4.5	32.5
19	Hyola 401	1003	20	40.9	38	57	87	34	6.0	28.8
20	Hyola 420	1163	14	42.5	39	57	86	37	3.8	13.8
B. rapa (Polish) varieties:										
21	BOR 4105	1730	1	40.7	33	51	74	37	4.3	0.0
22	Hysyn 110	1582	3	40.3	32	52	74	37	4.5	0.0
23	Tobin	1344	7	39.8	32	52	73	34	5.0	0.0
24	Reward	1125	16	40.4	33	52	74	33	7.0	0.0
	Mean	1237		41.5	39	61	86	39	4.7	13.8
	LSD .05	375			1	2	2	4	2.3	11.6
	C.V.	21.5			1.3	2.0	1.9	8.0	34.2	60.4

Planted on May 21, 1996.

Light hail fell on the plots on August 21, 1996, after the following varieties had been harvested: BOR 4105, Hysyn 110, Tobin, Reward, and Hyola 308. The hail caused considerable shattering of mature pods in the remaining entries.

Table 4. Results of the 1998 canola variety trial averaged over Webster and Watertown, SD.

Entry No.	Variety	Seed Yield (lbs/A)	Yield Rank	Oil	Days from planting to: 10% Flwr	End Flwr	Maturity	Plant Height (in.)	Lodging (1-9)	Shatter (%)
B. napus (Argentine) varieties:										
1	Hudson (M1-9099)	1213	24	41.5	48	67	93	35	2.4	43.8
2	PF 7041 191	1494	13	41.9	50	69	97	37	3.6	4.9
3	Mari	1667	5	41.8	53	71	97	41	2.9	5.3
4	OAC Springfield	1256	21	42.1	48	65	95	35	4.1	13.6
5	HN 9460	1669	4	43.0	50	72	100	41	4.1	3.8
6	HN 9520	1450	16	40.3	47	72	97	36	3.9	16.0
7	HN 9523	1629	9	41.6	49	73	100	37	4.3	3.4
8	Ebony	1842	2	43.3	52	71	100	39	2.6	3.9
9	Pearl	1412	19	40.8	50	72	98	40	3.9	13.6
10	LG 3260	1252	23	42.4	48	66	94	34	3.5	25.8
11	LG 3310	1478	15	41.9	50	70	97	36	4.1	10.9
12	LG 3369	1429	17	43.6	49	67	98	37	4.3	4.3
13	PSL 121	1766	3	41.3	50	69	98	34	3.3	6.5
14	PSL 124	1651	8	41.4	50	70	98	40	2.4	6.0
15	PSL 9403	1491	14	42.6	53	72	101	38	3.5	3.5
16	Sponsor	1876	1	41.6	51	71	98	41	2.3	2.1
17	Hyola 308	1664	6	41.0	44	62	87	32	4.3	7.4
18	Hyola 330	1608	10	41.4	46	62	94	34	3.6	18.5
19	Hyola 401	1424	18	41.6	46	64	95	32	4.1	16.9
20	Hyola 420	1532	12	42.2	47	64	94	35	3.1	10.8
B. rapa (Polish) varieties:										
21	BOR 4105	1658	7	40.3	41	60	81	36	3.4	0.0
22	Hysyn 110	1590	11	40.6	40	60	80	34	3.8	0.0
23	Tobin	1373	20	39.9	41	61	81	33	3.6	0.0
24	Reward	1255	22	41.1	41	61	82	33	5.5	0.0
	Mean	1528		41.6	48	67	94	36	3.6	9.2
	LSD .05	ns			2	6	3	4	ns	19.5
	C.V.	16.4			1.1	1.5	1.7	7.0	36.5	68.9

1996 Flax Variety Trials

Kathleen A. Grady

A yield trial of released flax varieties and experimental lines from SD, ND and Canada was grown at the Watertown Northeast Research Station and two other locations in 1996. The purpose of the trial was to provide performance data on released varieties to producers and compare performance of experimental lines to established checks in order to identify possible new varieties.

In 1996, ten experimental lines from the SDSU flax breeding program were tested against seventeen named varieties (checks) and eleven advanced lines from ND or Canada. There was both an early- end late-seeded trial at Brookings. The early trial was planted on April 26 and the late trial on May 20, 1996. The test at Watertown was planted on May 21 and at Webster on April 19, 1996.

Experiment design was a randomized complete block with three replications. Plots consisted of seven rows 14.5 ft. long, with rows spaced seven in. apart. Stands were fair to good at all locations. There was considerable lodging of some plots at Watertown. Lodging was rated on a scale from one to nine, with one being no plants lodged and nine being all plants lodged.

The growing season in east central and northeast South Dakota began with a surplus of topsoil and subsoil moisture and cooler than normal temperatures through early June. Soil moisture was adequate for most of the remainder of the season. Temperatures remained slightly below normal except for two periods of hot, humid weather in mid and late June.

The plots at all locations were harvested by cutting the middle three rows of each plot with a bundle cutter, then drying and threshing the bundles. Seed yield data on the 38 entries in the test are presented in Table 1 and agronomic data are in Table 2. The average yield across all varieties at all locations was 31.7 bu/A and the average oil content was 38.7%. The highest yielding check variety in 1996 was Flanders (35.5 bu/A). The highest yielding experimental was CI 3396, which yielded 34.9 bu/A.

Table 1. Seed yield of flax varieties and experimental lines grown in the 1996 South Dakota Tristate test.

Entry	Variety	Origin -Year	Seed Yield (bu/A)					Yield Rank
			Brkgs	Wtrtwn	Webstr	Late	Mean	
1	Linott	CAN-66	30.0	30.6	26.8	28.5	28.9*	37
2	Dufferin	CAN-75	26.6	38.6*	36.4*	30.1	32.9*	12
3	Flor	ND-81	30.0	29.4	33.8*	29.2	30.5*	29
4	McGregor	CAN-82	30.0	37.8*	31.0	30.2	32.2*	16
5	Rahab	SD-85	30.1	32.6	28.4	31.3	30.6*	28
6	Linton	ND-85	26.0	34.8	36.1*	26.7	30.9*	25
7	Neche	ND-88	24.4	39.5*	31.8	32.2	31.9*	19
8	Prompt	SD-89	27.8	38.0*	36.7*	29.3	32.9*	13
9	Day	SD-90	28.6	28.8	29.2	26.8	28.3*	38
10	Omega	ND-90	29.3	28.3	33.5*	27.7	29.7*	33
11	Somme	CAN-90	31.7*	26.0	33.7*	28.2	29.8*	31
12	Linora	CAN-92	27.4	37.6*	27.1	32.2	31.0*	24
13	Flanders	CAN-90	34.5*	36.8*	34.9*	36.2*	35.5*	1
14	Rahab 94	SD-94	26.5	28.1	32.5	29.3	29.1*	36
15	McDuff	CAN-93	27.8	41.3*	24.7	34.3*	32.0*	18
16	Verne 93	SD-93	28.2	30.3	30.8	34.2*	30.8*	26
17	AC Emerson	CAN-95	33.7*	42.8*	25.5	30.4	33.0*	9
18	CI 3327	ND-exp.	30.4	38.5*	32.2	30.9	32.9*	10
19	CI 3330	ND-exp.	33.0*	34.9	33.3*	29.8	32.7*	14
20	CI 3332	CAN-exp.	31.7*	34.6	30.8	28.6	31.4*	21
21	CI 3351	SD-exp.	29.0	33.3	26.0	30.7	29.7*	32
22	CI 3353	SD-exp.	29.5	40.0*	31.2	31.7	33.1*	8
23	CI 3355	SD-exp.	27.4	37.2*	34.5*	26.1	31.2*	23
24	CI 3356	SD-exp.	30.9*	34.3	29.9	36.9*	32.9*	11
25	CI 3358	ND-exp.	30.4	37.4*	30.7	30.0	32.1*	17
26	CI 3360	ND-exp.	29.9	32.5	35.3*	35.0*	33.1*	6
27	CI 3361	ND-exp.	29.9	31.8	30.0	33.9*	31.3*	22
28	CI 3393	SD-exp.	30.5	35.3*	34.2*	32.7*	33.1*	7
29	CI 3394	ND-exp.	29.9	31.1	31.6	26.1	29.7*	34
30	CI 3395	ND-exp.	34.0*	36.0*	33.7*	29.5	33.3*	5
31	CI 3396	ND-exp.	30.5	43.7*	34.4*	31.3	34.9*	2
32	CI 3397	CAN-exp.	29.6	31.5	28.8	32.7*	30.6*	27
33	CI 3398	CAN-exp.	27.1	37.5*	29.0	28.4	30.4*	30
34	CI 3401	SD-exp.	23.1	40.9*	37.5*	29.2	32.6*	15
35	CI 3402	SD-exp.	27.3	38.0*	39.7*	29.6	33.6*	4
36	CI 3403	SD-exp.	35.4*	29.5	33.8*	27.5	31.5*	20
37	CI 3404	SD-exp.	34.6*	35.2*	39.0*	29.2	34.4*	3
38	CI 3405	SD-exp.	25.7	30.9	30.3	29.5	29.1*	35
	MEAN		29.5	34.9	32.1	30.4	31.7	
	LSD .05		4.8	8.8	6.5	4.4	ns	
	C.V.		10.0	15.4	12.4	8.9	12.9	

* Indicates a variety that is in the top-yielding group at that location, based on the LSD .05.

Table 2. Oil and agronomic traits of flax varieties and experimental lines grown in the 1996 South Dakota Tristate test.

Entry	Variety	Origin -Year	Oil (%)				Days to Flower	Mean Height	Wtrtwn Lodging
			Bkgs	Wat.	Web.	Mean	Brkgs	(cm)	(1-9)
1	Linott	CAN-	38.7	37.3	37.8	37.9	60	54	3.5
2	Dufferin	CAN-	39.3	38.6	38.1	38.7	60	57	1.8
3	Flor	ND-81	38.1	36.8	37.5	37.5	62	55	3.5
4	McGregor	CAN-	38.9	37.3	37.3	37.8	61	55	2.1
5	Rahab	SD-85	39.6	39.2	37.7	38.8	60	53	0.0
6	Linton	ND-85	38.0	37.9	36.9	37.6	59	51	2.2
7	Neche	ND-88	39.3	38.2	37.5	38.3	60	54	0.0
8	Prompt	SD-89	39.5	37.8	38.2	38.5	61	52	0.9
9	Day	SD-90	40.7	40.0	39.0	39.9	59	55	3.3
10	Omega	ND-90	39.8	38.2	38.5	38.8	64	55	2.7
11	Somme	CAN-	38.5	36.4	37.8	37.5	61	53	5.3
12	Linora	CAN-	39.7	38.7	39.1	39.2	65	59	2.6
13	Flanders	CAN-	40.2	38.8	38.4	39.1	61	53	1.4
14	Rahab 94	SD-94	39.8	38.9	38.3	39.0	60	52	1.3
15	McDuff	CAN-	41.0	40.7	40.3	40.7	61	56	0.7
16	Verne 93	SD-93	39.7	37.5	38.2	38.5	61	54	3.3
17	AC Emerson	CAN-	38.4	37.2	36.6	37.4	61	56	1.9
18	CI 3327	ND-	40.2	39.9	38.7	39.6	63	56	0.4
19	CI 3330	ND-	39.0	37.3	37.4	37.9	60	55	2.5
20	CI 3332	CAN-	38.8	37.9	37.4	38.0	62	54	2.2
21	CI 3351	SD-	39.1	37.7	38.5	38.4	61	55	2.2
22	CI 3353	SD-	38.9	38.1	37.8	38.3	61	56	2.6
23	CI 3355	SD-	40.0	39.0	39.4	39.4	60	55	1.3
24	CI 3356	SD-	39.7	38.6	39.0	39.1	61	55	1.4
25	CI 3358	ND-	39.9	38.4	39.0	39.1	60	56	2.1
26	CI 3360	ND-	38.8	37.0	37.8	37.9	62	54	1.3
27	CI 3361	ND-	38.8	36.9	37.3	37.6	60	53	2.7
28	CI 3393	SD-	39.6	39.2	38.7	39.2	60	55	0.9
29	CI 3394	ND-	39.4	38.0	38.3	38.6	61	55	1.7
30	CI 3395	ND-	39.0	38.2	37.6	38.2	60	55	2.5
31	CI 3396	ND-	38.5	36.8	36.4	37.2	62	56	0.2
32	CI 3397	CAN-	39.5	37.6	38.4	38.5	61	53	2.6
33	CI 3398	CAN-	38.5	37.3	36.8	37.5	61	54	0.3
34	CI 3401	SD-	40.4	39.3	38.9	39.5	61	54	2.1
35	CI 3402	SD-	40.4	39.0	39.0	39.5	61	53	1.5
36	CI 3403	SD-	41.9	40.7	41.5	41.4	64	60	2.7
37	CI 3404	SD-	39.9	38.3	38.2	38.8	62	55	1.4
38	CI 3405	SD-	41.2	40.3	40.1	40.5	61	52	2.8
	MEAN		39.5	38.3	38.2	38.7	61	55	1.9
	LSD .05		0.8	0.8	0.7	0.6	1	ns	2.1
	C.V.		1.2	1.3	1.1	1.3	1.2	6.8	67.0

