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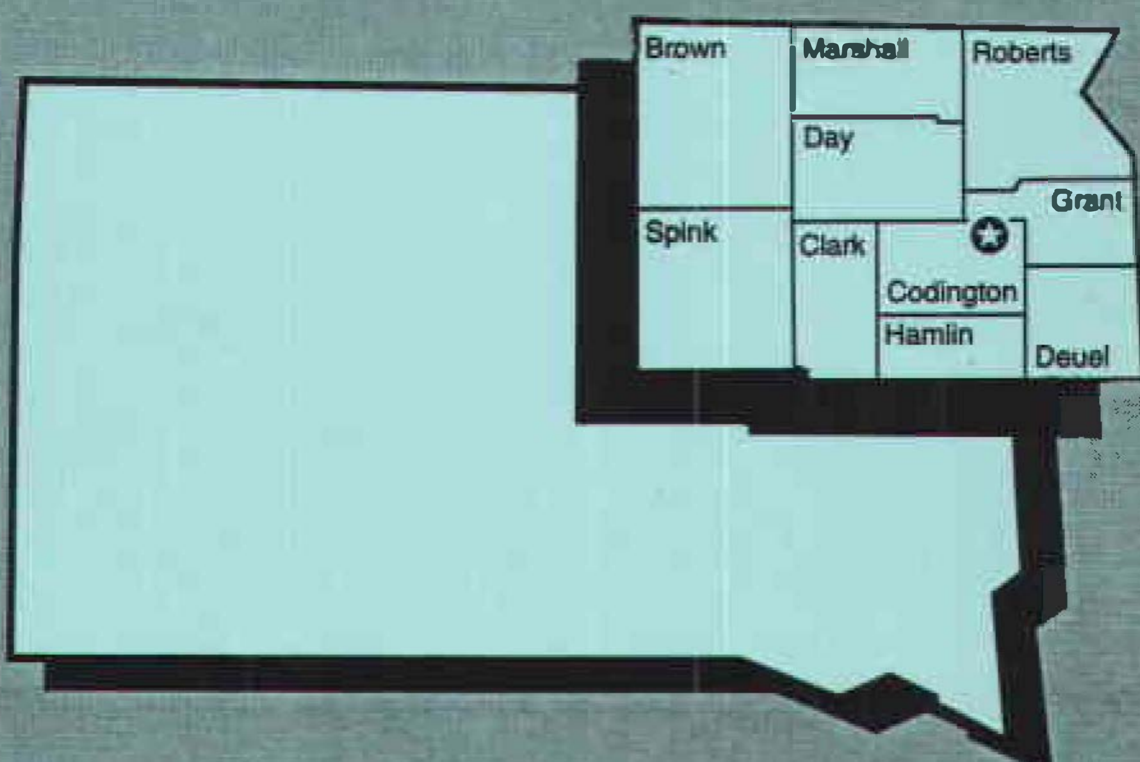
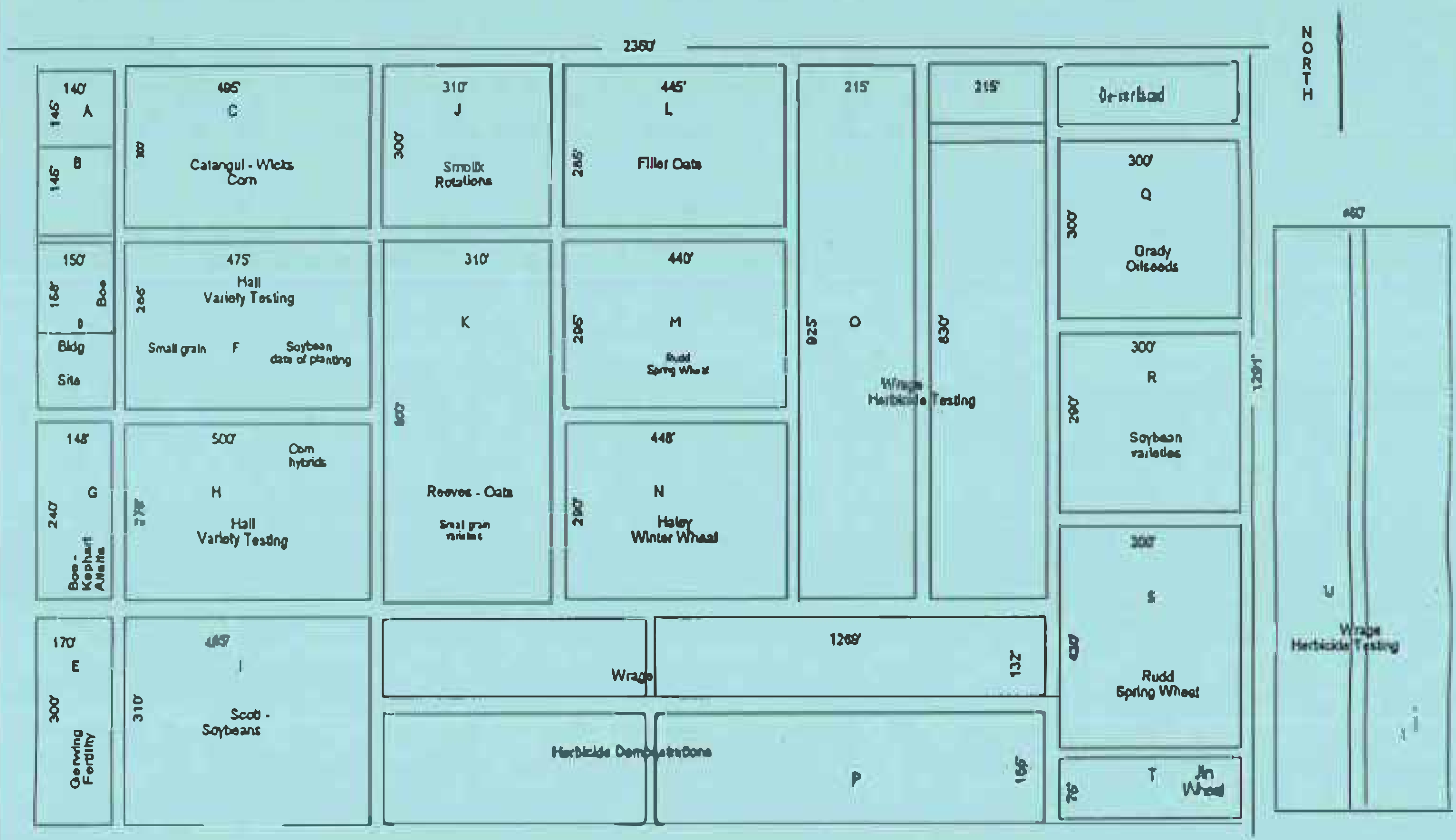
1998 Annual Progress Report

Northeast Research Station • Watertown, South Dakota

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



Northeast Research Station (Watertown)
1998 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	2.06
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	2.98	U	9.72

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

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1999
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* County Extension Educator

** SDSU Representatives

Annual Progress Report, 1998
Northeast Research Station, Watertown, South Dakota
J.D. Smolik

The 1998 growing season was longer than average (Table 1), with generally favorable growing conditions. The last killing frost (28°F) occurred on 17 April. April precipitation was below average, but precipitation in May was more than an inch above average. Both June and July were dryer than average followed by above average precipitation in August. The 0.02 inch recorded in September was the lowest precipitation recorded for this month at the NE Station, and was followed by the wettest October (Table 1). The first killing frost occurred on 1 October. Overall, growing season precipitation was nearly 3 inches above the long-term average, due in large part to the very wet October. Growing season precipitation over the past 43 years is summarized in Figure 1.

The favorable growing season resulted in very good crop yields. Corn, soybean, spring wheat, oats, alfalfa, canola and flax yields were all substantially above those recorded in 1997. Foliar diseases and head scab were present in the small grain crops, but infection levels were not as high as has been observed in previous years. Corn borer populations were high again this year, and unprotected corn lines were significantly damaged.

Two well-attended tours were held in 1998. The summer tour included updates on herbicides, small grain varieties and diseases, fertilizers, alfalfa management, winter wheat breeding and corn insects. The fall tour included discussions on herbicides, corn and soybean performance, soybean breeding, corn row space studies and Bt corn.

We thank the area Crop Improvement Associations for sponsoring the lunch following the summer tour. We also thank Orrin Korth and family for assistance with harvesting operations and Nick Endres for providing wagons for use at the tours. Thanks also to Arlan Kannas for his assistance over the summer months.

The 1998 Summer Tour will be held on 7 July starting at 4pm. The Fall Tour on 8 September will begin at 1pm.

Note: Much of the information in this report is based on ongoing studies, and the 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.

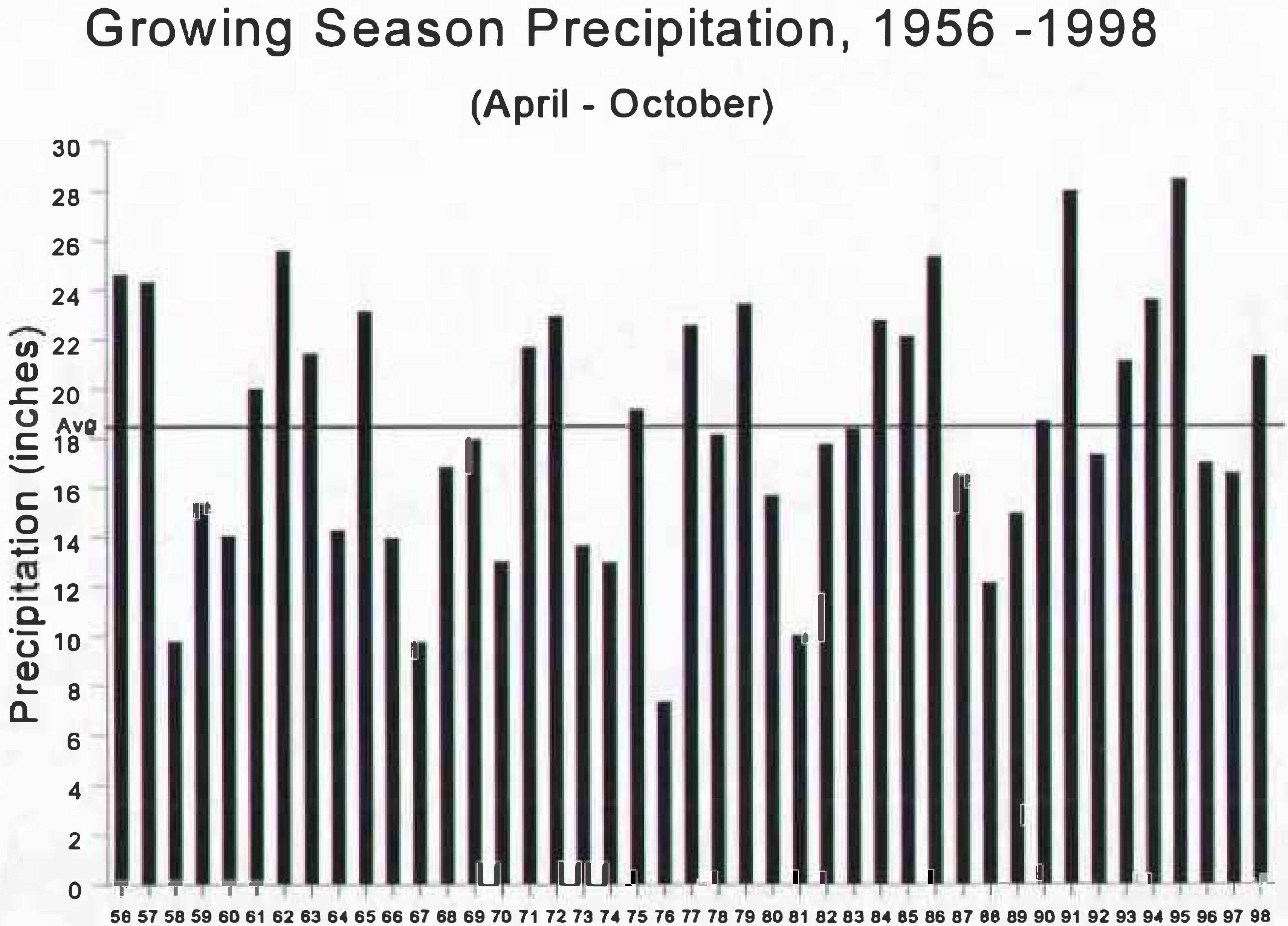
Special thanks to Marjorie VanderWaal for her assistance in preparing this report.

Table 1. Growing Season Precipitation* (Inches) 1956-1998

Year	April	May	June	July	Aug.	Sept.	Oct.	Total	Frost-Free Days
1956	1.80	2.88	6.56	4.02	6.25	0.70	2.44	24.65	125
1957	4.26	5.98	2.85	0.74	5.26	2.12	3.12	24.33	119
1958	1.41	1.49	2.65	2.68	0.57	0.81	0.18	9.79	116
1959	0.58	3.47	1.91	1.66	4.69	1.10	1.95	15.38	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	10.38	1.89	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	92
1965	2.89	6.08	3.66	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	0.89	4.58	1.05	1.13	1.08	0.35	9.78	129
1968	3.04	2.15	3.18	2.39	1.53	2.58	2.00	16.85	132
1969	1.52	3.44	1.96	4.52	2.48	1.88	2.16	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	1.48	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	2.87	1.12	2.05	1.27	3.81	1.39	13.65	163
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	1.28	1.49	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	160
1978	3.38	5.15	2.26	2.08	2.43	2.32	0.53	18.15	176
1979	3.14	2.17	5.76	3.10	5.21	0.53	3.50	23.43	162
1980	0.43	3.09	4.97	1.98	3.82	0.72	0.68	15.87	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	2.86	1.30	18.38	140
1984	2.88	1.86	7.45	1.85	3.09	1.14	4.69	22.76	147
1985	1.93	3.90	2.07	5.21	3.65	3.77	1.59	22.12	167
1986	5.55	4.84	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	0.86	4.03	2.98	0.22	12.13	144
1989	2.95	1.15	1.74	2.41	4.58	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	28.01	148
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
1997	2.20	0.97	0.76	4.77	4.23	1.39	2.25	16.57	152
1998	0.69	4.18	2.96	1.93	3.94	0.02	7.58	21.30	167
AVG:	[illegible]	3.04	3.64	3.25	2.96	1.94	1.72	18.44	146

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

Figure 1.



Growing Season Precipitation, 1956 -1998
(April - October)
Precipitation (inches)
Avg
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98

1998 Crop Performance Results - Small Grains, Corn, & Soybean

R.G. Hall and K.K. Kirby

Hard Red Spring Wheat

Results of the 1998 hard red spring wheat trial are indicated in Table 1. The top-yielding varieties for the period 1995, 1996, and 1998 are Russ, Forge, Kulm, Sharp, Trenton, and Verde. The top-yielding varieties for 1998 are the variety Russ, the experimental lines SD8119 and SD3345, the variety Trenton, the experimental lines SD3219, SD3310, and SD3348, and the variety Sharp. Varieties or lines had to differ by 6 bu/ac or more and 7 bu/ac or more to be significantly different in yield for the three-year period and for 1998, respectively. During the three-year period all varieties except Chris, a very old check variety, were similar in bushel weight. During 1998 the varieties Ingot, Keene, Kulm, and Verde were the highest in bushel weight along with the two experimental lines SD3345 and SD8108. Proteins for 1998 ranged from a low of 12.0% to a high of 14.4%. Caution should be used when evaluating these proteins because they were obtained from one sample per variety or experimental line.

Durum Wheat

Results of the 1998 Durum wheat trial are indicated in Table 2. The top-yielding varieties for the period 1995, 1996, and 1998 are Monroe, Munich, and Renville. Varieties had to differ by 4 bu/ac or more to be significantly different in yield for the three-year period. In 1998 there was no significant yield difference among the varieties tested. Therefore, the top-yielding varieties for 1998 included all the varieties under test. During the three-year period all varieties were similar in bushel weight. During 1998 the varieties Ben, Munich, Renville, and Vic along with the experimentals ND89135 and ND901313 were the highest in bushel weight. Proteins for 1998 ranged from a low of 11.4% to a high of 15.0%. Caution should be used when evaluating these proteins because they were obtained from only one sample per variety or experimental line.

Table 1. Hard red spring wheat one- and three-year yield, bushel weight, and protein averages.

VARIETY	'98	3-YR@	'98	3-YR@	'98	3-YR@
	--- BU/A ---		-- LBS/BU --		---- % ----	
BUTTE 86	45	44	56	57+	12.8	.
CHRIS,CK	32	32	52	53	13.0	.
FORGE	46	46+	56	57+	13.2	.
HAGAR	37	.	52	.	13.2	.
HAMER	43	44	56	58+	12.8	.
HJ98	36	.	53	.	14.0	.
INGOT	46	.	60+	.	14.4	.
IVAN	44	.	54	.	12.9	.
KEENE	42	40	58+	57+	13.4	.
KULM	47	46+	58+	59+	13.2	.
NORA	34	.	54	.	15.2	.
NORLANDER	42	43	55	57+	14.2	.
OXEN	43	45	56	57+	14.4	.
RUSS	55+	51+	57	58+	12.8	.
SAXON	43	.	55	.	13.4	.
SHARP	48+	46+	55	58+	13.5	.
TRENTON	51+	46+	57	58+	13.6	.
VERDE	43	46+	58+	58+	12.4	.
2375	41	43	57	59+	12.0	.
2398	35	.	54	.	14.0	.
SD3219	49+	.	56	.	12.5	.
SD3310	49+	.	57	.	14.0	.
SD3345	53+	.	59+	.	12.6	.
SD3348	49+	.	57	.	13.1	.
SD3356	43	.	57	.	14.4	.
SD8108	44	.	58+	.	12.9	.
SD8119	53+	.	56	.	14.1	.
ND690	38	.	54	.	14.4	.
ND694-WHITE	42	.	57	.	13.8	.
ND695	42	.	56	.	14.0	.
TEST AVG.:	44	44	56	58	13.5	.
LSD (5%):	7	6	2	2		
CV (%) :	11	9	2	2		

@ Includes years 1995, 1996, and 1998.

+ Indicates value is in the top-yield or top-bushel weight group within a yield or bushel weight column.

Table 2. Durum wheat one- and three-year yield, bushel weight, and protein averages.

VARIETY	'98	3-YR@	'98	3-YR@	'98	3-YR@
	--- BU/A ---		-- LBS/BU --		--- % ---	
BEN	36+	37	56+	57+	11.4	.
MONROE	38+	42+	53	55+	11.6	.
MUNICH	39+	40+	54+	55+	11.5	.
RENVILLE	40+	43+	56+	56+	11.4	.
VIC, CK	34+	37	54+	56+	11.9	.
ND89135	37+	.	54+	.	15.0	.
ND901313	34+	.	51	.	13.1	.
TEST AVG.:	37	40	54	56	12.3	.
LSD (5%):	NS#	4	3	NS		
CV (%):	8	10	3	2		

@ Includes years 1995. 1996, and 1998.
+ Indicates value is in the top-yield or top-bushel weight group within a yield or bushel weight column.
# Indicates differences within a column are not significant (NS).

Barley

Results of the 1998 barley trial are indicated in Table 3. The top-yielding varieties for the period 1995, 1996, and 1998 are all the entries except Bowman. Likewise, the top-yielding varieties for 1998 are all the varieties tested except Bowman. Varieties or lines had to differ by 11 bu/ac or more and 12 bu/ac or more to be significantly different in yield for the three-year period and for 1998, respectively. During the three-year period the two row varieties Bowman, Logan, and Stark were similar but higher in bushel weight than the other varieties. During 1998 all of the two row varieties including Bowman, Conlon, Logan, and Stark were the highest in bushel weight. Proteins for 1998 ranged from a low of 9.6% to a high of 12.9%. Caution should be used when evaluating these proteins because they were obtained from only one sample per variety or experimental line.

Table 3. Barley one- and three-year yield, bushel weight, and protein averages.