Fertilizer and Soil Test Effects on Soybean Yield

Jim Gerwing, Ron Gelderman, Allen Heuer, and Anthony Bly

Introduction: Soil testing research has shown that knowledge of soil test levels can improve the profitability of fertilizer use. Profits increase if more fertilizer is used when soil test levels are low and less or no fertilizer is used when test levels are high. It is still a common practice, however, to apply fertilizer without a current soil test. Frequently all the major nutrients (N P K) and sometimes zinc are used. This experiment was initiated to demonstrate the effects of applying N P K and Zn regardless of soil test. The intent is to continue the experiment on the same location at the NE experiment station for a number of years. The planned rotation is soybean, wheat and corn. The objective is to demonstrate soil testings' ability to predict crop response to fertilizer.

Materials and Methods: The site selected at this NE Experiment Station is a nearly level silty clay loam soil (Brookings) which is common to North East South Dakota. Soil test results from samples taken in April, 1996 are listed in Table 1. The phosphorus and zinc soil test were medium and the potassium test very high although just into the very high range. The nitrate soil test was high also. No nitrogen would have been recommended for soybeans. The sulfur soil test was medium. No sulfur would have been recommended on this site. The previous crop (1995) was soybeans.

Fertilizer treatments are listed in Table 2. The "check" treatment consisted of 50 lb/a each of nitrogen and potassium, 40 lb/a of phosphorus and 5 pounds/a of zinc. Each subsequent treatment received three of the four nutrients allowing a comparison of the "full" fertilizer program to a treatment lacking one individual nutrient. Fertilizer was broadcast on June 3 and incorporated. Soybeans (Dawson variety) were drilled into the plots on June 4 resulting in a good stand.

Plot size was 15 feet by 60 feet. Plots were replicated 4 times. Soybeans were harvested with a small plot combine.

Results and Discussion: Soybean yields ere listed in Table 2. A good growing season resulted in 32 bushel soybeans at the site even though planting date was late (June 3). None of the fertilizer treatments (nitrogen, phosphorus, potassium or zinc) increased yields. This would have been predicted for nitrogen, potassium and zinc since soybeans are legumes and don't need additional nitrogen, the potassium soil test was very high, and soybeans do not regularly respond to zinc. A response to phosphorus would have been possible since soil test levels were medium (9 ppm P). At this soil test level, however, the long-term probability of response is only between 40 and 60% and therefore is not expected to happen every year.

The site will be rotated to wheat in 1997. Similar fertilizer treatments (N rate will change) will be applied to the same plots in 1997.

Table 1. Soil Tests[1] for Fertilizer Demo at Watertown Experiment Station, 1996

Nitrate-N, lb/a 2 feet:	100
Phosphorus, ppm Olsen:	9 (medium)
Potassium, ppm:	171 (very high)
Zinc, ppm:	0.55 (medium)
Sulfate-S, lb/a 2 feet:	27 (medium)
pH:	6.6
OM, %:	3.6
Salt, mmhos/cm:	0.40
Texture:	medium

[1] Sampled 5/20/96

Table 2. Fertilizer Treatments and Soybean Grain Yield Fertilizer, Demo, Watertown Station, 1996

Fertilizer				
N	P_2O_5	K_2O	Zn	Soybean Yield
----------lb/a----------				bu/a
50	40	50	5	32
0	40	50	5	31
50	0	50	5	32
50	40	0	5	33
50	40	50	0	31
CV %				11.4
Pr > F				0.96
LSD .05				5.5

Phosphorus and Potassium Starter Studies for Corn

Ron Gelderman,Jim Gerwing,Allen Heuer and Anthony Bly

Introduction: For many reasons farmers are utilizing no-till as a common production practice. Soil temperatures are usually cooler under no-till and growth response to planter applied phosphate should increase over tilled conditions. Data from Minnesota has shown response to banded potash from no-till or ridge till corn even under "high" K soil tests. However, the soil test K value at which yield responses no longer occur to starter K is not known. Studies utilizing P and K starters on no-till corn are limited in South Dakota. The objective of these studies is to determine yield responses and their relationship to soil tests for P and K starter under no-till.

Materials and Methods: This is the first year for this Northeast Research Station site and no-till planting conditions will not be established until the 1997 crop. The site selected at the station is a nearly level silty clay loam soil (Brookings) which is common to NE South Dakota. Relevant soil test results from samples taken in April, 1996 are listed in Table 1. Other tests were considered adequate except zinc which was medium. Adequate nitrate-N was available. The previous crop (1995) was soybeans.

Starter treatments are listed in Table 1. The material was applied in a separate band 2 inches to the side and 2 inches below the seed except for sulfur. The materials used were 10-34-0 (liquid) or 0-0-60 (dry). The sulfur treatment was broadcast applied as ammonium sulfate (21-0-0-24) soon after planting. All treatments had nitrogen rates balanced with broadcast applications of ammonium nitrate. Plot size was 15 feet by 60 feet. Plots were replicated 4 times. Plots were planted on May 22, 1996. Hybrid is given in Table 1. Recommended herbicides were applied as needed. Yields were determined by hand harvesting 3 sections of row each 20 feet long.

Results and Discussion: Corn yields are given in Table 1 for this site(Cod2) and four no-till sites with the same starter treatments. Very good yields (145 bu/a) were realized at this site. Corn borer caused significant stalk damage and some yield loss. The results show a significant P response of about 20 bu/acre to the 40 lb P2O5/a treatment. There was no K response nor a significant response to sulfur. This would have been predicted from the soil tests.

The other sites showed the following: McCook1 - a trend for higher yields existed if both P and K were applied but not if either were applied alone; McCook 2 - no differences were noted at this site; Lake - a trend for yield increase to starter P and significant response to starter K. There was significant stalk breakage where no K was applied; Cod1 - no differences were noted at this site that was limited slightly by dry growing conditions. The Cod2 site (NE station) will probably be planted to corn again in 1997 with the same treatments. All site data will be summarized after five years to determine any relationships that exist.

Table 1. Influence of starter fertilizer on corn yields, 1996

Starter Treatment[1]	SITE[2]				
N, P_2O_5 or K_2O	McCook1	McCook2	Lake	Cod1	Cod2
lbs/acre	Yields bu/a 15% moisture				
0-0-0 (CK)	194	166	128	119	120
12-40-0 (P)	197	165	137	123	139
0-0-40 (K)	192	146	146	113	118
12-40-40 (PK)	207	157	154	126	143
12-40-40-40 (PKS)	210	165	162	117	147
L.S.D.	11.6	17.9	12.2	13.1	15.3
Hybrid	Pio3751	Pio3751	Pio3751	Pio 3893	Pio 3893
Soil Tests					
Olsen P	30(VH)	8(M)	4(L)	9(M)	11(M)
K	482(VH)	248(VH)	303(VH)	191(VH)	163(VH)

[1]P and K treatments applied 2x2 at planting, sulfur broadcast.
[2]All sites were no-till except Cod2.

Alfalfa Cultivar Yield Test

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

Two alfalfa cultivar yield experiments were conducted at the NE station during 1996. One was planted May 12, 1993 and had 29 entries and a new experiment with 30 entries was planted May 22, 1996. Most of the alfalfa cultivars were entered by seed companies, whereas other entries were entered by plant breeders at SDSU and 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 NE South Dakota.

There was heightened concern for alfalfa stands following the winter of 1995/96. Widespread mortality of alfalfa stands occurred throughout eastern South Dakota. Few (if any) residents remember more damage than what became evident in 1996. The alfalfa yield experiment planted in 1993 was damaged so badly that yield data were not collected in 1996 and the study was terminated. Prior to termination, however, all the plots were visually rated for stand density on May 24, 1996 as a measure of alfalfa variety endurance to winter-related stress. The visual rating scale ranged from 0 to 10 with 0 designating a completely dead stand and 10 designating a full stand with a closed canopy. The average rating among the 29 entries was 1.1, indicating severe damage throughout the study. There were significant differences among cultivars. The experimental entry ABI9126 expressed the greatest visual rating and was significantly better than all other entries. Entries with mean ratings below 1.0 included 'Saranac AR', 'WL 322 HQ', 'Riley', 'WL 323', and 'MS92' (an experimental entry from Michigan State University). The remaining 23 varieties clustered together in a range from 1.0 to 1.6.

The new seeding was clipped once in mid July for weed suppression and was harvested on August 29 for yield data. Average yield for this single harvest was 0.97 T/A, and no significant differences were detected among cultivars. Yield data collected during the seeding year has limited usefulness for evaluation of alfalfa cultivars. Data collected in years subsequent to the first winter period after planting are more useful.

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 were 12 experimental entries in the terminated experiment and one in the new seeding. 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.

Forage yield and stand density ratings of 29 alfalfa cultivars planted May 12, 1993, at the Northeast Experiment Station, Watertown, SD. This experiment suffered extensive winterkill during the winter of 1995/96. Damage was such that collection of yield data was not warranted. Plots were visually rated for stand density on May 24, 1996. Cultivars are ranked by the 1996 stand density ratings.

Cultivar	1993 2-Cut Total	1994 4-Cut Total	1995 3-Cut Total	94 - 95 Average	% of 2-year Average	1995 Stand[a] Density	1996 Stand Density
	tons DM / acre				- % -	rating[a]	
AB9126 (experimental entry[b])	2.80	5.52	3.11	4.32	119	8.3	2.4
Majestic	2.37	5.43	2.49	3.96	109	6.8	1.6
Baker	2.30	4.46	1.92	3.18	88	6.3	1.5
SDHL1LLL (experimental entry)	1.65	3.93	2.17	3.05	84	7.1	1.5
SDHL1SSS (experimental entry)	1.64	3.80	2.02	2.91	80	7.6	1.5
Pioneer Brand 5262	2.58	5.45	2.81	4.13	114	8.3	1.4
ICI Brand 645	2.89	5.56	2.67	4.12	113	6.8	1.3
LegenDairy	2.02	5.05	2.59	3.82	105	8.0	1.3
Dominator	2.69	5.09	2.19	3.64	100	5.9	1.3
Complete (experimental entry)	2.51	5.58	2.76	4.17	115	7.8	1.2
Defiant (experimental entry)	2.48	5.34	2.76	4.04	111	7.3	1.2
Pioneer Brand 5246	2.20	5.29	2.76	4.03	111	8.0	1.2
SDHL1SSL (experimental entry)	2.08	4.58	2.25	3.42	94	7.8	1.2
Arrow	2.68	5.50	2.50	4.00	110	7.1	1.1
Pioneer Brand 5454	2.06	4.97	2.58	3.77	104	7.8	1.1
3452-ML	2.28	4.94	2.52	3.73	103	7.3	1.1
Dart	2.61	5.42	2.39	3.91	108	7.1	1.0
Dawn	2.60	5.18	2.37	3.78	104	6.8	1.0
AB8939 (experimental entry)	2.38	4.87	2.21	3.59	98	8.6	1.0
STX8 (experimental entry)	2.39	5.06	2.08	3.57	98	6.1	1.0
WS040 (experimental entry)	2.14	4.97	2.15	3.56	98	8.5	1.0
Wisyn-C (experimental entry)	1.82	4.73	2.04	3.39	93	6.0	1.0
Vernal	2.09	4.60	2.05	3.33	92	7.0	1.0
SDHL1LLS (experimental entry)	1.55	3.42	1.86	2.64	73	6.3	1.0
Saranac AR	2.59	5.22	2.27	3.75	103	6.8	0.9
WL 322HQ	2.44	4.83	2.12	3.47	96	5.1	0.8
Riley	1.84	4.58	1.96	3.27	90	6.3	0.8
WL 323	2.10	4.97	1.93	3.45	95	5.5	0.7
MS92 (experimental entry)	2.30	4.82	1.89	3.36	92	4.5	0.6
AVERAGE	2.28	4.94	2.32	3.63		6.8	1.1
CV (%)	24.6	12.1	15.1	9.0		12.3	33.6
LSD (0.05)	0.79	0.84	0.50	0.62		1.2	0.5

(a) All plots were rated for stand density on 19 May 1995 and 24 May 1996. Healthy stand = 10 (100% stand), 50% stand = 5, 10% stand = 1, dead plots = 0.