VARIETY	'98	3-YR@	'98	3-YR@	'98	3-YR@
	--- BU/A ---		-- LBS/BU --		--- % ---	
BOWMAN	42	48	51+	50+	12.1	.
CONLON	72+	.	51+	.	11.7	.
EXCEL	72+	70+	48	48	9.8	.
FOSTER	77+	72+	49	48	9.6	.
LOGAN	66+	63+	51+	50+	10.8	.
MNBRITE	70+	.	50	.	12.1	.
ROBUST	75+	64+	50	49	11.0	.
STANDER	78+	69+	50	49	10.9	.
STARK	81+	69+	51+	50+	12.9	.
TEST AVG.:	70	65	50	49	11.2	.
LSD (5%):	12	11	1	1		
CV (%):	11	11	1	1		

@ Includes years 1995. 1996, and 1998.
+ Indicates value is in the top-yield or top-bushel weight group within a yield or bushel weight column.

Oat

Results of the 1998 oat trial are indicated in Table 4. The top-yielding varieties for the period 1995, 1996, and 1998 are Jerry, Jim, Valley, Riser, and Settler. The top-yielding varieties for 1998 are Jud and the experimental lines SD94160, SD94152, SD94004 and SD94173. Varieties or lines had to differ by 18 bu/ac or more over three years and 11 bu/ac in 1998 to be significantly different in yield. The two experimentals SD95810 and SD95963, both are hulless lines, were the better bushel weight entries for 1998. During the longer three-year period Hytest, Riser and Jerry are the better test weight entries. Protein in 1998 ranged from a low of 12.3% for Don to a high of 16.8% for Riser. Caution should be used when evaluating these proteins because they were obtained from only one sample per variety or experimental line.

Table 4. Oat one- and three-year yield, bushel weight, and protein averages.

VARIETY	'98	3-YR@	'98	3-YR@	'98	3-YR@
	--- BU/A ---		-- LBS/BU --		--- % ---	
DON	101	75	35	35	12.3	-
GEM	116	-	37	-	16.2	-
HYTEST	86	74	40	38+	15.7	-
JERRY	115	101+	39	38+	13.1	-
JIM	106	89+	35	34	12.4	-
JUD	123+	-	38	-	14.8	-
RISER	108	93+	38	38+	16.8	-
SETTLER	96	86+	36	35	13.7	-
TROY	89	74	36	33	13.3	-
VALLEY	87	94+	34	35	13.1	-
SD93018	115	-	41	-	15.2	-
SD93311	120	-	39	-	15.9	-
SD94004	121+	-	41	-	15.7	-
SD94152	124+	-	38	-	15.4	-
SD94155	118	-	38	-	15.4	-
SD94160	132+	-	39	-	15.9	-
SD94173	121+	-	38	-	15.0	-
SD95810HULL	67	-	43+	-	14.4	-
SD95963HULL	74	-	44+	-	15.7	-
TEST AVG.:	106	86	38	36	14.7	-
LSD (5%):	11	18	2	2		
CV (%):	7	7	4	4		

@ Includes years 1995, 1996, and 1998.

+ Indicates value is in the top-yield or top-bushel weight group within a yield or bushel weight column.

Hard Red Winter Wheat

Results of the 1998 hard red winter wheat trial are indicated in Table 5. The top-yielding varieties for 1998 are the variety Windstar, the hybrids Quantum 7510 and Quantum 566, the variety Pronghorn, and the experimental lines SD94227 and NE93427. Varieties or lines had to differ by 8 bu/ac or more to be significantly different in yield for 1998. During 1998 the varieties Scout 66, Pronghorn, and Tandem appear to be the highest in bushel weight. Proteins for 1998 ranged from a low of 11.1% to a high of 13.9%. Caution should be used when evaluating these proteins because they were obtained from only one sample per variety or experimental line.

Table 5. Hard red winter wheat one- and three-year yield, bushel weight, and protein averages.

VARIETY	'98	3-YR@	'98	3-YR@	'98	3-YR@
	--- BU/A ---		-- LBS/BU --		--- % ---	
ALLIANCE	52		53		11.8	
ARAPAHOE	51		54		13.5	
CRIMSON	52		58		12.0	
CULVER	50		54		12.8	
DAWN	54		58		11.9	
ELKHORN	52		57		13.4	
JAGGER	52		54		12.0	
MCQUIRE	45		57		13.5	
NEKOTA	46		54		12.6	
PRONGHORN	61 +		59		13.1	
QUANTUM 7510	64 +		57		13.9	
QUANTUM 566	64+		57		13.7	
RANSOM	53		55		13.0	
ROSE	48		55		12.8	
ROUGHRIDER	42		58		13.0	
SCOUT 66	47		60		13.2	
SEWARD	37		53		11.4	
SIOUXLAND	56		58		12.4	
TAM 107	40		54		11.7	
TAM 110	48		55		11.1	
TANDEM	52		59		13.3	
VISTA	56		58		12.0	
WINDSTAR	65+		58		12.3	
2137	50		54		11.2	
SD92107	56		56		13.7	
SD93195	42		54		11.2	
SD93338	47		54		12.1	
SD93528	55		56		13.8	
SD94149	51		57		11.5	
SD94227	59 +		58		12.6	
SD94241	53		58		11.8	
N95L158	56		53		11.4	
NE93427	57 +		57		11.8	
TEST AVG.:	52		58		12.5	
LSD (5%):	8					
CV (%):	11					

@ Includes years 1995, 1996, and 1998.

+ Indicates value is in the top-yield group within a yield column.

Corn

Early maturity trial results for 1998 and 1997-98 are indicated in Table 6. There were 20 entries tested over the two year 1997-98 time period with an average of 153 bu/ac. Entries also had to yield 147 bu/ac or higher to be in the top-yield group. There were 13 hybrids in the top-yield group for 1997-98. Yields differences between entries had to be 26 bu/ac or higher to be significant. There were 54 entries for 1998 with an average of 158 bu/ac. Top-yielding hybrids had to average 183 bu/ac or higher. There were 3 hybrids in the top-yield group for 1998. In 1998, hybrids had to differ by 16 bu/ac to be significantly different in yield. In the early trial grain moisture averaged 19%, test weight 56 LB/bu, harvest population 26,136 plants/ac, and lodging 1%. Grain moisture had to differ by 2%, test weight by 2 lb/bu, and lodging by 2% for there to be a significant difference in these variables between any two hybrids in the trial.

Table 6. 1998 Corn hybrid trial, early maturity – 95 days or less, seeded May 19, 1998, thinned to 26,136 plants/acre.

BRAND & HYBRID	YIELDS AT 15.5% MOIST. 2-YR (Bu/A)	YIELDS AT 15.5% MOIST. 1998 (Bu/A)	1998 GRAIN MOIST. (%)	1998 BU. WT. (lb)	1998 PLANTS PER ACRE	1998 STALKS LODGED (%)
******** ENTRIES TESTED TWO YEARS ********						
WENSMAN MAX 78	172	171	20	57	26136	1
WENSMAN MAX 007	170	170	19	57	26136	1
WENSMAN W 4146	169	159	20	56	26136	0
WENSMAN MAX 127	166	167	20	58	26136	1
MUSTANG DX403	163	166	21	54	26136	0
DAIRYLAND STEALTH-1297	163	183	21	55	26136	1
DAIRYLAND STEALTH-1496	162	166	20	55	26136	1
DEKALB DK449	160	161	20	55	26136	0
DAIRYLAND STEALTH-1595	159	161	19	54	26136	1
ENESTVEDT'S E-605	154	152	19	54	26136	0
WENSMAN W 4137	154	154	18	57	26136	2
KAYSTAR KX-410	152	155	20	55	26136	3
WENSMAN W 4123	149	164	20	57	26136	1
MYCOGEN 2395	146	154	20	57	26136	2
GOLDEN HARVEST H-2265	143	150	18	55	26136	1
ASGROW RX355	141	151	18	56	26136	1
MYCOGEN 2420	140	162	19	56	26136	2
MYCOGEN 2250	139	140	19	59	26136	2
TOP FARM TFSX 2196	133	145	19	55	26136	1
CARGILL 2777	127	151	21	60	26136	1
******** ENTRIES TESTED ONE YEAR ********						
MUSTANG DX460	.	198	20	53	26136	2
GARST 8830	.	187	21	54	26136	2
DEKALB DK440	.	178	19	54	26136	2
DENBESTEN DB2695	.	176	19	55	26136	0
KALTENBERG 3904	.	176	19	56	26136	1

Table 6. 1998 Corn hybrid trial, early maturity (continued).

BRAND & HYBRID	YIELDS AT 15.5% MOIST. 2-YR (Bu/A)	1998 (Bu/A)	1998 GRAIN MOIST. (%)	BU. WT. (lb)	PLANTS PER ACRE	STALKS LODGED (%)
******** ENTRIES TESTED TWO YEARS ********						
PAYCO 468	.	172	19	56	26136	3
GARST 8814	.	172	19	57	26136	2
WENSMAN W 5108 BT	.	166	19	61	26136	0
DEKALB DK405	.	165	16	54	26136	1
MUSTANG DX402	.	165	20	54	26136	1
WENSMAN MAX 70	.	160	20	54	26136	0
MALLARD UC-389-A	.	159	20	55	26136	1
MALLARD UC-414-A	.	158	20	54	26136	2
GOLDEN HARVEST H-2292	.	158	19	54	26136	0
MUSTANG 3090	.	157	20	54	26136	1
GOLDEN HARVEST H-2309	.	155	21	54	26136	1
MUSTANG 3093	.	155	18	54	26136	2
ENESTVEDT'S E-601	.	154	20	57	26136	3
DENBESTEN DB2892	.	153	19	54	26136	2
KALTENBERG 3709	.	152	19	55	26136	1
WENSMAN W 5088 BT	.	152	19	57	26136	0
DENBESTEN DB2890	.	152	19	54	26136	1
DAIRYLAND STEALTH-1292	.	150	20	56	26136	2
EPLEY EX1122	.	149	19	54	26136	3
M-W GENETICS G 6920	.	148	17	55	26136	1
KRUGER K-9896	.	148	19	54	26136	3
DAIRYLAND DST-9047	.	148	18	55	26136	2
KRUGER K-9995	.	148	20	55	26136	1
GARST N6901	.	147	20	60	26136	3
ASGROW RX352	.	146	19	57	26136	1
TERRA E857	.	144	20	57	26136	2
DAIRYLAND DST-9044	.	139	18	54	26136	3
MUSTANG 2085	.	139	18	58	26136	1
TERRA E858	.	129	16	55	26136	1
AVERAGE:	153	158	19	56	26136	1
LSD (5%):	26	16	2	2	NS**	2
MIN. TOP YIELD VALUE*:	147	183				
COEF. OF VARIATION#:	7	6				

*Top yield – yields within one LSD value of highest yield.

**Yield differences within a column are not significant (NS).

Late maturity trial results for 1998 and 1997-98 are indicated in Table 7. There were 15 entries tested over the two year 1997-98 time period with an average of 159 bu/ac. The test trial was unable to detect significant hybrid yield differences over the two year time period. Therefore, even the lowest numerical yield of 142 bu/ac was in the top-yield group for 1997-98. Hence, there were 135 hybrids in the top-yield group for 1997-98. There were 45 entries for 1998 with an average of 173 bu/ac. Top-yielding hybrids also had to average 180 bu/ac or higher. There were 11 hybrids in the top-yield group for 1998. In 1998, hybrids had to differ by 15 bu/ac to be significantly different in yield. In the late trial grain moisture averaged 20%, test weight 58 lb/bu, harvest population 26,136 plants/ac, and lodging 1%. Grain moisture had to differ by 2% for there to be a significant difference between hybrids. There was no difference among the hybrids in test weight, plants per acre, or stalk lodging. In both trials all populations averaged 26,136 plants/ac.

Table 7. 1998 Corn hybrid trial, late maturity - 96 days or more, seeded May 19, 1998, thinned to 26,136 plants/acre.

BRAND & HYBRID	YIELDS AT 15.5% MOIST. 2-YR (Bu/A)	1998	1998 GRAIN MOIST. (%)	BU. WT. (lb)	PLANTS PER ACRE	STALKS LODGED (%)
******** ENTRIES TESTED TWO YEARS ********						
DEKALB DK477	169	189	19	57	26136	1
CARGILL 3677	167	171	20	54	26136	1
KRUGER K-9705	167	175	22	55	26136	1
MUSTANG DX550	167	184	21	56	26136	1
KRUGER K-9802	166	173	23	55	26136	0
MYCOGEN 2545	166	183	23	54	26136	0
KRUGER K-9904	165	169	25	55	26136	1
GARST 8707	161	170	21	53	26136	1
WENSMAN MAX 88	158	178	21	56	26136	2
CARGILL 4111	156	195	19	58	26136	1
TOP FARM TFSX 2100	156	170	23	54	26136	0
MYCOGEN 2500	153	186	20	57	26136	1
PAYCO 607	151	173	19	56	26136	0
EPLEY EX1160	144	177	19	54	26136	0
TOP FARM TFSX 2201	142	160	21	55	26136	1
MYCOGEN 2593	.	188	20	55	26136	2
DENBESTEN DB2702	.	181	23	58	26136	1
GARST 8766	.	181	22	57	26136	1
KALTENBERG 4809	.	180	20	55	26136	0
TERRA E968	.	180	20	56	26136	0
******* ENTRIES TESTED ONE YEAR *******						
WENSMAN W 4297	.	180	23	55	26136	3
KRUGER K-9901	.	179	20	56	26136	2
WENSMAN W 4237	.	179	22	55	26136	2
KRUGER EX805	.	177	23	54	26136	2
KAYSTAR KX-625	.	177	22	55	26136	1
M-W GENETICS G 6960	.	175	20	55	26136	2
DEKALB DK493BTX	.	174	19	56	26136	2
KALTENBERG 4807	.	174	20	55	26136	1
MUSTANG DX503	.	174	23	55	26136	1
TOP FARM TFSX 2202	.	173	24	56	26136	1

Table 7. 1998 Corn hybrid trial, late maturity (continued).

BRAND & HYBRID	YIELDS AT 15.5% MOIST. 2-YR (Bu/A)	1998	1998 GRAIN MOIST. (%)	BU. WT. (lb)	PLANTS PER ACRE	STALKS LODGED (%)
EPLEY EX1460	-	173	23	54	26136	1
KRUGER EX803	-	172	20	55	26136	0
HYLAND SEEDS HL 2507	-	171	21	54	26136	1
HYLAND SEEDS HL 2614	-	168	22	55	26136	1
DENBESTEN D85101	-	168	20	55	26136	1
HYLAND SEEDS HL 2505	-	168	20	55	26136	1
HYLAND SEEDS HL 2521	-	167	23	55	26136	0
KRUGER K-9902A	-	165	21	55	26136	1
MALLARD UC-595-A	-	165	22	55	26136	1
KRUGER EX902	-	165	21	53	26136	0
TERRA E988IT	-	164	22	54	26136	0
EPLEY EX1140	-	164	19	56	26136	1
KRUGER K-9803	-	159	20	53	26136	2
EPLEY EX1125	-	159	20	54	26136	1
DENBESTEN D82696	-	149	21	55	26136	2
AVERAGE:	159	173	21	55	26136	1
LSD (5%):	NS**	15	2	NS	NS	NS
MIN. TOP YIELD VALUE*:	142	180				
COEF. OF VARIATION#:	6	5				

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

Soybean: Note – Protein and oil data in these results are for 1997.

Maturity group- 0 trial results for 1998, 1997-98, and 1996-98 are indicated in Table 8. There were 25 entries tested over the three year 1996-98 time period with an average of 48 bu/ac. Entries also had to yield 50 bu/ac or higher to be in the top-yield group. There were 11 varieties in the top-yield group for 1996-98. Yield differences between entries had to be 5 bu/ac or higher to be significant. There were 8 entries tested over the two year 1997-98 time period with an average of 49 bu/ac. Entries also had to yield 52 bu/ac or higher to be in the top-yield group. There were 13 varieties in the top-yield group for 1997-98. Yield differences between entries had to be 5 bu/ac or higher to be significant. There were 68 entries for 1998 with an average of 53 bu/ac. Top-yielding varieties had to average 57 bu/ac or higher. There were 27 varieties in the top-yield group for 1998. In 1998, varieties had to differ by 4 bu/ac to be significantly different in yield.

Table 8. 1998 conventional soybean performance trial – maturity group-0. seeded May 19, 1998.

	— YIELD —			– 1997 –		— 1998 —		
--- BRAND / ENTRY —	3YR	2YR	'98	** PROT.	** OIL	HT.	$$ LDG.	## REL. MAT.
	— bu/a —			— % —		in.		
******* ENTRIES TESTED THREE YEARS *******								
KRUGER/K-1333	55	57	55	37.6	16.4	35	2	1.0
KRUGER/K-0909	53	55	59	35.5	16.6	37	4	0.8
PRAIRIE BRAND/PB-104	53	53	56	34.6	17.2	33	3	0.7
MUSTANG/M-0995	53	53	55	35.7	16.3	32	3	0.7
PRAIRIE BRAND/PB-097	52	54	60	35.3	17.4	34	3	0.8
PAYCO/9610	52	53	57	35.1	17.0	34	4	0.7
KRUGER/K-0999	52	53	54	35.7	16.3	36	2	0.8
GOLDEN HARVEST/H-1082	51	53	54	36.6	16.4	35	3	0.8
GOLD COUNTRY/WINDSOR	50	52	55	36.3	16.3	35	3	0.7
DAIRYLAND/DSR-065	50	51	55	35.1	16.9	37	3	0.6
PAYCO/9609	50	50	55	36.2	17.0	40	1	0.7
PAYCO/9508	49	50	52	36.9	16.3	34	3	0.8
PUBLIC/SURGE	49	49	54	37.1	16.9	36	2	0.7
PUBLIC/HENDRICKS	48	48	51	35.9	16.9	35	4	0.8
GOLD COUNTRY/RAYDOR	47	49	51	35.9	16.4	36	2	0.8
PUBLIC/MN 0301	46	46	49	35.6	17.1	37	3	0.4
GOLDEN HARVEST/H-1078	46	45	48	35.3	17.2	41	3	0.6
PUBLIC/PARKER,I-CK*	46	46	50	36.3	16.5	39	4	2.0
TOP FARM/TF6096	45	46	48	36.0	17.0	35	2	0.7
PUBLIC/SIMPSON	45	45	47	36.1	16.8	37	3	0.6
PUBLIC/LAMBERT	44	43	46	36.3	17.4	33	3	0.7
PUBLIC/DAWSON,0-CK*	44	44	49	35.0	17.0	38	3	0.7
PUBLIC/COUNCIL	43	48	53	36.0	16.7	36	3	0.7
PUBLIC/GLACIER	35	34	41	35.5	16.0	31	3	0.2
PUBLIC/MC CALL,00-CK*	35	33	42	33.3	16.8	36	3	0.1
******* ENTRIES TESTED TWO YEARS *******								
KRUGER/K-1212+	.	55	59	36.2	17.2	38	3	0.8
PRAIRIE BRAND/PB-098	.	54	57	36.6	16.7	35	3	0.8
MYCOGEN/5072	.	53	58	35.9	17.5	34	1	0.6
MUSTANG/M-0970	.	53	55	36.3	16.8	36	3	0.8
GOLD COUNTRY/X7707	.	51	54	36.6	16.5	3	3	0.7
WENSMAN/W 3096	.	50	54	35.2	17.0	31	3	0.6
GOLD COUNTRY/NORCROSS	.	49	50	36.5	16.6	37	2	0.8
GOLD COUNTRY/BYGLAND	.	44	47	36.9	16.2	37	3	0.5
******* ENTRIES TESTED ONE YEAR *******								
PRAIRIE BRAND/PB-091X	.	.	61	.	.	31	3	0.7
KRUGER/K-0999+	.	.	60	.	.	35	3	0.8
SANDS/EXP 0977	.	.	59	.	.	35	3	0.8
KRUGER/K-1222	.	.	59	.	.	39	3	0.8
KALTENBERG/KB090	.	.	58	.	.	37	4	0.8

Table 8. 1998 conventional soybean (continued) – maturity group-0.