(b) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly.

Forage yield of 30 alfalfa cultivars planted May 22, 1996, at the Northeast Experiment Station, Watertown, SD[a].

Cultivar	1996 Cut 1 29-Aug	% of 1-Cut Total
	- tons DM / acre-	- % -
A395	1.11	114
WL 324	1.09	113
WL 325-HQ	1.08	111
SDFB (experimental entry[b])	1.07	110
DK 127	1.07	110
ICI 631	1.06	109
AlfaStar	1.06	109
Defiant	1.05	108
Saranac AR	1.05	108
LegenDairy 2.0	1.04	107
Rainier	1.00	103
DK 122	0.98	101
Vernal	0.98	101
Pioneer Brand 5454	0.97	100
Bounty	0.97	99
ABT205	0.96	99
HayGrazer	0.95	98
ICI Brand 620	0.95	98
CIBA 2444	0.95	97
Columbia 2000	0.92	95
Riley	0.92	95
TMF Multi-plier II	0.91	94
WL 252-HQ	0.89	92
Viking 1	0.85	88
Pioneer Brand 5312	0.84	87
Big Horn	0.80	82
Travois	0.80	82
Baker	0.77	79
AVERAGE	0.97	
Maturity[c]	3.5	
CV (%)	18.9	
LSD (P=0.05)	NS[d]	

(a) Plot area was fertilized with 50 lb. P_2O_5 during seedbed preparation.

(b) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly

(c) Kalu and Fick (1983) maturity index, mean stage by count.

(d) Yields among cultivars are not statistically different at the 0.05 level of probability

Forage Yield of Annual Legumes

Robin Bortnem and Arvid Boe

There is increasing interest in annual legumes for supplemental forage during the summer and fall when the production from perennials such as alfalfa declines. Our objective was to evaluate several annual legumes for forage yield and quality at two harvest dates in late summer.

'Sundance' foxtail dalea, berseem and alsike clover, hairy vetch, 'Nitro' alfalfa and 'Hubam' annual sweetclover were planted in 5-row plots at a rate of 2500 pure live seeds per plot on May 22, 1996. Row spacing was 6 inches. The experiment was a split-plot design with harvest dates as whole plots end species as subplots. All species were harvested on August 1 and September 5, 1996 with a sickle-bar harvester. Those species that exhibited substantial regrowth after the August 1 harvest were harvested again on September 25, 1996. Forage yield was measured for all three harvests and subsamples were taken from each species for moisture determination and forage quality analysis. Plots that were not harvested until September 5 had substantial infestations of annual grassy and broadleaved weeds. Therefore, we divided subsamples of forage from each plot in two of the replications into legume and weed fractions to provide an estimate of weed contribution to dry matter yield.

Significant ($P<0.05$) differences were found among species for forage yield at all three harvests (Table 1). Species yields ranged from 0.72 to 1.41 tons/acre for the first harvest and 1.19 to 2.78 tons/acre for the second harvest. Berseem clover exhibited the largest amount of regrowth with approximately a ton/acre and a total production of 2.35 tons/acre. No regrowth potential was demonstrated by either Sundance foxtail dalea or Hubam sweetclover. However, Hubam significantly outyielded all other species on the second harvest with 2.78 tons/acre. Forage quality analysis will be conducted this winter to compare *in vitro* digestible dry matter of the six legumes.

Large differences were found among species for the magnitude of the weed component that contributed to dry matter production. Hairy vetch and Hubem sweetclover appeared to be most competitive with only about 20% of the dry matter production from plots planted to these species comprised of weeds. Alsike clover and Nitro alfalfa, on the other hand, appeared to be the least competitive, with about 95% of the dry matter production from plots planted to them comprised of weeds. Several of these annual legumes demonstrated potential for summer forage. Further studies will be conducted at the Northeast Station on the more promising species.

Table 1. Dry matter forage yield of six annual legumes.

Species	Harvest date August 5	September 5	September 25 regrowth
	-----	Tons/acre	-----
Alsike clover	0.72	1.19	0.20
Berseem clover	1.37	1.62	0.98
Sundance Foxtail dalea	0.94	1.83	NH
Hairy vetch	1.41	1.53	0.37
Hubam sweetclover	1.35	2.78	NH
Nitro alfalfa	1.01	1.20	0.34
LSD (0.05)	0.25	0.35	0.17

NH - plots not harvested due to lack of regrowth.

Soybean Breeding and Genetics
Roy A. Scott and Greg Lammers

Advanced South Dakota breeding lines were tested among released public varieties and commercial varieties that were included on the 1996 recommended or acceptable promising list published by the South Dakota crop performance testing program. Replicated tests were grown both at the Northeast research farm near Watertown and at the Aurora research farm near Brookings. Plots were four rows, 17 feet long and 30 inches apart. The two middle rows were harvested for yield determinations. At Watertown plots were planted on 24 May and at Brookings on 15 May. Soybeans were mature at both locations before the first killing frost.

Results and Discussion: Yields were lower at Brookings than at Watertown (Table 1). Brookings mean yields were 4 bu/a lower than the average of the two locations. Maturity dates generally were later at Watertown than at Brookings, and may partially explain the greater yields at Watertown. The CV of the Watertown test was larger than at Brookings, indicating a more precise test at Brookings. There were fewer significant differences among the entries at Watertown than at Brookings. Although there were some fairly large numerical differences among some entries at Watertown (yield range 34-50 bu/a), most differences were not statistically significant, indicating that most commercial and SD entries had similar yields at Watertown. The top three entries, which were commercial varieties, were significantly different only from the bottom four entries at Watertown (Table 1).

There were two SD lines and two commercial varieties that ranked in the top 20%, at both locations. The SD lines, SD(M)92-1233 and SD(M)92-1357 were both in large increases in 1996 and will be proposed to the SD release committee for release in 1997. SD(M)92-1233 is classified as a late group 0 and SD(M)92-1357 an

early group 1 line. Although not statistically significant in some cases, both out-yielded all the public varieties and some commercial varieties in these tests. These lines have been tested for four years across the region, and release data will be based on numerous environments.

Table 1. Comparison of SD lines with 1996 recommended varieties and released public varieties in maturity groups 0 and 1.

	MATURITY[a]		PLANT HEIGHT[b]		LOCATION YIELD[c]		OVERALL	YIELD RANKS		
NAME	BRKS	WTN	BRKS	WTN	BRKS	WTN	YIELD	WTN	BRKS	MEAN
MUSTANG 0830	120	118	27	29	38.80	50.03	44.42	1	3	1
KRUGER 0999	121	125	26	36	38.76	49.72	44.24	2	4	2
MUSTANG 1050	122	126	34	38	34.68	49.40	42.04	3	22	7
SD(M)92-1357	124	124	30	36	39.84	48.17	44.01	4	1	3
SD(M)92-1233	121	124	27	35	38.44	47.60	43.02	5	6	4
PIONEER 9071	116	122	28	32	37.37	46.84	42.11	6	14	6
PARKER	124	126	35	40	38.42	46.71	42.56	7	7	5
PIONEER 9092	119	122	28	33	37.63	45.95	41.79	8	11	10
SD93-492	124	127	34	45	35.76	45.85	40.81	9	17	13
ND92-5952	116	123	30	35	32.69	45.82	39.26	10	27	20
ND92-2381	126	125	28	38	35.03	45.63	40.33	11	21	15
SD9494	118	124	31	36	35.50	45.47	40.49	12	18	14
NORTHRUPKING S095	120	124	29	34	38.48	45.41	41.95	13	5	8
KRUGER 0909	122	124	26	30	39.40	44.43	41.91	14	2	9
ARROWHEAD 8350	124	126	35	37	35.38	44.11	39.75	15	19	17
SD(N)93-6072	116	120	28	40	35.34	43.96	39.65	16	20	18
ND92-5252	118	120	34	36	38.10	43.58	40.84	17	9	12
HENDRICKS	120	122	27	32	37.06	43.54	40.30	18	16	16
SD93-863	124	124	33	44	38.39	43.35	40.87	19	8	11
ARROWHEAD 8450	121	126	30	38	32.78	43.04	37.91	20	26	23
DEKALB CX096	120	125	30	38	32.34	42.69	37.51	21	29	26
SD(M)92-1272	120	122	31	38	34.43	42.50	38.46	22	23	21
ND92-2277	118	124	30	38	33.48	42.21	37.85	23	24	24
DAWSON	117	121	30	34	33.07	41.80	37.44	24	25	27
SD93-1040	124	127	34	37	37.53	41.49	39.51	25	12	19
SIMPSON	119	124	28	37	32.50	41.23	36.87	26	28	28
TOP FARM 01000	119	127	30	37	30.79	38.95	34.87	27	30	30
SD(N)93-5810	124	125	33	38	37.40	38.48	37.94	28	13	22
SD(N)93-5721	122	124	27	42	37.91	37.53	37.72	29	10	25
LAMBERT	120	121	30	39	37.34	33.95	35.64	30	15	29
GRAND MEAN					38.15	43.98	40.07			
CV[d]					7.30	12.27	11.06			
LSD[e]					4.32	8.82	5.06			

[a]Maturity recorded as days from planting to 95% brown pods. [b]Plant height in inches.
[c]Yield in bushels per acre (bu/a).
[d]CV indicates precision; lower CV indicates better precision. [e]LSD indicates significant differences.
BRKS = Brookings (SDSU Aurora farm); WTN = Watertown (Northeast research farm).

WEED CONTROL - W.E.E.D. PROJECT

L. J. Wrage, P. O. Johnson, D. A. Vos, S. A. Wagner, and R. J. Stahl

Demonstration plots provide side-by-side comparisons. Rates used are those best suited for the weed and soil type. Plots are evaluated for weed control and crop tolerance. Yields are harvested from replicated tests.

Evaluation and extension demonstration plots provide weed control data for northeastern South Dakota. The W.E.E.D. program includes comparisons of labeled treatments for all major crops and experimental herbicides available for initial evaluation. Data collected are summarized over several years to provide a more accurate measurement of expected performance. These plots are used for tours and are the basis for educational material.

1996 TESTS

Plot work was delayed considerably due to wet field conditions in the weed plot areas. Planting and soil applied herbicide treatment were established June 5th. Soil conditions were not favorable for preplant treatments; dry conditions followed planting. Early weed flush was lost; however there was moderate yellow foxtail and some annual broadleaf weed emergence.

Plots were evaluated for weed control; however yields were not harvested due to late planting and uneven stands; especially for small-seeded, shallow planted crops.

1996 Evaluation/Demonstration Tests

1. Corn Herbicide Demonstration
2. Wild Buckwheat Control in Soybeans
3. Sunflower Herbicide Demonstration
4. Flax Herbicide Demonstration
5. Weed Control and Crop Tolerance in Canola
6. Foxtail Control in Sunflowers
7. Proso Millet Demonstration
8. Alfalfa Control
9. Quackgrass Control in Soybeans
10. Dandelion Burndown
11. Herbicide Tolerant Soybean Demonstration

More than twenty field evaluation and demonstration tests were conducted in 1996. These include initial evaluation of unlabeled, experimental herbicides, herbicide additives, and herbicide tolerant crops. Data for these tests are reported in the W.E.E.D. project data report.