--- BRAND / ENTRY ---	--- YIELD --- 3YR	2YR	'98	-- 1997 -- ** PROT.	** OIL	--- 1998 --- HT.	$$ LDG.	## REL. MAT.
	----- bu/a -----			--- % ---		in.		
HYTEST/HTX0910	.	.	58	.	.	34	3	0.8
KALTENBERG/KB076	.	.	58	.	.	36	2	0.6
WENSMAN/W 3078	.	.	58	.	.	33	2	0.6
PROFISEED/PS090	.	.	58	.	.	37	4	0.8
MUSTANG/M-0958	.	.	57	.	.	35	3	0.8
PRAIRIE BRAND/PB-103X	.	.	57	.	.	34	2	0.8
TOP FARM/TF6078	.	.	57	.	.	35	2	0.6
STINE/1090-6	.	.	57	.	.	34	3	0.8
MUSTANG/M-0700	.	.	55	.	.	33	2	0.6
TOP FARM/TF6077	.	.	55	.	.	36	3	0.7
SANDS/SOI 101	.	.	55	.	.	35	3	0.7
KRUGER/K-1333+	.	.	54	.	.	37	2	0.8
GARST/D085	.	.	53	.	.	34	2	0.7
ASGROW/A0868	.	.	53	.	.	32	3	0.8
SANDS/EXP 0927	.	.	52	.	.	36	3	0.6
DEKALB/CX075	.	.	52	.	.	36	3	0.6
DEKALB/CX105	.	.	52	.	.	36	3	0.8
GOLD COUNTRY/X89599	.	.	51	.	.	35	4	0.7
DAIRYLAND/DST1109	.	.	51	.	.	35	2	0.7
ARROWHEAD/EXP-98	.	.	46	.	.	38	2	0.5
PUBLIC/JIM	.	.	43	.	.	31	4	0.1
PUBLIC/DAKSOY	.	.	41	.	.	29	4	0.0
TEST AVERAGE:	48	49	53	35.9	16.8	35	3	
LSD(5%) VALUES:	5	5	4					
MIN.TOP-YIELD VALUE ($):	50	52	57					
COEF. OF VARIATION:	5	5	4					

CK = maturity group check.
$Top yield – yields within one LSD value of highest yield.
$$ 1 = Excellent, 5 = Poor.
A scale difference of 0.1 is equal to 1.8 days in maturity.

Maturity Group I Results

Maturity group-I trial results for 1998, 1997-98, and 1996-98 are indicated in Table 9. There were 20 entries tested over the three year 1996-98 time period with an average of 45 bu/ac. Entries also had to yield 48 bu/ac or higher to be in the top-yield group. There were 7 varieties in the top-yield group for 1996-98. Yield differences between entries had to be 5 bu/ac or higher to be significant. There were 16 entries tested over the two year 1997-98 time period with an average of 49 bu/ac. Entries also had to yield 51 bu/ac or higher to be in the top-yield group. There were 16 varieties in the top-yield group for 1997-98. Yield differences between entries had to be 6 bu/ac or higher to be significant. There were 75 entries for 1998 with an average of 53 bu/ac. Top-yielding hybrids had to average 56 bu/ac or higher. There were 29 varieties in the top-yield group for 1998. In 1998, varieties had to differ by 5 bu/ac to be significantly different in yield.

Table 9. 1998 conventional soybean performance trial – maturity group-I. seeded May 19, 1998.

	--- YIELD ---			-- 1997 -- **	**	--- 1998 ---	$$	## REL.
--- BRAND / ENTRY ---	3YR	2YR	'98	PROT.	OIL	HT.	LDG.	MAT.
	----- bu/a -----			--- % ---		in.		
****** ENTRIES TESTED THREE YEARS ******								
PRAIRIE BRAND/PB-197	52	53	58	37.1	15.8	37	3	1.6
KRUGER/K-1444	51	54	57	37.8	16.1	36	2	1.6
DEKAL8/CX145	51	52	57	36.3	16.8	36	2	1.3
GOLD COUNTRY/GOODWIN	50	52	58	35.4	16.8	40	3	1.3
PUBLIC/STRIDE	49	50	56	34.5	17.6	38	2	1.4
MYCOGEN/5143	48	50	56	36.0	16.1	42	2	1.4
KRUGER/K-1990	48	49	52	37.0	16.6	34	3	1.7
SANDS/SOI 177	47	48	48	36.7	16.1	42	3	1.7
PUBLIC/PARKER,I-CK*	46	47	52	36.5	16.8	40	3	2.0
MUSTANG/M-1133	46	48	51	36.7	16.5	39	2	1.5
GOLD COUNTRY/KANDI	45	47	49	37.9	16.3	33	3	1.5
PUBLIC/IA1006	45	47	49	36.5	16.5	43	3	1.6
PUBLIC/MN 1301	45	48	52	39.2	15.2	43	2	1.4
PUBLIC/STURDY,II-CK*	43	44	46	36.2	16.3	42	2	2.3
GOLD COUNTRY/BOYD 95	43	43	47	35.8	16.8	42	3	1.2
PUBLIC/DAWSON,0-CK*	42	43	51	34.6	17.2	41	4	0.7
PUBLIC/FREEBORN-SCN	42	42	48	37.1	16.5	39	3	1.5
PUBLIC/GRANITE	40	41	42	36.7	16.5	41	3	1.6
PUBLIC/BELL-SCN	39	40	43	37.2	16.9	34	4	1.7
PUBLIC/FAIRBAULT-SCN	37	37	43	34.9	17.5	37	3	1.6
****** ENTRIES TESTED TWO YEARS ******								
PRAIRIE BRAND/PB-146	.	55	57	37.1	16.4	35	2	1.5
STINE/1386-6	.	54	59	36.7	16.6	35	2	1.5
KRUGER/K-2021 +	.	54	58	36.9	16.1	38	2	1.9
KRUGER/K-2021	.	53	55	36.7	16.0	38	3	1.8
KRUGER/K-1777	.	53	54	35.9	16.2	37	3	1.7
DAIRYLAND/DSR-180/STS	.	53	55	36.4	16.7	37	3	1.7
PRAIRIE BRAND/PB-145	.	52	56	36.2	17.7	38	2	1.7
STINE/1680	.	52	56	35.9	16.1	37	3	1.7
KRUGER/K-1515	.	52	55	35.4	17.0	36	2	1.5
DEKALB/CX205	.	51	55	34.4	17.0	42	3	1.7
ASGROW/A1553	.	51	54	33.8	17.9	36	4	1.6
WENSMAN/W 3107	.	51	53	.	.	35	2	1.3
GOLD COUNTRY/5715	.	49	51	35.4	16.9	38	3	1.4
GOLDEN HARVEST/H-1147	.	49	53	36.4	16.8	42	3	1.5
CROPLAN/GENETICS L1475	.	46	48	35.4	17.3	41	3	1.4
PUBLIC/MN 1401	.	45	49	37.4	16.8	43	3	1.3

Table 9. 1998 conventional soybean (continued) - maturity group-I.

	--- YIELD ---			-- 1997 --		— 1998 —		
--- BRAND / ENTRY ---	3YR	2YR	'98	** PROT.	** OIL	HT.	$$ LDG.	## REL. MAT.
	----- bu/a -----			--- % ---		in		
	******* ENTRIES TESTED ONE YEAR *******							
MUSTANG/M-1128	.	.	60	.	.	36	2	1.3
MALLARD/0910 48	.	.	59	.	.	38	2	1.3
HYTEST/HTX1410	.	.	59	.	.	34	2	1.5
PROFISEED/PS1499	.	.	59	.	.	36	2	1.4
WENSMAN/W 3148	.	.	58	.	.	36	2	1.5
KALTENBERG/KB128	.	.	58	.	.	37	3	1.2
KRUGER/K-2125	.	.	58	.	.	33	3	1.8
MUSTANG/E-139	.	.	57	.	.	38	3	1.3
MUSTANG/E-149	.	.	57	.	.	37	3	1.4
MYCOGEN/200	.	.	57	.	.	33	2	1.7
LATHAM/EX-140	.	.	57	.	.	39	3	1.5
MUSTANG/M-1138	.	.	57	.	.	35	3	1.6
KRUGER/K-1404	.	.	57	.	.	36	3	1.4
STINE/1486	.	.	57	.	.	36	2	1.5
SANDS/SOI 169	.	.	56	.	.	38	3	1.7
MYCOGEN/5121	.	.	56	.	.	35	2	1.3
GARST/EX8124	.	.	56	.	.	35	2	1.4
PRAIRIE BRAND/PB-140X	.	.	56	.	.	37	2	1.4
KRUGER/K-1444+	.	.	55	.	.	35	2	1.5
KALTENBERG/KB145	.	.	55	.	.	40	2	1.4
GOLD COUNTRY/X3814	.	.	55	.	.	37	2	1.5
CROPLAN/GENETICS L1187	.	.	54	.	.	42	3	1.3
LATHAM/250	.	.	53	.	.	37	3	1.7
TOP FARM/TF6168	.	.	53	.	.	40	3	1.7
WENSMAN/W 3177	.	.	52	.	.	37	3	1.7
DENBESTEN/DB1797	.	.	52	.	.	30	2	1.6
MUSTANG/E-134	.	.	52	.	.	36	3	1.4
HYTEST/HTX1920	.	.	52	.	.	37	4	1.7
DENBESTEN/DB1997	.	.	52	.	.	39	3	1.7
SANDS/EXP 1440	.	.	51	.	.	35	4	1.4
TOP FARM/TF6147	.	.	51	.	.	37	3	1.4
KAYSTAR/K1050	.	.	50	.	.	32	3	1.3
DENBESTEN/DB1598	.	.	50	.	.	39	2	1.7
DEKALB/CX160C	.	.	49	.	.	38	3	1.5
M-W GENETICS/G1400	.	.	49	.	.	38	3	1.5
HY-VIGOR/1150	.	.	49	.	.	38	3	1.5
DEKALB/CX195	.	.	47	.	.	38	2	1.7
MALLARD/0960 49	.	.	47	.	.	39	3	1.3
SANDS/SOI 142	.	.	47	.	.	39	3	1.4
TEST AVERAGE:	45	49	53	36.2	16.6	38	3	
LSD(5%) VALUES ($):	4	5	4					
MIN.TOP-YIELD VALUE ($):	48	51	56					
COEF. OF VARIATION (#):	5	6	5					

CK = maturity group check.
$Top yield - yields within one LSD value of highest yield.
$$ 1 = Excellent, 5 = Poor.
A scale difference of 0.1 is equal to 1.3 days in maturity.

1998 FLAX VARIETY TRIALS

Kathleen A. Grady and Lee Gilbertson

A yield trial of released flax varieties and experimental lines from SD, ND and Canada was grown at the Watertown Northeast Research Station, Brookings (early- and late-seeded), and Webster in 1998. 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 1998, seven experimental lines from the SDSU flax breeding program were tested against twenty-four named varieties (checks) and seven advanced lines from ND or Canada. There were both early- and late-seeded trials at Brookings. The Brookings Early trial was planted on May 8th, Brookings Late on June 2nd, Webster on April 29th, and Watertown on April 30th, 1998.

Experiment design at each location was a randomized complete block with three replications. Plots consisted of seven rows 14.5 ft. long, with rows spaced seven inches apart. Stands were fair to good at all locations.

The growing season in east central and northeast South Dakota began with adequate to surplus topsoil and subsoil moisture. Brookings was much drier than normal in May, June, and July. Webster had above-average precipitation in April, May, June, and August, but was dry in July. Watertown was drier than normal in April, June, and July, but had slightly above-average precipitation in May and August.

May temperatures were warmer and June temperatures cooler than normal at all locations. Brookings and Webster had about average temperatures in July and August, while Watertown temperatures were below normal these two months.

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 and flowering 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 19.9 bu/A (Table 1). The highest yielding check variety over all locations in 1998 was Rahab 94 (22.1 bu/A). The highest yielding experimental was CI 3408, which averaged 22.2 bu/A.

Table 1. Yield and flowering of flax varieties grown in the 1998 South Dakota Tristate Test.

Variety	Origin -Year	Seed Yield (bu/acre) Brkgs (early)	Watrtwn	Webster	Brkgs (late)	Mean	Overall Rank	Days to Flower Brkgs
BISON	ND-27	15.6	27.8	17.6	9.8	17.7	35	53
LINOTT	CAN-66	13.4	29.5	21.9	7.9	18.2	33	48
MCGREGOR	CAN-82	13.3	35.1	22.4	9.2	20.0	20	56
RAHAB 94	SD-94	13.8	41.6	23.5	9.6	22.1	2	55
CI 3404	SD-exp.	17.6	30.1	21.9	11.6	20.3	18	56
CI 3408	ND-exp.	15.2	37.5	25.5	10.7	22.2	1	54
CI 3411	CAN-exp.	18.0	34.0	22.2	8.0	20.5	14	53
CI 3423	ND-exp.	17.1	34.4	24.2	9.1	21.2	5	55
CI 3424	CAN-exp.	14.1	35.5	21.5	9.7	20.2	19	54
CI 3425	CAN-exp.	16.0	26.9	14.3	9.0	16.5	38	52
CI 3426	CAN-exp.	16.1	36.8	19.0	7.4	19.8	21	55
CI 3427	CAN-exp.	14.7	40.7	24.8	7.0	21.8	3	52
SDT9703	SD-exp.	13.8	36.1	24.1	8.8	20.7	11	56
SDT9705	SD-exp.	16.5	32.1	21.1	7.8	19.4	28	56
SDT9711	SD-exp.	13.2	30.5	23.2	9.1	19.0	31	57
SDT9712	SD-exp.	17.6	26.4	22.9	9.8	19.2	30	59
SDT9714	SD-exp.	16.0	34.9	20.5	6.5	19.5	25	57
SDT9716	SD-exp.	15.0	32.2	20.4	8.3	19.0	32	56
DUFFERIN	CAN-75	14.3	35.8	23.6	7.5	20.3	16	55
FLOR	ND-81	14.6	35.6	25.5	8.5	21.0	8	51
RAHAB	SD-85	17.9	36.4	21.4	9.3	21.3	4	55
LINTON	ND-85	15.8	36.9	19.9	8.9	20.4	15	52
NECHE	ND-88	14.4	35.3	23.2	9.3	20.6	13	53
PROMPT	SD-89	14.6	36.3	24.1	9.2	21.1	7	48
DAY	SD-90	13.3	34.1	21.1	9.5	19.5	26	51
OMEGA	ND-90	15.1	30.6	21.9	9.3	19.2	29	55
SOMME	CAN-90	12.8	33.1	17.5	6.7	17.5	36	51
LINORA	CAN-92	14.4	36.0	24.3	8.4	20.8	10	52
FLANDERS	CAN-90	14.9	35.9	20.9	7.5	19.8	22	55
MCDUFF	CAN-93	14.0	36.8	20.4	7.1	19.6	24	55
VERNE 93	SD-93	14.7	35.2	23.2	9.3	20.6	12	51
AC EMERSON	CAN-95	15.0	34.6	20.7	8.1	19.6	23	54
CATHAY	ND-97	16.1	36.4	24.5	7.5	21.1	6	55
PEMBINA	ND-97	14.1	32.5	20.1	5.4	18.0	34	56
WEBSTER	SD-98	15.8	36.9	24.4	6.1	20.8	9	55
AC WATSON	CAN-97	13.1	33.8	22.7	8.4	19.5	27	52
CDC VALOUR	CAN-97	11.7	29.3	19.4	7.4	16.9	37	50
CDC NORMANDY	CAN-96	15.5	36.7	20.2	8.7	20.3	17	51
Grand mean		15.0	34.3	21.8	8.5	19.9		54
LSD .05		ns	6.0	4.2	2.7	3.0		2
Min. yield of top yield group*		11.7	35.6	21.3	8.9	19.2		
C.V.		13.7	10.8	11.8	19.3	13.4		1.9

* Top yield group = yield within one LSD value of highest numerical yield.

Table 2. Agronomic traits of flax varieties grown in the 1998 Flax South Dakota Tristate Test.

Variety	Origin -Year	Plant Height (cm) Brkgs (early)	Watrtwn	Webste	Brkgs (late)	Mean	Wilt* (1-9) Brkgs	Lodging* (1-9) Wtrtn	Webstr
BISON	ND-27	52	66	61	45	56	2.5	3.0	4.7
LINOTT	CAN-66	49	67	57	43	54	4.7	1.0	4.0
MCGREGOR	CAN-82	59	69	62	44	59	5.6	1.0	1.3
RAHAB 94	SD-94	54	70	59	43	57	5.5	1.0	1.0
CI 3404	SD-exp.	56	72	65	44	59	6.8	1.0	3.3
CI 3408	ND-exp.	52	71	63	45	58	4.5	1.0	1.0
CI 3411	CAN-exp.	50	67	59	45	55	5.5	1.0	2.0
CI 3423	ND-exp.	49	72	60	41	56	4.0	1.0	1.3
CI 3424	CAN-exp.	54	69	65	42	57	6.1	1.3	1.3
CI 3425	CAN-exp.	50	66	60	40	54	2.1	4.3	3.3
CI 3426	CAN-exp.	49	65	57	38	52	7.1	1.7	1.7
CI 3427	CAN-exp.	54	63	59	41	54	2.6	1.0	1.3
SDT9703	SD-exp.	59	78	65	45	62	7.9	1.0	2.0
SDT9705	SD-exp.	57	74	63	45	60	1.7	2.7	3.3
SDT9711	SD-exp.	51	76	59	43	57	7.0	1.0	2.0
SDT9712	SD-exp.	59	80	62	44	61	8.1	1.3	1.7
SDT9714	SD-exp.	57	75	63	47	61	6.2	1.0	3.3
SDT9716	SD-exp.	55	75	65	47	61	5.6	1.0	1.3
DUFFERIN	CAN-75	53	68	60	45	57	5.2	1.0	2.3
FLOR	ND-81	52	60	58	39	52	6.2	1.0	2.7
RAHAB	SD-85	53	70	59	43	56	6.4	1.0	1.0
LINTON	ND-85	51	66	58	45	55	2.3	2.0	4.3
NECHE	ND-88	55	68	58	44	56	5.7	1.0	1.3
PROMPT	SD-89	50	64	60	42	54	5.6	1.0	2.0
DAY	SD-90	51	68	57	44	55	5.4	1.0	1.7
OMEGA	ND-90	49	69	58	42	54	5.8	1.3	3.3
SOMME	CAN-90	52	65	55	42	54	6.5	2.0	5.0
LINORA	CAN-92	51	68	57	44	55	5.4	1.7	3.7
FLANDERS	CAN-90	53	66	59	42	55	5.2	1.7	2.0
MCDUFF	CAN-93	57	71	57	45	58	4.1	1.0	1.0
VERNE 93	SD-93	53	64	60	45	56	1.8	1.3	4.7
AC EMERSON	CAN-95	52	69	58	43	56	2.2	4.7	3.0
CATHAY	ND-97	55	77	63	47	61	3.0	1.0	1.0
PEMBINA	ND-97	55	78	59	40	58	2.8	1.0	1.7
WEBSTER	SD-98	54	77	69	46	62	5.7	1.7	2.3
AC WATSON	CAN-97	46	59	56	41	51	6.0	1.0	4.3
CDC VALOUR	CAN-97	47	63	55	40	51	6.8	2.7	5.7
CDC	CAN-96	51	66	58	44	55	7.3	1.3	3.7
Grand mean		53	69	60	43	56	5.1	1.5	2.5
LSD .05		7	6	6	ns	3.0	1.7	0.9	1.7
C.V.		7.8	5.7	5.9	7.0	6.6	20.8	38.2	41.6

* Wilt and lodging rated on a scale of 1 to 9, where 1 = best.

1998 Canola Variety Evaluations

Kathleen A. Grady and Lee Gilbertson

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

Methods: Canola varieties were evaluated at two northeastern South Dakota locations in 1998. Eleven Argentine (*Brassica napus*) and three Polish (*B. rapa*) varieties were planted at Webster, SD on April 29 and at the Watertown Northeast Research Station, also on April 29, 1998.

Experimental design was a randomized complete block with four replications. Plots consisted of seven rows 14.5 feet long, rows spaced seven inches apart. Notes were taken on % stand, 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. Shattering % was also estimated at harvest.

Stands were variable at Webster, due to crusting and possibly some insect damage. Some plants emerged later than others, making it difficult to take flowering and maturity notes. Only days to 10% flower are reported. A covariance analysis was used to adjust plot yields for stand. There was also some hail damage at Webster on June 19th. The Polish varieties were nearing completion of flowering and appeared more damaged than the Argentine varieties. There was no shattering at harvest.

Watertown had good stands and generally good growing conditions.

The growing season in northeast South Dakota began with adequate to surplus topsoil and subsoil moisture. Webster was wetter than normal in April, May, June, and August, but dry in July. Watertown was drier than normal in April, June, and July, but had slightly above average precipitation in May and August. Temperatures were warmer than normal in May at both locations. Webster was cooler than normal in June and had normal temperatures in July and August, while Watertown had below normal temperatures for June, July, and August.