Experimental Tests and Other Weed Control Evaluations

1. Weed Control in Corn with Balance
2. Quackgrass Control in Corn
3. Dandelion Control in Turf
4. Herbicide Tolerant Corn
5. Foxtail Control in Alfalfa
6. Alfalfa Demonstration
7. Canada Thistle Control with Resolve in "IMI" Corn
8. Canada Thistle Control in Soybeans

The cooperation and assistance from station personnel is acknowledged. Extension agents identify needs, assist with tours, and utilize the data in producer programs.

Data reported in this publication are results from field tests that include labeled product uses, experimental products or experimental rates, combinations or other unlabeled users for herbicide products. Refer to the appropriate weed control fact sheet available from county extension offices for herbicide recommendations.

Table 1. Corn Herbicide Demonstration

Demonstration
Variety: Northrup King 3808
Planting Date: 6/5/96
PPI, SPPI: 6/5/96
PRE: 6/5/96
EPOST: 6/22/96
POST: 7/2/96
Soil: Clay loam; 3.9% OM; 6.3 pH

Precipitation: 1st week 0.17 inches
2nd week 0.23 inches

Yeft = Yellow foxtail
Colq = Common lambsquarter
Gr = General grass control
Bdlf = General broadleaf control

COMMENTS: Data for 1996 reflects seasonal conditions and can be contrasted with the 2-yr avg for 1994-95. Poor evaluations in 1996 reflect late planting; wet soil and inadequate rain during the initial post-planting period. Preplant and postemergence treatments provided the highest grass control in 1996.

Treatment	Rate/A	% Yeft 8/13/96	% Colq 8/13/96	(1994-95) 2-Yr. Avg. % Gr	%Bdlf
Check	—	0	0	0	0
PREPLANT INCORPORATED					
Eradicane	4.75 pt	85	50	62	48
Eradicane + Extrazine II	3.6 pt+2.2 lb	78	98	89	94
DoublePlay	5 pt	84	85	88	83
SHALLOW PREPLANT INCORPORATED					
Dual II	2.5 pt	45	20	92	72
Lasso	3 qt	50	30	86	76
Frontier	2 pt	20	10	92	83
Harness	2.3 pt	45	50	91	89
Surpass	2.5 pt	55	70	90	89
SHALLOW PREPLANT INCORPORATED & POSTEMERGENCE					
Bladex&Accent + COC + 28% N	2.2 lb&.67 oz+ 1% +4 qt	85	70	91	99
PREEMERGENCE					
CGA-77102	1.5 pt	20	20	—	—
Dual II	2.5 pt	30	40	92	69
Lasso	3 qt	40	40	89	77
Prowl	3.6 pt	35	30	70	81
Harness	2.3 pt	42	40	96	92
Surpass	2.5 pt	55	40	95	90
Frontier	1.6 pt	20	40	93	89
Axiom	22 oz	30	40	—	—
Balance	2 oz	40	50	—	—
Balance + Surpass	2 oz+ 1.25 pt	45	50	—	—
Broadstrike/Dual	2.25 pt	55	50	86	90
Ramrod + Broadstrike Plus	4 qt+.3 lb	52	50	—	—
Axiom + atrazine	20 oz+ 1.1 lb	45	60	—	—
Lasso + etrazine	2 qt+ 1.1 lb	45	55	—	—
Lasso + Bladex	2 qt + 2.2 lb	55	60	—	—
Bicep Lite	4.8 pt	42	70	—	—
PREEMERGENCE & POSTEMERGENCE					
Dual II&Marksman	2 pt&2.5 pt	40	60	91	94
EARLY POSTEMERGENCE					
Prowl + Marksman	3.6 pt+ 3.5 pt	65	98	64	97
Prowl + Marksman + Bladex	3 pt + 2 pt + 1.1 lb	50	98	—	—
Prowl + Accent + Banvel + X-77 + 28% N	3 pt+.33 oz+ .5 pt + .25% + 4 qt	68	98	—	—
Basis + COC + 28% N& Cult (14 days)	.33 oz+ 1% + 4 qt	85	98	—	—
Basis + COC + 28% N	.33 oz+ 1% + 4 qt	70	98	—	—
Accent + COC + 28% N	.67 oz+ 1% + 4 qt	68	98	—	—

Treatment	Rate/A	% Yeft 8/13/96	% Colq 8/13/96	(1994-95) 2-Yr. Avg. % Gr	% Bdlf
EARLY POSTEMERGENCE (Continued) . . .					
Extrazine II + Veg Oil	2.2 lb + 1 qt	55	98	71	94
Marksman + X-77	2.9 pt + .5%	40	90	—	—
Frontier + Accent + Clarity + X-77 + 28% N	1.25 pt + .3 oz + .8 pt + .25% + 4 qt	55	85	—	—
Basis + Marksman + COC + 28% N	.33 oz + 1 pt + 1% + 4 qt	50	90	—	—
Tough + Accent + Beacon + COC + 28% N	.75 pt + .33 oz + .38 oz + 1% + 4 qt	62	95	—	—
PREEMERGENCE & EARLY POSTEMERGENCE					
Ramrod&Tough + atrazine	4 qt&.75 pt + .75 lb	78	95	96	98
Ramrod&Clarity	4 qt&.8 pt	74	95	91	98
PREEMERGENCE					
Ramrod	4 qt	50	20	—	—
PREEMERGENCE & POSTEMERGENCE					
Ramrod&Banvel	4 qt&.5 pt	55	95	88	93
Ramrod&2,4-D amine	4 qt&1 pt	45	85	86	82
Ramrod&Laddok S-12 + COC + 28% N	4 qt&1.67 pt + 1 qt + 1 qt	55	95	—	—
Ramrod&Laddok S-12 + Clarity + 28% N	4 qt&1.33 pt + 3.2 oz + 2 qt	58	98	—	—
Ramrod&Buctril	4 qt&1.5 pt	58	98	86	97
Ramrod&Buctril + atrazine	4 qt&1 pt + .56 lb	62	98	91	98
Ramrod&Marksman	4 qt&2.5 pt	64	98	90	98
PREEMERGENCE & POSTEMERGENCE					
Ramrod&Sencor + Buctril	4 qt&2 oz + 1 pt	62	98	86	95
Ramrod&Shotgun	4 qt&3 pt	66	98	90	96
Ramrod&Shotgun + Buctril	4 qt&1.5 pt + .75 pt	72	98	—	—
Ramrod&Permit + X-77	4 qt&.67 oz + .5%	76	95	87	80
Ramrod&Exceed + COC	4 qt&1 oz + 1 qt	74	95	—	—
POSTEMERGENCE					
Beacon + COC + 28% N	.38 oz + 1 qt + 4 qt	72	95	—	—
Scorpion III + X-77 + 28% N	4 oz + .25% + 2.5%	30	70	—	—
Resource + atrazine + COC + 28% N	4 oz + .56 lb + 1 pt + 2 qt	45	85	—	—
Accent + COC + 28% N	.67 oz + 1% + 4 qt	78	30	81	82
LSD (.05)				18	16

Table 2. Wild Buckwheat Control in Soybeans

Demonstration
Variety: Dawson
Planting Date: 6/5/96
PRE: 6/5/96
POST: 7/2/96
Soil: Clay loam; 3.9% OM; 6.3 pH

Precipitation: 1st week 0.43 inches
2nd week 0.34 inches

Wibw = Wild buckwheat

COMMENTS: Uniform, moderate weed pressure. Control differences were apparent. Evaluations exceeding 80% would be considered satisfactory; even though plants were not completely killed.

Treatment	Rate/A	% Wibw 7/9/96	% Wibw 8/13/96
PREEMERGENCE & POSTEMERGENCE			
Lasso&Pursuit DG + Sun-It II + 28% N	2 qt&1.44 oz+ 1 qt+ 1 qt	45	85
Lasso&Scepter + X-77	2 qt&.33 pt+ .5%	35	35
Lasso&Basagran + COC	2 qt&1 qt + 1 qt	66	25
Lasso&Blazer + X-77	2 qt&1.5 pt+.5%	98	95
Lasso&Stellar + COC + 28% N	2 qt&5 oz+.5% + 2.5%	65	20
Lasso&Cobra + COC	2 qt&.8 pt+.5 qt	73	20
Lasso&Flexstar + 28% N	2 qt&2 pt+2.5%	92	35
Lasso&Galaxy + X-77	2 qt&2 pt + .5%	97	50
Lasso&Pinnacle + X-77	2 qt&.25 oz+.25%	42	30
Lasso&Classic + X-77	2 qt&.75 oz+.25%	57	20
Lasso&Concert + X-77 + 28% N	2 qt&.5 oz +.25% + 1 qt	55	45
Lasso&Basagran +Pursuit DG + COC	2 qt&1 pt+.72 oz+ 1 qt	53	0
Lasso&Pinnacle + Pursuit DG + X-77	2 qt&.25 oz + 1.08 oz+ .25%	57	80
Lasso&Expert + X-77 + 28% N	2 qt&1.5 oz +.5% + 2 qt	50	40
POSTEMERGENCE			
Raptor + Sun-It II + 28% N	4 oz+.75 qt+ 1 qt	28	25
Pursuit DG + Sun-It II + 28% N	1.44 oz + 1 qt+ 1 qt	49	82
Pursuit DG	1.44 oz	33	60
Poast Plus + Galaxy + COC	2.25 pt + 2 pt + 1 qt	93	65
Check	—	0	0

Table 3. Sunflower Herbicide Demonstration

RCB: 2 reps
Variety: AgriPro ST330
Planting Date: 6/5/96
PPI, SPPI: 6/5/96
PRE: 6/5/96
POST: 7/3/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation: 1st week 0.17 inches
2nd week 0.23 inches

Yeft = Yellow foxtail
Pesw = Pennsylvania smartweed

COMMENTS: Late-season planting due to wet conditions. Postemergence treatments provided excellent foxtail control. Wet soil conditions at planting and dry conditions after planting reduced effectiveness of soil-applied treatments. (*) denotes experimental treatments evaluated for potential use in sunflowers.

Treatment	Rate/A	% Yeft 6/5/96	% Pesw 6/5/96	3-Yr Avg. % Gr	3-Yr Avg. % Bdlf
Check	—	0	0	0	0
PREPLANT INCORPORATED					
Eptam	3.5 pt	72	35	70	24
Sonalan	2.67 pt	78	55	85	49
Treflan	1 pt	63	20	73	19
Treflan	1.5 pt	69	35	79	28
Treflan	2 pt	83	55	87	45
*Treflan	3 qt	87	85	92	80
Treflan 10G	7.5 lb	74	58	69	36
Prowl	3 pt	79	40	82	42
SHALLOW PREPLANT INCORPORATED					
Prowl	3 pt	73	35	75	33
PREEMERGENCE					
Prowl	3 pt	38	29	56	27
*Prowl + 2,4-D ester	3 pt + 1 qt	52	25	63	63
*Racer	2 pt	28	20	—	—
POSTEMERGENCE					
Ultima 160 + COC	20 oz + 1 qt	92	0	—	—
Ultima 160 + Assert + COC	20 oz + 1.25 pt + 1 qt	95	0	—	—
*Prism + COC	8.5 oz + 1 qt	95	0	—	—
*Prism + COC	12.8 oz + 1 qt	96	0	—	—
*Prism + COC	17 oz + 1 qt	92	0	—	—
LSD (.05)		19	14	11	14

Table 4. Flax Demonstration

RCB: 2 reps
Variety: Verne 93
Planting Date: 6/5/96
PPI: 6/5/96
POST: 7/2/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation: 1st week 0.17 inches
2nd week 0.23 inches

Yeft = Yellow foxtail
Colq = Common lambsquarter

COMMENTS: Late planting due to wet field conditions. Ultima 160 provided very good foxtail control. Crop oil additive was required for effective grass control.