All plots were straight-combined with a Hege plot combine. Plots were harvested on several different dates due to maturity differences among varieties. An oil sample from each plot has been sent to Ken Frank at the University of Nebraska for oil analysis.

Results and Discussion: Table 1 lists the canola varieties tested in South Dakota in 1998.

Seed yield, stand, plant height, lodging, flowering, maturity, and shattering data (where taken) for the fourteen canola varieties are presented in Tables 2-3. The average yield across all varieties was 1910 lbs/A at the Watertown NE Research Station and 1268 lbs/A at Webster. Yields of the later-maturing Argentine varieties were generally better than those of the earlier-maturing Polish varieties at both locations. Plant heights were about twelve inches taller at Watertown than at Webster (Tables 2 and 3). Lodging was similar at the two locations and there was very little shattering.

Table 1. List of varieties tested in the 1998 South Dakota Canola Trials.

Variety	Company entering
1-9173	AgriProgress Inc., PO Box 2499, Morden, Manitoba, ROG 170
179165	AgriProgress Inc., PO Box 2499, Morden, Manitoba, ROG 170
OAC Summit	Agri-Tel Grain Ltd., Box 808, Beausejour, MB, ROE OCO
Hyola 401	Interstate Seeds, Box 338, 1215 Prairie Parkway, West Fargo, ND 58078
Hyola 420	Interstate Seeds, Box 338, 1215 Prairie Parkway, West Fargo, ND 58078
Crusher	Interstate Seeds, Box 338, 1215 Prairie Parkway, West Fargo, ND 58078
Quantum	Interstate Seeds, Box 338, 1215 Prairie Parkway, West Fargo, ND 58078
LG 3369	Limagrain Canada, 1885A Mitchell Rd. South, PO Box 250, Listowel, Ontario N4W 3H4
LG 3333	Limagrain Canada, 1885A Mitchell Rd. South, PO Box 250, Listowel, Ontario N4W 3H4
PSL 95-116	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
PSL 97-102	Parsons Seeds Ltd., PO Box 280, Beeton, Ontario LOG IAO
AC Boreal	Check
AC Parkland	Check
Reward	Check

Table 2. Results of the 1998 Canola Variety Trial grown at the Watertown Northeast Research Station.

Variety	Company	Seed Yield	Yield Rank	Days from planting to 10% Flwr	End Flwr	Maturity	Plant Height	Lodging#	Shatter
		(lbs/A)					(in.)	(1-9)	(%)
Brassica napus (Argentine) varieties:									
1-9173	Agriprogress	2196	3	52	70	98	53	2.8	2
179165	Agriprogress	1665	10	48	66	94	48	1.6	10
OAC	Agri-Tel Grain Ltd.	1977	6	54	73	102	56	2.5	0
Hyola 401	Interstate Seed	2518	1	48	68	98	46	1.6	0
Hyola 420	Interstate Seed	2472	2	49	69	99	48	1.6	0
Crusher	Interstate Seed	2191	4	57	75	103	56	1.5	0
Quantum	Interstate Seed	2079	5	50	72	99	53	2.1	1
LG 3369	Limagrain Canada	1923	8	50	72	102	53	1.4	1
LG 3333	Limagrain Canada	1584	11	46	70	96	48	2.7	5
PSL 95-116	Parsons Seeds	1931	7	52	73	103	54	2.0	0
PSL 97-102	Parsons Seeds	1737	9	52	71	102	49	3.0	0
B. rapa (Polish) varieties:									
AC Boreal	Check	1441	14	38	60	81	45	4.7	0
AC Parkland	Check	1478	13	41	64	84	49	3.8	0
Reward	Check	1549	12	39	62	83	45	2.9	0
Mean		1910		48	69	96	50	2.4	1.3
LSD .05		323		1	1	2	3	0.9	
C.V.		11.80		1.15	1.06	1.27	4.84	27.0	

Planted April 29, 1998.

Lodging was rated on a scale of 1 to 9, 1 = no lodging, 9 = prostrate on ground.

Table 3. Results of the 1998 Canola Variety Trial grown at Webster, SD.

Variety	Company	Seed* Yield	Yield Rank	Stand	Days to 10% Flwr	Plant Height	Lodging#
		(lbs/A)		(%)		(in.)	(1-9)
Brassica napus (Argentine)							
1-9173	Agriprogress	1459	5	77	51	39	3.0
179165	Agriprogress	1358	7	78	49	36	1.7
OAC Summit	Agri-Tel Grain Ltd.	1327	8	94	53	40	3.4
Hyola 401	Interstate Seed	1148	11	100	47	32	3.8
Hyola 420	Interstate Seed	1627	4	98	48	37	3.2
Crusher	Interstate Seed	1822	1	94	57	45	1.3
Quantum	Interstate Seed	1150	10	93	50	40	4.1
LG 3369	Limagrain Canada	1426	6	88	51	41	2.6
LG 3333	Limagrain Canada	1184	9	89	48	39	3.5
PSL 95-116	Parsons Seeds Ltd.	1764	3	75	52	41	1.9
PSL 97-102	Parsons Seeds Ltd.	1810	2	81	52	43	2.5
B. rapa (Polish) varieties:							
AC Boreal	Check	509	14	96	40	35	2.9
AC Parkland	Check	555	13	85	41	36	2.6
Reward	Check	620	12	76	42	33	1.8
Mean		1268		87	49	38	2.7
LSD .05		307		16	1	3	1.5
C.V.		16.4		12.6	1.9	6.2	39.2

Planted April 29, 1998.

* Seed yields were adjusted for % stand by covariance analysis.

Lodging was rated on a scale of 1 to 9, 1 = no lodging, 9 = prostrate on ground.

1998 Alfalfa Production

Robin Bortnem, Kevin D. Kephart, and Vance Owens

Several new alfalfa cultivars are released annually. This enables the producer to select from a wide choice of cultivars, but it also makes the decision process more difficult. The alfalfa cultivar yield trial is a tool to assist producers in identifying cultivars adapted to their specific locations and/or needs. It also allows seed companies and public breeders to test their product at various locations throughout the state.

The alfalfa cultivar yield trial was established at the Northeast Research Farm near South Shore, SD in May, 1996. Four replications of each entry were planted at 15 lbs pure live seed/acre. Fifty pounds of super phosphate (P_2O_5) per acre was applied prior to planting. Recommendations from the South Dakota State Soil Testing Laboratory resulted in 100 lbs of super phosphate being applied in July, 1997 and 20 lbs in June, 1998. Potash was applied in June, 1998 at 10 lbs/acre.

Plots (51 ft^2) were harvested once in the establishment Year (1996), 3 times in 1997, and 3 times in 1998. This year's forage production was evaluated with our new sickle-type harvester. Fresh herbage weights were obtained in the field immediately following plot removal. Random subsamples were taken from the fresh herbage to determine percent dry matter. Data were analyzed by analysis of variance and yield differences among cultivars were tested by the least significant difference (LSD) procedure at the 0.05 level of probability. Alfalfa cultivars were evaluated prior to harvest, for stage of maturity using a mean-stage-by-count scheme (Table 1).

Alfalfa forage production was good at the Northeast Research Farm in 1998. Average total yield for the three harvests taken in 1998 was 5.66 tons per acre, 32% greater than production in 1997 (Table 2). This trial will also be evaluated in 1999 for forage production and a new trial will be established.

Table 1. Kalu and Fick[a] maturity index for phenological development of alfalfa.

Stage number	Stage name
0	Early vegetative
1	Mid-vegetative
2	Late vegetative
3	Early bud
4	Late bud
5	Early flower
6	Late flower
7	Early seed pod
8	Late seed pod
9	Ripe seed pod

[a]Kalu, BA., and G.W. Fick, 1993. Quantifying morphological development of alfalfa for studies of herbage quality. Crop Sci. 21:267-271.

Table 2. Alfalfa forage production. Northeast Research Farm, 1998.

	1998				1997	1996	1997 & 1998
Cultivar	18 June	14 July	21 Aug.	Total	Total	Total	Average
	---------------------Tons DM/Acre---------------------						
WL 324	2.99	1.65	1.50	6.15	4.78	1.09	5.46
DK 127	3.01	1.45	1.64	6.10	4.55	1.07	5.33
AlfaStar	3.26	1.49	1.56	6.31	4.26	1.06	5.28
Columbia 2000	2.74	1.45	1.47	5.66	4.91	0.92	5.28
Pioneer Brand 5454	2.80	1.49	1.60	5.90	4.56	0.97	5.23
CIBA 2444	2.60	1.52	1.42	5.55	4.86	0.95	5.20
Saranac AR	3.19	1.66	1.16	6.01	4.38	1.05	5.19
ICI 631	2.81	1.63	1.48	5.92	4.46	1.06	5.19
Pioneer Brand 5312	2.79	1.86	1.29	5.94	4.42	0.84	5.18
Viking I	2.99	1.51	1.48	5.99	4.33	0.85	5.16
HayGrazer	2.76	1.48	1.52	5.76	4.48	0.95	5.12
A395	2.78	1.38	1.48	5.64	4.57	1.11	5.10
WL 325 HQ	2.60	1.49	1.40	5.49	4.55	1.08	5.02
TMF Multi-plier II	2.94	1.34	1.36	5.63	4.26	0.91	4.95
DK 122	3.16	1.38	1.26	5.79	4.09	0.98	4.94
Bounty	3.19	1.42	1.24	5.85	4.00	0.97	4.93
Defiant	2.92	1.42	1.27	5.61	4.22	1.05	4.91
WL 252 HQ	2.83	1.37	1.33	5.53	4.22	0.89	4.87
Riley	2.73	1.39	1.61	5.73	3.95	0.92	4.84
Big Horn	3.05	1.29	1.34	5.69	3.96	0.80	4.82
LegenDairy	2.77	1.32	1.40	5.49	4.09	1.04	4.79
ABT 205	2.44	1.64	1.29	5.37	4.14	0.96	4.75
Vernal	2.69	1.27	1.39	5.35	4.15	0.98	4.75
Baker	2.71	1.22	1.31	5.24	4.16	0.77	4.70
Rainier	2.64	1.27	1.41	5.32	3.91	1.00	4.62
ICI Brand 620	2.44	1.59	1.29	5.31	3.91	0.95	4.61
Travois	2.35	1.01	1.04	4.40	3.37	0.80	3.89
Average	2.82	1.44	1.39	5.66	4.28	0.96	4.97
Maturity	5.3	4.1	4.0				
LSD (P=0.05)	NS	0.33	0.25	0.58	0.63	0.26	0.48

Canada Tickclover vs. Alfalfa In Legume/Grass Mixtures

Arvid Boe and Robin Bortnem

'Remora' Canada tickclover was developed by the South Dakota Agricultural Experiment Station and released in 1997. It is a native legume intended for use in mixtures with grasses for forage, wildlife habitat, and conservation purposes. Remora initiates growth in May and flowers in late July, making it compatible with native warm-season grasses, such as switchgrass. Our objective was to compare Remora with alfalfa in mixtures with warm- and cool-season grasses for forage production under a delayed harvest scheme. There is a need in this region for a legume that has the same type of growth cycle as warm-season perennial grasses. Alfalfa begins growth at least a month earlier than our native warm-season grasses and thus outcompetes them for water and nutrients early in the growing season. In addition, by the time the warm-season grass is ready to utilize for pasture or hay in July, the alfalfa is in an advanced stage of maturity and consequently of low forage quality. To date, the search for a legume that is compatible with warm-season grasses has been unsuccessful. Therefore, our objective was to develop a late-maturing legume cultivar that would be compatible with warm-season grasses for summer pasture and hay. The evaluations that we are conducting at the Northeast Research Farm will provide us with the information on forage production and quality and persistence that we need to determine if Remora is the answer to the long-standing problem.