Treatment	Rate/A	% Yeft 8/13/96	% Colq 8/13/96
Check	----	0	0
POSTEMERGENCE			
MCPA amine	1 pt	0	74
MCPA ester	1 pt	0	73
Buctril	1 pt	0	85
MCPA ester+ Tordon	1 pt + 1 oz	0	90
Ultima 160 + COC	1.25 pt+ 1 qt	94	0
Ultima 160 + Buctril + COC	1.25 pt+ 1 pt+ 1 qt	96	86
Ultime 160 + Buctril	1.25 pt + 1 pt	65	85
PREPLANT INCORPORATED			
Treflan	1.5 pt	75	85
LSD (.05)		8	24

Table 5. Weed Control and Crop Tolerance in Canola

RCB: 3 reps
Variety: Hyola 401
Planting Date: 6/5/96
PPI: 6/5/96
POST: 7/2/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation: 1st week 0.43 inches
2nd week 0.34 inches

VCRR = Visual Crop Response Rating

Yeft = Yellow foxtail

COMMENTS: Objective to evaluate crop tolerance and weed control with herbicides, using normal and double rates. Late planted. Double rates provided only slight crop response (stunting). Foxtail control was very good to excellent.

Table 5. Weed Control and Crop Tolerance in Canola (Continued . . .)

Treatment	Rate/A	% VCRR 8/13/96	% Yeft 8/13/96
Check	—	0	0
PREPLANT INCORPORATED			
Sonalan	2 pt	3	89
Sonalan	4 pt	13	91
Treflan	1.5 pt	0	87
Treflan	3 pt	12	91
PREPLANT INCORPORATED & POSTEMERGENCE			
Treflan&Stinger	1.5 pt&.33 pt	0	86
Treflan&Stinger	1.5 pt&.66 pt	5	87
POSTEMERGENCE			
Ultima 160+Stinger+COC	20 oz+.33 pt+1 qt	0	97
Ultima 160+Stinger+COC	40 oz+.66 pt+2 qt	0	94
Ultima 160+Stinger+COC	20 oz+.66 pt+2 qt	15	92
LSD (.05)		13	5

Table 6. Foxtail Control in Sunflowers

RCB: 3 reps
Variety: AgriPro ST330
Planting Date: 6/5/96
POST: 7/3/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation: 1st week 0.45 inches
2nd week 0.32 inches

Grft = Green foxtail

COMMENTS: No performance difference noted between treatments. Late planting due to wet field conditions.

Treatment	Rate/A	% Grft 8/13/96
Check	—	0
POSTEMERGENCE		
Prism+COC	8.6 oz+1%	96
Prism+COC	13 oz+1%	96
Prism+COC	17 oz+1%	96
Ultima 160+Sun-It II	30 oz+1.5 pt	95
LSD (.05)		1

Table 7. Proso Millet Demonstration

RCB: 2 reps
Variety: Rise
Planting Date: 6/5/96
POST: 7/2/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation: 1st week 0.45 inches
2nd week 0.32 inches

Pesw = Pennsylvania smartweed
Wibw = Wild buckwheat

COMMENTS: Seeded in wet seedbed; millet stand 75%. Comparisons include "X" and double rates. No adverse crop response noted. Peak provides a new option for annual broadleaf weeds in Proso millet.

Treatment	Rate/A	% Pesw 8/13/96	% Wibw 8/13/96
Check	---	0	0
POSTEMERGENCE			
2,4-D amine	1 pt	20	38
2,4-D amine	1 qt	20	45
Benvel + 2,4-D amine	.5 pt + 1 pt	90	85
Buctril	1.5 pt	96	90
Peak + COC	.5 oz + 1 qt	95	80
Peek + COC	1 oz + 1 qt	90	95
LATE POSTEMERGENCE			
Banvel + 2,4-D amine	.5 pt + 1 pt	97	91
POSTEMERGENCE & LATE POSTEMERGENCE			
Peak + 2,4-D amine&Peak + COC	.25 oz + .5 pt&.5 oz + 1 qt	95	88
LSD (.05)		7	16

Table 8. Alfalfa Control

RCB: 2 reps
Variety: Vernal
Planting Date: 6/2/95
POST: 6/5/96
Soil: Silty clay loam; 3.2% OM; 6.1 pH

Precipitation: 1st week 0.17 inches
2nd week 0.23 inches

ALFZ = Alfalfa
Dali = Dandelion

COMMENTS: Full one-year stand. Purpose to evaluate late spring Burndown for no-till planting. Alfalfa 6-8 inches.

Treatment	Rate/A	% ALFZ 6/21/96	% ALFZ 7/10/96	% Dali 7/10/96
POSTEMERGENCE				
2,4-D ester	1 pt	43	79	38
2,4-D ester	1 qt	55	96	71
Curtail	2 pt	53	69	42
Curtail	4 pt	65	93	60
Stinger	.33 pt	35	70	15
Check	---	0	0	0
Banvel	1 pt	45	72	20
Roundup Ultra	1 qt	95	94	87
Roundup Ultra	2 qt	98	98	94
Roundup Ultra + 2,4-D ester	1 pt + 1 pt	75	96	89
Roundup Ultra + 2,4-D ester	1 qt + 1 qt	95	99	98
2,4-D ester + Banvel	1.5 pt + 4 oz	67	95	74
Check	---	0	0	0
LSD (.05)		8	11	15

Table 9. Quackgrass Control in Soybeans

RCB: 4 reps
Variety: Roundup Ready, Regular
Planting Date: 6/5/96
POST: 7/2/96
LPOST: 7/15/96
Soil: Clay loam; 3.9% OM; 6.1 pH

Yeft = Yellow foxtail
Qugr = Quackgrass

COMMENTS: Plot area tilled in late spring prior to planting. Herbicide tolerant experimental seed source used for Roundup treatments.

Table 9. Quackgrass Control in Soybeans (Continued . . .)

Treatment	Rate/A	% Yeft 8/13/96	% Qugr 8/13/96
Check (Roundup Ready soybeans)	—	0	0
POSTEMERGENCE			
Roundup Ultra	1 pt	98	90
Roundup Ultra + As	1 pt + 8.5 lb/100 gal	98	87
POSTEMERGENCE & LATE POSTEMERGENCE			
Roundup Ultra + AS&Roundup Ultra + AS	1 pt+ 8.5 lb/100 gal& 1 pt+ 8.5 lb/100 gal	98	96
POSTEMERGENCE			
Roundup Ultra + AS	1 qt+ 8.5 lb/100 gal	98	93
Check	—	0	0
Poast Plus+ COC	36 oz + 1 qt	95	78
POSTEMERGENCE & LATE POSTEMERGENCE			
Poast Plus+ COC&Poast Plus+ COC	36 oz+ 1 qt&24 oz+ 1 qt	95	87
POSTEMERGENCE			
Assure II+ COC	10 oz + 1 qt	93	83
Select +COC	16 oz+ 1 qt	96	89
POSTEMERGENCE & LATE POSTEMERGENCE			
Select + COC&Select + COC	18 oz+ 1 qt&6 oz+ 1 qt	96	92
POSTEMERGENCE			
Option II + COC	1.2 pt+ 1 qt	92	25
Fusion +COC	.75 pt+ 1 qt	94	81
POSTEMERGENCE & LATE POSTEMERGENCE			
Fusion + COC&Fusion + COC	.75 pt+ 1 qt& .5 pt+ 1 qt	96	90
POSTEMERGENCE			
Fusilade DX + COC	12 oz+ 1 qt	94	81
POSTEMERGENCE & LATE POSTEMERGENCE			
Fusilade DX + COC&Fusilade DX + COC	12 oz + 1 qt&8 oz+ 1 qt	94	88
LSD (.05)		2	7

Table 10. Dandelion Burndown

RCB: 2 reps
POST: 6/4/96

Precipitation: 1st week 0.23 inches
2nd week 0.22 inches

Dali = Dandelion
Cath = Canada thistle

COMMENTS: Purpose to evaluate herbicides for potential use to Burndown established dandelion in no-till systems. Effectiveness would be improved with earlier treatment or fall application. Wet conditions prevented early treatment. Considerable regrowth for several Canada thistle treatments.

Treatment	Rate/A	% Dali 8/13/96	% Cath 8/13/96
Check	---	0	0
POSTEMERGENCE (SPRING)			
2,4-D ester	1 qt	81	72
2,4-D ester	2 qt	84	83
2,4-D amine	2 qt	73	73
2,4-D ester+atrazine+COC	1 pt+2.2 lb+1 qt	38	35
Roundup Ultra+AS	1 qt+8.5 lb/100 gal	30	44
Roundup Ultra+AS	2 qt+ 8.5 lb/100 gal	50	63
Roundup Ultra+2,4-D ester+AS	1 qt+ 1 pt+8.5 lb/100 gal	56	59
Roundup Ultra+2,4-D ester+ AS+Sen/Lex	1 qt+1 pt+ 8.5 lb/100 gal+4 oz	75	75
Banvel	1 pt	52	62
Gramoxone Extra+X-77	2 pt+.25%	38	20
Scorpion III+X-77	4 oz+.25%	43	58
Exceed+COC+28% N	1 oz+1 qt+4 qt	25	38
Pursuit DG+Sun-It II+28% N	1.44 oz+1 qt+1 qt	15	10
Peak+COC	1 oz+1 qt	33	35
Permit+X-77	1.33 oz+.5%	33	15
Reliance STS+COC+28% N	.5 oz+1%+2 qt	38	25
LSD (.05)		12	21

Table 11. Herbicide Tolerant Soybean Demonstration

Demonstration
Variety: STS, Roundup Ready
Planting Date: 6/5/96
PPI, PRE: 6/5/96
POST: 7/2/96
LPOST: 7/15/96
Soil: Clay loam, 3.9% OM; 6.3 pH

Precipitation: 1st week 0.43 inches
2nd week 0.34 inches

Yeft = Yellow foxtail
Pesw = Pennsylvania smartweed

COMMENTS: Evaluation for weed control only. Late planted; wet soil conditions affected performance of soil applied herbicides. High rate (2X) treatments included to evaluate crop response; no visual differential noted.

Treatment	Rate/A	% Yeft 8/13/96	% Pesw 8/13/96
Check (STS Soybeans)	---	0	0
POSTEMERGENCE			
Reliance STS + Poast Plus + X-77	.5 oz + 1.5 pt + .5%	92	85
PREEMERGENCE & POSTEMERGENCE			
Dual II&Reliance STS + COC + 28% N	2.5 pt&.5 oz + 1% + 2 qt	10	50
PREPLANT INCORPORATED & POSTEMERGENCE			
Treflan&Reliance STS + COC + 28% N	1.5 pt&.5 oz + 1% + 2 qt	45	75
Treflan&Reliance STS + COC + 28% N	1.5 pt&1 oz + 1% + 2 qt	50	92
Check (Roundup Ready Soybeans)	---	0	0
POSTEMERGENCE			
Roundup + AS	1 pt + 8.5 lb/100 gal	90	80
POSTEMERGENCE & LATE POSTEMERGENCE			
Roundup + AS& Roundup + AS	1 pt + 8.5 lb/100 gal& 1 pt + 8.5 lb/100 gal	94	95
POSTEMERGENCE			
Roundup + AS	1 qt + 8.5 lb/100 gal	92	95
LATE POSTEMERGENCE			
Roundup + AS	1 qt + 8.5 lb/100 gal	95	92
POSTEMERGENCE			
Roundup + AS	2 qt + 8.5 lb/100 gal	94	95
PREPLANT INCORPORATED & LATE POSTEMERGENCE			
Treflan&Roundup + AS	1 pt&1 pt + 8.5 lb/100 gal	96	90

'Quaris' Fungicide for Controlling Foliar Diseases on Wheat

Y. Jin and J. Smolik

Introduction: Quaris is an experimental fungicide for controlling foliar diseases. The effect of this fungicide on tanspot and headscab of wheat was investigated.

Materials and experimental design: Two spring wheat cultivars, Russ and Butte 86, were planted on 22 May, 1996. Alleys were cut, and plots (5' X 14') were formed at the heading stage. Up to the flowering stage, foliar disease development was slow. A trace amount of tanspot was observed on the lower leaves in the plots. Thus, a decision was made to inoculate the plots with the tanspot fungus. The following treatments were used:

Treatment	Fungicide	Inoculation
I	yes	yes
II	yes	no
III	no	yes
IV	no	no

A randomized complete block design was used. Treatments were randomized within each block. Fungicide was applied at the late flowering to early watery ripening stage (16 July) at the manufacturer's recommended rate (.125lbai/a). Inoculation was made a week after the fungicide application (23 July).

Results and discussion: Tanspot. Foliar diseases were evaluated at the soft dough stage of plant growth (7 August). Other foliar diseases were either absent or negligible; thus, tanspot severity was evaluated only. Disease severity (percentage of leaf tissue covered by tanspot) was estimated visually. Disease severity on flag leaves and flag-1 leaves were recorded separately. Yield data were not collected because stands were not uniform. Disease severity data are given in Table 1 to 4.

Table 1. Disease severity on flag leaves (cultivar Russ):

Treatment	Mean disease severity (%)	Duncan* grouping
III	30.0	A
IV	21.3	B
I	4.3	C
II	2.8	C

* Treatments followed by the same letter are not significantly different at P = 0.05

Table 2. Disease severity on flag-1 leaves (cultivar Russ):

Treatment	Mean disease severity (%)	Duncan grouping
III	62.5	A
IV	57.5	A
I	6.3	B
II	5.0	B

Table 3. Disease severity on flag leaves (cultivar Butte 86):

Treatment	Mean disease severity (%)	Duncan grouping
III	35.0	A
IV	23.8	B
I	3.5	C
II	1.8	C

Table 4. Disease severity on flag-1 leaves (cultivar Butte 86):

Treatment	Mean disease severity (%)	Duncan grouping
III	67.5	A
IV	60.0	A
I	6.3	B
II	4.3	B

Head scab. Head scab was evaluated at the same growth stage. Forty spikes were randomly selected in each plot as a sample. The number of spikes with visible scab infection were recorded as the incidence (number of blighted spikes over forty), and the number of spikelets with visible scab infection per infected spike were recorded as the severity (the number of spikelets infected over the total number of spikelets of those infected spikes). The level of scab infection in these plots was very low (the average incidence was 6% and the average severity on the infected spikes was 17%). Significant differences were not observed among treatments.

1996 Spring Wheat Scab Foliar Fungicide Trial

D. Gallenberg, B. Farber, M. Thompson, J. Rudd and L. Fischer

Introduction: Wheat scab can be a serious end dameging disease. There is a great deal of interest in developing control strategies for this disease which will minimize the impact. Use of foliar fungicides may be one option. The following trial represents a continuation of studies designed to evaluate the potential of foliar fungicides in reducing damage from wheat scab.

Materials and Methods: Plots of Sharp and 2375 were planted at the NE Farm and Aurora. Ten fungicide treatments, as outlined in Table 1, were used. Each treatment was replicated four times in each variety. Plots were rated for incidence and severity of head scab. Yields and test weights were measured at harvest.

Results and Discussion: Very low levels of scab were observed in 1996. This is reflected in the relative lack of differences among treatments in this trial.

At Aurora, the only significant difference observed was a slight increase in test weight by Mancozeb IV.

At the NE Farm, Tilt IV decreased the incidence of scab on Sharp, and increased yield of both varieties. Benomyl I, Folicur IV and Govern III increased yields of 2375.

Overall, the very low levels of scab did not allow much discrimination between treatments. Foliar fungicides are not a viable option during seasons of low scab levels, but may be useful when scab is more severe.

Table 1.

Varieties:	Sharp & 2375	
Locations:	NE Farm & Aurora	
Planting Dates:	NE Farm:	05/21/96
	Aurora:	04/19/96
Spray Dates:		
Anthesis:	NE Farm:	07/12/96 (Sharp)
		07/15/95 (2375)
	Aurora:	06/28/96
A+7:	NE Farm:	07/19/96 (Sharp)
		07/22/96 (2375)
	Aurora:	07/05/96
Disease Ratings:	NE Farm:	08/05/96
	Aurora:	07/23/96

1996 Application Rates and Timing of Compounds

Foliar Fungicides

Product	Rate (product)	Timing*
Govern III	1.4 fl oz/A	a,a+7
Folicur II	4 fl oz/A	a
Folicur IV	8 fl oz/A	a
Mancozeb IV	2 lb/A	a,a+7
Mancozeb + Benomyl III	2 + .5 lb/A	a
Tilt IV	4 fl oz/A	a
Tilt + Benomyl	4 + 8 fl oz/A	a
Benomyl I	0.5 lb/A	a
Benomyl II	0.25 + .25 lb/A	a,a+7

* mancozeb product used was Dithane DF; applications of mancozeb, Govern and benomyl were made with a spreader sticker.
a = anthesis; a+7 = anthesis + 7 days.

Table 2.

AURORA	#/50*		Ave % Scab Visual**		Yield (bu/A)		TW (lb/bu)	
	Sharp	2375	Sharp	2375	Sharp	2375	Sharp	2375
Untreated	3.3	4.0	0.8	3.3	52.6	55.6	60.6	59.6
Tilt IV	4.0	5.3	1.0	5.0	57.3	59.3	61.3	59.6
Tilt+Benomyl	4.5	5.5	0.8	6.5	55.8	57.2	61.3	59.8
Mancozeb IV	5.0	3.5	2.5	3.9	55.5	56.0	62.0	59.9
Mancozeb +Benomyl III	3.0	4.0	1.3	2.1	52.1	55.5	61.1	59.6
Benomyl I	4.0	4.8	1.3	4.8	54.2	57.1	60.7	59.9
Benomyl II	4.0	4.8	1.7	3.4	53.4	56.1	60.7	59.7
Folicur II	3.8	4.5	0.5	3.4	52.8	56.8	61.4	59.9
Folicur IV	4.3	2.8	0.7	2.0	49.6	56.5	61.4	59.7
Govern III	4.8	4.0	1.1	2.9	54.8	56.7	60.8	59.8
$LSD_{(.05)}$	2.2	2.1	1.2	2.9	9.1	4.2	1.0	0.7

NE FARM	#/50*		Ave % Scab Visual**		Yield (bu/A)		TW (lb/bu)	
	Sharp	2375	Sharp	2375	Sharp	2375	Sharp	2375
Untreated	5.8	3.0	1.0	1.3	37.9	34.2	56.8	56.0
Tilt IV	2.3	4.3	0.5	1.6	41.5	39.8	57.5	56.8
Tilt + Benomyl	4.5	3.0	0.9	0.6	37.8	35.9	56.3	56.0
Mancozeb IV	4.8	4.5	0.8	1.7	37.9	37.2	56.8	56.2
Mancozeb + Benomyl III	4.0	3.3	0.7	1.0	37.9	36.4	56.4	55.5
Benomyl I	6.3	3.5	1.3	0.7	37.8	39.2	56.9	55.9
Benomyl II	4.5	4.0	0.8	1.6	36.1	37.2	56.3	55.6
Folicur II	4.8	3.8	0.8	0.8	38.8	36.1	57.0	56.3
Folicur IV	2.5	3.5	0.4	1.5	38.7	39.1	57.2	56.7
Govern III	6.3	3.8	1.0	0.9	38.0	39.3	55.4	56.1
$LSD_{(.05)}$	3.5	2.7	0.8	1.6	3.0	3.8	1.5	1.3

* #/50 = number of scabby heads/50
** % scab = average percent scab/50 heads

1996 Oats Foliar Fungicide Trial

D. Gallenberg, D.. Reeves, M. Thompson and L. Hall

Introduction: Oats are subject to attack from a variety of foliar diseases. Some of these diseases can be controlled or reduced through application of foliar fungicides. The purpose of the following study was to determine the effects of various foliar fungicide treatments on disease ratings, yield and test weight of oats.

Materials and Methods: Trials were conducted at the Southeast Research Farm (SE Farm), Brookings Agronomy Farm and Northeast Research Farm (NE Farm) during 1996. The variety Don was used in this study. The foliar fungicide treatments and number of plots were the same at all 3 locations. Treatments were replicated 4 times.

Fungicides used in the study were Tilt (propiconazole) and Oithane OF (mancozeb). Tilt is not currently labelled on oats and was applied as an experimental compound in a single application of 4 fl oz/A at flag leaf emergence (7/1/96 at NE Farm, 6/18/96 at Brookings and 6/10/96 at SE Farm). Three mancozeb treatments were used: Mancozeb I: 1 lb/A early (6/25/96 at NE Farm, 6/11/96 at Brookings and 6/22/96 at SE Farm); Mancozeb II: 1 lb/A at boot (7/1/96 at NE Farm, 6/22/96 at Brookings and 6/10/96 at SE Farm), and again 10 days later; and Mancozeb III: 1 lb/A early, 2 lb/A at boot and again 10 days later.

Plots were rated for % disease on the flag leaf (i.e. % non-green tissue) on 7/22/96 at NE Farm, 7/10/96 at Brookings and 7/11/96 at SE Farm.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

Results and Discussion: At the NE Farm in 1996, none of the treatments significantly lowered the disease ratings, although all resulted in a significant yield increase compared to the untreated check. Only Mancozeb III resulted in a significant increase in test weight.

At the SE Farm, Mancozeb II and III significantly lowered the disease ratings, but none of the treatments increased yield or test weight.

At Brookings, Mancozeb II and III significantly lowered the disease ratings, and increased test weights. Only Mancozeb III increased yield.

While responses to fungicides were lower in 1996 than in some previous seasons, results still indicate the potential to decrease disease and increase yield and test weight in oats.

Variety:		Don	
Locations:		NE Farm	
		Brookings	
		SE Farm	
Plots/Location:		20	
Planting Dates:		NE Farm:	05/21/98
		Brookings:	
		SE Farm:	
Disease Ratings:		NE Farm:	07/11/98
		Brookings:	07/10/96
		SE Farm:	07/22/96
Spray Dates:			
	Early	NE Farm:	06/25/98
		Brookings:	06/11/98
		SE Farm:	05/22/96
	Flag	NE Farm:	07/01/96
		Brookings:	06/18/96
		SE Farm:	06/10/96
	Boot	NE Farm:	07/01/96
		Brookings:	06/22/96
		SE Farm:	06/10/96
	Boot + 10	NE Farm:	07/11/96
		Brookings:	07/02/98
		SE Farm:	08/20/96

	Disease Rating Scale 0-5	Yield (bu/A)	Test Weight (lb/bu)
NE FARM			
Untreated	0.9	81.8	33.2
Tilt III	0.8	74.4	33.6
Mancozeb I	1.0	89.0	33.9
Mancozeb II	0.8	79.9	33.9
Mancozeb III	0.9	78.9	34.3
$LSD_{(.05)}$	0.4	5.0	1.0
BROOKINGS			
Untreated	1.5	73.0	31.1
Tilt III	1.0	85.8	32.8
Mancozeb I	1.4	67.3	30.3
Mancozeb II	1.0	85.9	33.6
Mancozeb III	1.0	91.0	33.4
$LSD_{(.05)}$	0.4	15.0	2.3
SE FARM			
Untreated	3.1	103.3	34.1
Tilt III	2.9	104.1	34.2
Mancozeb I	3.4	98.2	33.6
Mancozeb II	2.1	104.3	34.3
Mancozeb III	2.3	102.5	34.9
$LSD_{(.05)}$	0.4	12.8	0.9

Spring Wheat Breeding

Jackie Rudd and Brad Farber

The spring wheat breeding 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. Table 1 presents data from the Northeast Research Station (Watertown), the Johnson farm in northern Day county (Day County), and data averaged across all 9 locations. Both Watertown and Day County trials were planted late (May 21 and May 1, respectively) due to excessive spring rains.

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. 'Oxen' is an early semi-dwarf that was approved for 1996 release. Originating from Pioneer Hi-bred International, the name Oxen was chosen to symbolize the success attainable when public and private industry work together as a 'team'. Russ and Oxen have both averaged 2 bushels per acre greater grain yield than Butte 86 with a similar test weight and protein content. Two experimentals are currently being increased for potential release in the future. SD3156, a possible 1997 release, is 1 to 2 days earlier than Butte 86 with a better yield and test weight. SD3249 (target release in 1998) is early with very high test weights and has moderate resistance to *Fusarium* head scab.

Table 1. Spring wheat breeding 1996 advanced yield trials.

	Yield (bu/a)			Test Weight	Heading	Height
	Watertown	Day County	State Average	lb/bu	days	cm
SD3219	40.1	67.4	59.6	61.0	+1	85
Oxen	36.4	63.3	58.6	61.5	+2	81
SD8108	35.0	70.7	58.3	62.8	-1	91
Russ	38.8	61.4	56.8	61.1	+2	88
SD3156	30.0	66.6	54.9	62.0	-1	84
2375	33.5	58.7	53.4	61.7	+2	83
Prospect	35.8	56.6	53.4	60.9	+3	81
SD3249	38.1	64.0	53.3	63.5	-1	91
Butte 86	35.2	59.8	52.9	61.4	0	85
Sharp	33.5	59.5	52.3	62.1	0	85
Chris	27.3	42.5	41.7	59.2	+4	96
Mean	35.3	60.1	53.6			
CV(%)	7.8	3.7	6.8			
LSD(.05)	4.5	3.6	3.4			

Winter Wheat Breeding and Genetics

Scott D. Haley and Steven A. Kalsbeck

Summary of Activities: Since the 1995 crop season, the Winter Wheat Breeding and Genetics Program has utilized the Northeast Research Station primarily to conduct winterhardiness evaluations and for yield testing of advanced breeding lines developed during the course of the breeding process. The breeding program also conducts field-testing at several other sites throughout South Dakota (Brookings, Highmore, 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 Northeast Research Station during the 1996 season included:

i) The Crops Performance Testing (CPT) Variety Trial, under the overall coordination of Bob Hall. The trial included 37 entries, consisting of 23 released varieties (including new releases from other states), 10 advanced experimental lines from our program, and 4 experimental lines from the University of Nebraska. This trial was also grown et 12 other sites in South Dakota. Prior to cultivar release, promising elite lines must be grown in the CPT Variety Trial 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 (35 advanced experimental lines and 10 checks) and is also grown at seven other sites in South Dakota and one site each in Nebraska and North Dakota. Each year, 3-5 superior experimental lines are selected from this nursery and advanced to the CPT Variety Trial and the Regional Testing Program;

iii) A single-row winterhardiness nursery, consisting of replicated evaluations of several different breeding nurseries: the Regional Germplasm Observation Nursery (RGON, 292 entries), the Advanced Yield Trial (AYT, 45 entries), the Preliminary Yield Trial (PYT, 120 entries), the Nebraska Intrastate Nursery (NIN, 60 entries), and the Nebraska Triplicate Nursery (NTN, 60 entries);

iv) Cooperative projects with other SDSU Plant Science personnel, including a rye yield trial (Dale Reeves, Oat and Rye Breeding) and winter wheat phosphorous and chloride fertilizer management trials (Ron Gelderman and Jim Gerwing, Soil Fertility).

Methods and Results: The nurseries at the Northeast Research Station were planted into black-fallow with good moisture on 9/26/95. Plant development going into the winter was less than desirable due primarily to the cold fall temperatures recorded. Extremely high levels of winterkill (Roughrider was about 10-20% survival) were observed throughout the plots and the entire nursery was abandoned. For information

purposes, grain yield data for the other locations of the 1996 CPT Variety Trial are reported in Table 1.

In coming years, conduct of the winter wheat nurseries at the Northeast Farm will focus less on management for maximum winterkill and more on achieving optimum yield by planting into some type of protective cover (e.g., oat stubble). For purposes of selection, and maintaining winterhardiness levels for new releases in the future, nurseries at Highmore, Dakota Lakes, and Selby will continue to be managed with minimum or no protective cover at planting.

Experimental Lines on Increase: Two winter wheat experimental lines are under increase with the intent to release in fall 1997. The first of these, SD89119, is a medium-height and medium-maturing (similar to Arapahoe) line with good winterhardiness, exceptional end-use quality characteristics and good yield performance in its maturity range. In four years of testing in the CPT Variety Trial, the average yield of SD89119 has been roughly equal to Arapahoe with about a 1.5 lbs/bu test weight advantage over Arapahoe. SD89119 is moderately resistant to prevalent races of the stem rust pathogen, and susceptible to leaf rust, tan spot, *Septoria* leaf blotch, and wheat streak mosaic virus. The coleoptile length (considered important for optimum fall stand establishment) of SD89119 is very long (similar to Scout66) and the straw strength is considered medium (similar to Roughrider and Arapahoe). This experimental line would be positioned as a high-end use quality replacement for Siouxland and complement to Arapahoe.

The second experimental line on large-scale increase, SD89153, is a medium-late maturity, standard height (very similar to Rose) line with good winterhardiness, exceptional end-use quality characteristics, and superior yield performance in its maturity range. In three years of testing in the CPT Variety Trial, the average yield of SD89153 has been about 1-2 bu/acre greater than Rose and Seward with a higher test weight than any other entry in the trials (0.5 lbs/bu advantage over Rose, 2.5 lbs/bu advantage over Seward). SD89153 is moderately susceptible to prevalent races of the stem rust pathogen and susceptible to leaf rust. SD89153 is resistant in greenhouse seedling screening with isolates of the *Septoria* leaf blotch pathogen and has shown good leaf spotting scores in field nurseries. Greenhouse seedling screening with South Dakota isolates of wheat streak mosaic virus suggest a moderate level of resistance (slightly less than Dawn, but greeter than most available varieties). The coleoptile length of SD89153 is very long (similar to Scout66) and the straw strength is considered good (slightly better than Rose). This experimental line would be positioned as a high-end use quality replacement for both Rose and Seward.

Table 1. Grain yield means for the 1996 Winter Wheat Crops Performance Testing (CPT) Variety Trial.

Entry	Winner	Platte Oelrichs	Hayes-RT[3] Martin	Bison Hayes-CT[3]	Selby 96 AVG	94-96 AVG
	bushels/acre					
SD92107	65.2	54.1	58.0	60.2	58.3	66.1	82.5	74.8	62.4	—
Quantum 566 (hybrid)	63.3	56.9	55.8	61.1	56.0	69.1	54.3	77.1	61.7	56.2
Arapahoe	62.8	51.1	56.2	55.3	49.2	62.7	55.8	75.5	58.6	51.8
SD92191	54.8	56.8	52.9	56.4	56.1	60.6	60.7	68.6	58.4	—
Windstar	60.0	47.7	60.2	56.3	53.4	62.5	52.7	72.8	58.2	—
SD89119	62.9	57.3	53.8	56.3	43.1	54.0	58.0	76.5	57.7	51.3
Siouxland	66.6	59.4	53.9	58.6	43.6	57.7	55.9	65.8	57.4	48.3
Roughrider	56.6	55.0	46.0	58.2	57.2	59.7	54.8	71.5	57.4	44.5
Quantum AP7510 (hybrid)	64.1	58.8	58.3	64.8	47.1	53.2	51.3	70.6	57.3	—
SD92266	53.5	46.2	54.3	58.9	55.7	60.6	59.9	70.2	57.2	—
SD92227	56.7	49.0	58.2	56.4	48.1	59.3	56.0	70.4	56.8	—
Elkhorn	53.6	46.9	47.7	54.2	58.7	58.5	58.4	73.0	56.4	—
SD89153	65.9	61.5	52.6	54.6	48.5	53.5	50.8	63.8	56.4	50.6
Rose	59.0	60.9	50.3	47.8	54.0	60.8	47.8	67.3	56.0	48.8
Seward	47.9	54.1	45.5	56.8	48.7	62.2	57.7	71.3	55.5	49.2
SD92174	57.7	48.1	50.6	54.1	57.8	60.3	52.6	62.6	55.5	—
2137	62.3	60.2	50.0	51.3	45.7	55.3	47.8	65.5	54.8	—
Nekota	63.5	56.9	49.9	50.5	45.5	53.1	49.6	67.9	54.6	51.5
SD91192	59.0	48.5	52.5	49.8	48.1	58.2	56.0	64.7	54.6	—
NE91648	57.8	59.0	50.8	54.9	33.9	58.2	50.8	71.4	54.6	—
Redland	57.7	46.7	50.7	54.8	45.9	57.5	51.0	72.1	54.6	49.7
Niobrara	54.3	48.4	55.4	56.4	48.3	58.6	49.0	62.6	54.1	50.2
Alliance	62.8	47.0	54.6	50.6	41.1	60.7	47.9	67.3	54.0	51.9
NuWest	53.5	46.4	46.3	59.8	39.8	59.5	54.2	68.2	53.5	—
SD92124	60.8	45.7	51.5	44.3	47.1	54.2	54.0	64.5	52.8	—
Pronghorn	56.6	53.0	55.4	55.3	33.7	60.2	43.2	62.4	52.5	—
NE91631	50.9	43.3	51.6	50.3	43.3	60.2	49.7	67.4	52.1	—
Sage	52.6	43.2	54.6	54.3	46.6	59.8	39.3	58.0	51.1	46.5
NE90479	53.0	56.1	47.9	51.1	37.6	51.0	51.3	53.1	50.1	—
Dawn	57.0	50.5	46.7	53.4	34.9	59.3	39.1	59.1	50.0	47.0
Scout66	49.6	41.0	47.3	49.0	45.5	54.5	50.3	58.7	49.5	44.9
SD89205	60.8	52.6	46.8	51.6	37.1	43.0	39.6	59.8	48.9	48.3
Vista	53.9	43.8	52.6	50.8	33.1	52.9	42.5	58.1	48.5	48.1
TAM 107	55.7	49.9	46.9	46.1	31.9	43.3	48.0	64.5	47.0	48.0
Quantum AP7501 (hybrid)	60.3	54.5	47.0	44.5	30.0	49.2	32.8	57.2	46.9	—
Halt	61.5	46.7	54.5	40.8	23.8	42.9	35.5	47.5	44.2	—
Jagger	63.9	52.9	46.9	38.3	12.5	54.0	32.0	47.7	43.5	—
Mean	58.3	51.6	51.7	52.8	44.3	56.9	50.1	85.4	63.9	
CV (%)[1]	11.7	9.7	7.2	10.7	11.5	9.6	13.7	9.0		
LSD (0.05)[2]	9.5	7.0	5.4	7.9	7.1	7.7	9.8	8.3		

[1] The CV (coefficient of variability) is a statistical measure of experimental error. In general, yield trials with a CV of 16% or greater are considered to contain too much experimental error for reliable data interpretation.

[2] The LSD (least significant difference) is the minimum value by which two entries must differ in order for that difference to be meaningful (and not due to random chance alone). If the difference between two entries is equal to or less than the LSD value, the entries are not statistically different.

[3] Hayes-RT: reduced tillage; Hayes-CT: conventional tillage.

Cost Effectiveness of Bt Corn In Managing European Corn Borer

M.J. McLeod and M. A. Catangui

Introduction: European corn borer is one of the most destructive insect pests of corn in the Midwest. University research hes indicated that for every corn borer larva that successfully tunnels into the corn stalk, producers lose an average of 5 percent yield. To prevent this loss, corn producers must carefully manage corn borers by actively scouting fields and applying insecticides when an economic threshold is reached. Because corn borers complete two generations per year in South Dakota, conventional management of European corn borer requires a significant investment in time and labor.

South Dakota and other corn belt states experienced an outbreak of corn borers in 1995. Surveys from surrounding states indicate the 1995 outbreak may have been the worst in 30 years. Based on historical population trends, outbreaks typically carry over into a second year, thus damaging levels were expected again in 1996. Producers in South Dakota must be prepared to actively manage European corn borer populations in 1997 and beyond.

Corn producers now have a new management option to reduce losses from corn borers. Genetically altered corn (commonly referred to as Bt corn) is available which confers high levels of resistance to corn borers. When a corn borer larva feeds on Bt corn, a gene within the corn plant produces a toxin inside the insect gut which results in death of the insect in approximately 24 to 72 hours. This new technology offers another management option for producers battling European corn borer.

Development of Bt corn and subsequent registration of this product by the EPA has proceeded very rapidly. The development and commercialization of Bt corn has proceeded more quickly than anticipated, and the result is a lack of date comparing the economics of using Bt corn or conventional methods to manage corn borers. Preliminary data indicate that Bt corn does a very effective job in controlling corn borers, but several questions remain for producers. These questions include: (1) How do Bt hybrids compare to conventional hybrids In yield potential?, (2) How do yields of Bt hybrids and conventional hybrids compare in the absence of European corn borer?, and (3) Is using Bt corn cost effective over the long term? Very little independent University data exists to answer these and other important questions.

Methods: This study was designed to evaluate the economics of using Bt corn over a three year time period. The same corn hybrids with and without the Bt gene were evaluated in large plot strip tests at the Northeast Farm. Plots were four rows wide

by 85 feet long, replicated four times. Plots were planted on May 29, 1996 at a seeding rate of 24,000 plants per acre. Four hybrids were planted in the study, two from Ciba seeds and two from Northrup King. For each replication of the experiment three plots of each hybrid were planted. Each plot was managed for corn borer in a different way, the three treatments being (1) conventional hybrid scouted and treated with an insecticide if economic thresholds for corn borer were reached, (2) transgenic hybrid containing the BT gene, and (3) conventional hybrid not treated for corn borer to serve as an untreated check.

Plots were maintained according to standard agronomic practices for the region. Corn borer damage from both first end second generation was evaluated by splitting stalks and recording the number of cavities created by corn borers and the length of tunnels in the corn stalk created by corn borers. Ear shank tunneling was also evaluated for each of the treatments. Two rows of each four row plot were harvested for yield.

One of the treatments was to be treated for European corn borers with a conventional insecticide if an economic threshold was reached. At the Northeast farm in 1996, corn borers were present but below economic thresholds. Therefore, no insecticides were applied to any of the plots.

Results and Discussion: Results are presented in Table 1. Corn borers were present ~~at very low population~~ densities at the Northeast farm in 1996. Regardless, hybrids containing the BT trait significantly reduced the number of corn borer cavities and the length of stalk tunneling for both first and second generation for each of the hybrids tested. Shank tunneling was almost non-existent in this experiment.

There were no statistically significant differences in yield between treatments or hybrids. The level of corn borer infestation simply was not high enough to result in significant yield loss. Corn hybrids with the Bt trait had yields similar to isolines in the absence of corn borers. In similar studies at other locations in South Dakota in 1996, planting BT corn resulted in yield advantages of from 9 to 17 bushels per acre, depending on infestation levels and corn hybrid (See the 1996 SE Station Report).

Acknowledgment

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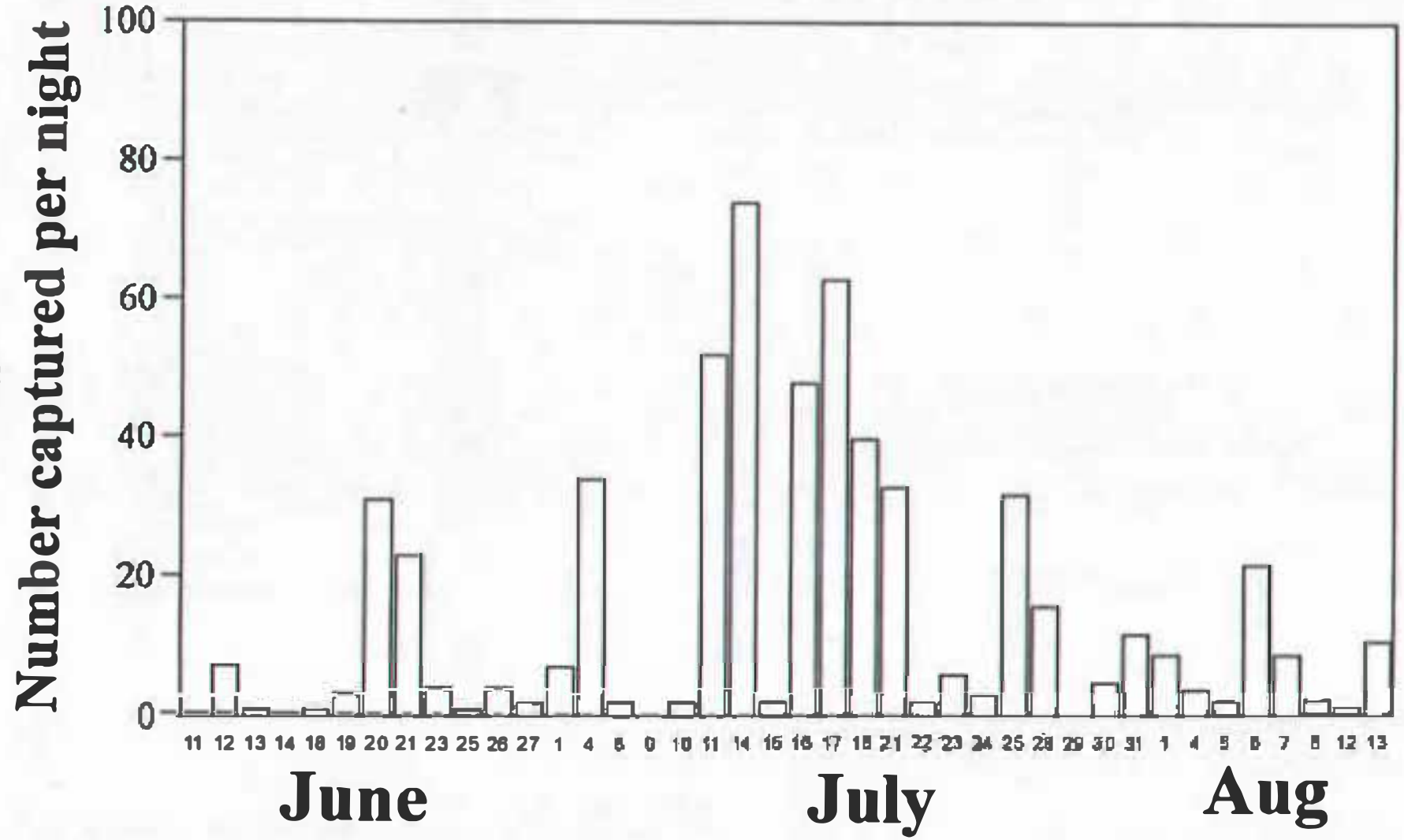
Table 1. Comparison of Management Strategy for European Corn Borer in 1996, NE Farm, South Dakota.						
	Number Cavities/ Stalk 1st Gen.	Cavity Length (inch) 1st Gen.	Number Cavities/ Stalk 1st & 2nd Gen.	Cavity Length (inch) 1st & 2nd Gen.	Ear Shank Tunneling in inches	Yield Adj. to 15.5%
Max 88 (BT)	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	81 a
Ciba 4273	0.1 b	0.1 ab	0.9 b	1.0 b	0.0 a	92 a
Ciba 4273 (Scouted but not treated)	0.2 c	0.2 b	1.2 b	1.4 b	0.0 a	96 a
Max 747	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a	92 a
Ciba 4214	0.1 a	0.0 a	1.2 b	1.1 b	0.1 a	92 a
Ciba 4214 (Scouted but not treated)	0.2 b	0.2 b	0.9 b	0.8 b	0.1 a	89 a
NK 4242 BT	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	96 a
NK 4242	0.3 b	0.4 b	1.1 b	1.2 b	0.1 a	99 a
NK 4242 (Scouted but not treated)	0.3 b	0.3 b	1.3 b	1.4 b	0.0 a	99 a
NK 4640 BT	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	85 a
NK 4640	0.2 b	0.2 b	0.8 b	0.7 b	0.0 a	87 a
NK 4640 (Scouted but not treated)	0.2 b	0.1 ab	0.8 b	0.6 b	0.0 a	86 a
Means within a hybrid group followed by the same letter are not significantly different.						

Corn borer moths captured in light trap

Northeast Farm, 1996



Rotation Studies

J. Smolik, A. Heuer, and L. Evjen

Objectives: Compare the long-term effects of various cropping systems on crop yields, soil nutrient levels, and plant pests.

Methods: This study includes four cropping systems in non-replicated plots. The plots are somewhat larger than usual (24' wide x 120' long) to facilitate certain field operations. All crops within a system are represented each year. The systems are: Conv, a corn-soybean-spring wheat rotation; continuous Hay, alfalfa that is harvested approximately three times per year; two alternate (organic) systems; Alt I, an oat/alfalfa-alfalfa-soybean-corn rotation, and Alt II, en oat-clover-clover (green manure)-soybean-spring wheat rotation. The conventional (Conv) and Hay systems receive recommended inputs of commercial fertilizer and pesticides (primarily herbicide). The oat/alfalfa plot in Alt I receives a moderate application of feedlot manure each fall or in early spring. Cultural practices for 1996 are listed in Table 1.

Results: This was the third year of a long-term study designed in part to compare rotation effects. Because rotation effects are best measured after completion of an entire cycle, the initial results in this study are of rather limited use. Both corn and spring wheat yields were generally lower than those recorded the previous year (Table 2). Soybean yields in the Alt systems were higher than the previous year, while Conv soybean yield was lower.

Extensive winter kill occurred in the Hay system and it was necessary to reseed in 1996. Alfalfa yield in the Alt I system was slightly lower than the previous year.

The highest soil test level of N occurred in clover (green manure) in the Alt II system. In general, soil test levels of N followed the same pattern as that recorded in 1995. The highest percentage of organic matter was measured in the Alt I system (Table 2). No serious pest problems were encountered in 1996.

Note: This study is supported in part by the Floyd Linhart Research Fund established through the SDSU Foundation.

Table 1. Cultural practices in 1996 Rotation Studies

System/Crop	Fertilizer	Herbicide	Tillage	
			Pre-plant	Post-Plant
Conv				
Corn	100 lb N + 30 lb P	Accent 2/3 oz+Banvel 1 pt	Field cult & harrow	Cult 2x, fall moldboard plow
Soybean	30 lb P	Lasso 2 qt+Amiben 3 qt	Field cult & harrow	Cult 2x, fall chisel plow
Spring Wheat	100 lb N + 30 lb P	Bronate 1.5 pt	Field cult & harrow	Fall moldboard plow
Hay[a]	30 lb P		Field cult & harrow	
Alt - I				
Oat/alfalfa			Field cult & harrow	
Alfalfa			----------	Fall chisel plow
Soybean			Field cult & harrow	Rotary hoe 2x, cult 2x, fall chisel plow
Corn			Field cult & harrow	Rotary hoe 2x, cult 2x, fall chisel plow
Alt II				
Oats/clover			Field cult & harrow	
Clover			----------	Chisel plow, (late summer)
Soybeans			Field cult & harrow	Rotary hoe 2x, cult 2x
Spring wheat			Field cult & harrow	Rotary hoe 1x, fall chisel plow

[a] Reseeded with Oats/Alfalfa in Spring, 1996.
Seeding rates (lb/A): Oats 100, Alfalfa 9.5, Sp. Wheat 70, Sweet Clover 4.5, Red Clover 4.5.
Corn seeded at 21,000/A, Soybean at 180,000/A

Table 2. Crop yields and soil test results in rotation studies

System/Crop	Yield	Soil Test Results (Fall, 1996) N 0-24"	P 0-6"	K 0-6"	% O.M.
		lbs/A			
Conv					
Corn	108.9 Bu/A	13.8	8	320	3.9
Soybean	36.2 Bu/A	31.2	6	324	4.2
Spring Wheat	38.6 Bu/A	47.2	4	328	3.9
Hay: (Reseeded in 1996, oats = 56.0 Bu/A)		30.8	6	316	4.1
Alt I					
Oats/Alfalfa:	16.8 Bu/A[b]	16.0	6	378	3.8
Alfalfa: 0.76 + 1.04 + 1.09 = 2.89 T/A[a]		25.6	22	372	4.7
Soybean	39.5 Bu/A	38.0	20	460	4.3
Corn	83.9 Bu/A	30.8	6	296	3.8
Alt II					
Oats/Clover	57.1 Bu/A	16.4	6	340	3.8
Clover:	1.42 T/A[b]	136.8	12	380	4.0
Soybeans	35.3 Bu/A	35.6	26	468	4.1
Spring Wheat	23.5 Bu/A	39.6	10	370	3.8

[a] Analysis/cut (% N-P-K) = 2.63 - 0.239 - 2.47; 3.24 - .324 - 2.39; 3.57 - .254 - 2.43

[b] Green manure: 2.96 - 0.23 - 2.44