Remora, 'LegenDairy' alfalfa, 'Kay' orchardgrass, and 'Sunburst' switchgrass were planted individually and in mixtures on 5 May, 1996. Seeding rates were 30 and 12 lbs pure live seed/acre for Remora and LegenDairy, respectively. The legume/grass mixtures were 6 lbs for grasses and 7.5 and 3 lbs/acre for Remora and LegenDairy, respectively. Experimental design was a randomized complete block with four replications of 20-foot plots with 6-inch row spacing. The plots were harvested twice in 1997 (29 July and 2 October) and once in 1998 (21 August). Only data from the 1998 crop will be presented here. Plots were harvested with a sickle-bar forage harvester. Subsamples were collected to determine species contributions to forage production.

Forage yields ranged from 1.5 tons/acre for the tickclover/switchgrass mixture to over 2 tons/acre for alfalfa and the alfalfa/orchardgrass mixture (Table 1), but differences among treatment means were not significant. Orchardgrass and alfalfa showed vigorous growth in the spring when moisture was adequate. Tickclover and switchgrass, on the other hand, didn't begin to grow until May. Consequently they were adversely affected by the lack of moisture that prevailed during June and July. However, even under those stressful conditions, we were encouraged by their synchronous growth patterns. Based on what we observed during 1997 and 1998, we are optimistic that Remora may be the legume that can fill the void that currently exists. In mixtures, Remora comprised about 20% of the forage with switchgrass, but only 4% with orchardgrass. In comparison, alfalfa comprised nearly 40% in both mixtures. Ultimately, we would like to be able to establish and maintain mixtures of 40% legume and 60% grass. We intend to plant more grass and legume mixtures on the station to gain additional information on management strategies to promote forage production and quality and stand longevity.

Table 1. Forage production of two legumes, two grasses, and their mixtures harvested on 21 August, 1998.

Species	Dry matter yield (tons/acre)
Alfalfa	2.1
Tickclover	1.8
Orchardgrass	1.9
Switchgrass	1.8
Alfalfa/Orchardgrass	2.1
Alfalfa/Switchgrass	1.5
Tickclover/Orchardgrass	1.8
Tickclover/Switchgrass	1.5

Spring Wheat Breeding

Jackie Rudd, Brad Farber, and Ravindra Devkota

Spring wheat yields in South Dakota were respectable, even though temperatures were above average and rainfall was slightly below average. The crop benefited from good subsoil moisture and timely rains. The top yielding varieties in the Advanced yield trial were Forge, Russ and Oxen. In general, the standard height varieties performed better than the semi-dwarfs. This is common in our environment when early season moisture is marginal and temperatures are above normal. SD3219 will be considered for release in 1999. It generally yields similar to Russ and Oxen, but has better scab tolerance (equal to that of Ingot). SD3407 and SD3414 are being increased this winter for possible release in 2000. They are the first SDSU spring wheat lines to be increased that have scab resistance from Chinese sources. The scab resistance is good, but yield has been 2 to 4 bu/a below Russ and Oxen.

The newest spring wheat varieties from South Dakota are Forge (1997) and Ingot (1998). Forge looks a lot like Sharp and Butte 86 but is 1 day earlier to head and is slightly shorter. Yields of Forge have been good in South Dakota. Bushel weight of Forge is good, similar to Sharp and Kulm, and protein content is average. It has resistance to stem rust but has shown moderately susceptible reactions to leaf rust in recent years. Scab tolerance of Forge is similar to 2375. Forge can be hard threshing in some environments. Ingot, like Forge, is very early to head and is standard height. The bushel weight is very high, 1 pound/bushel higher than Sharp and Kulm, and protein content is good. It is similar to Forge in reaction to leaf and stem rust. Ingot has shown better tolerance to scab than 2375 and Forge, but is not considered resistant. Ingot was released because of its excellent milling and baking characteristics and because of its increased tolerance to scab. Both Forge and Ingot are standard height varieties and are subject to lodging, particularly under high nitrogen conditions.

Table 1. Spring wheat breeding 1997 advanced yield trials.

	Watertown	Day County	State Average	97-98	Test Weight lb/bu	Heading days	Height cm
SD3310	55.9	55.4	51.5	48.1	54.6	170	86
SD8119	51.5	50.8	48.2	46.8	54.2	173	85
SD3219	50.8	55.0	47.7	44.8	51.7	173	84
FORGE	47.2	54.2	46.3	44.2	54.2	169	87
RUSS	49.5	46.6	46.1	45.1	54.8	173	85
OXEN	45.1	50.1	46.1	45.2	55.3	172	80
SD3407	47.9	45.1	45.7		54.6	171	86
INGOT	47.2	51.4	44.8	42.8	58.9	170	88
BUTTE 86	49.7	44.6	44.8	42.7	53.7	170	84
SD3414	49.9	46.7	44.8		54.9	169	81
SHARP	46.2	48.7	43.5	41.4	54.2	170	84
2375	41.6	43.1	41.3	39.8	56.0	173	83
CHRIS	24.0	25.8	27.7	28.4	47.1	178	99
Mean	47.2	46.5	44.8				
CV%	3.9	5.1	5.2				
LSD (.05)	3.0	3.9	1.5				

Spring Wheat Seeding Rate

Jackie Rudd, Brad Farber, Ravindra Devkota, and Jim Smolik

A seeding rate study was conducted at two locations in 1998. One was at the Northeast Research Station and the other was on the Agronomy Farm at Brookings. Four spring wheat varieties and six seeding rates were used. There were three replications at each location. The NE Station was planted on April 29 and Brookings was late planted on May 20.

The data from the two locations are presented in Tables 1 and 2. The recommended planting rate for spring wheat in South Dakota is 28 seeds per square foot (sd/ft^2). If planting after May 10, it is recommended to increase the planting rate by 25%. Twenty-eight sd/ft^2 is around 80 pounds per acre for averaged sized seed (15,000 seed per pound). The data from this year supports the current recommendation. All varieties yielded lower at 14 sd/ft^2 and there were no statistical differences in yield with planting rates from 28 to 48 sd/ft^2.

The current recommended planting rate of 28 sd/ft^2 was not significantly different from the highest planting rate even at Brookings, which was planted late. This trial was also conducted in 1997 with similar results.

Table 1. Grain yield of spring wheat varieties planted at various seeding rates - NE Station.

	Seeds per square foot							
	14	21	28	35	42	49	Average	LSD
	Yield (bushels per acre)							
OXEN	41.0	45.8	45.7	43.7	43.9	48.3	44.7	
RUSS	42.4	37.9	51.0	50.0	48.9	50.0	46.6	
2375	32.0	41.3	37.9	38.7	37.8	39.7	37.9	
FORGE	41.5	46.1	47.8	47.7	46.5	47.6	46.2	
Average	39.2	42.8	45.6	44.9	44.3	46.4	43.9	3.1
LSD							2.5	

LSD for Variety*Seeding rate = 6.1
CV (%) = 8.4

Table 2. Grain yield of spring wheat varieties late planted at various seeding rates - Brookings.

	Seeds per square foot							
	14	21	28	35	42	49	Average	LSD
	Yield (bushels per acre)							
OXEN	18.4	20.5	24.3	25.7	24.0	26.0	23.1	
RUSS	17.5	20.9	22.8	25.3	22.8	23.7	22.2	
2375	18.9	19.3	20.2	22.2	21.4	20.6	20.4	
FORGE	19.5	22.0	27.1	26.1	26.2	26.5	24.6	
Average	18.6	20.7	23.6	24.9	23.6	24.2	22.6	2.4
LSD							1.9	

LSD for Variety*seeding rate = 4.8
CV (%) = 12.7

Oat Research

Dale Reeves and Lon Hall

Oat research at the Northeast Research Farm is used for variety release and oat foliar fungicide screening. The oat foliar fungicide research is a cooperative effort with Extension pathologist Marty Draper.

The most important characteristics for varietal release are yield, yield stability, and test weight; however, there may be several factors that will contribute to the increase of these characteristics. Genetics, lodging resistance, Barley Yellow Dwarf resistance, crown rust, and stem rust resistance all contribute to increased yield and test weight. Some other characteristics that are considered when releasing a variety are hull percent, high protein, high oil, low oil, plant height, maturity, hulled or hulless, and hull color.

The quality of the oat may determine the consumer. Several millers want a high protein; whereas, the livestock producer wants a high oil, high protein, and tall variety. The race horse industry wants a white hulled variety.

A total of 1010 plots were grown at the northeast research farm, they included eight breeding nurseries, and an oat foliar fungicide trial. The Uniform Mid-season Nursery (UMO) is made up of 36 advanced medium and late maturing lines, usually 1 to 3 lines from each of the participating state and Canadian breeding programs. The UMO is grown at 1 to 2 locations for each each of the breeding programs, the data collected provides information needed for varietal release. The best line in this test this year produced 134.8 bu/a with a test weight of 37.8 lbs/bu.

Our advanced test of early maturing selections had 40 entries that averaged 97.8 bu/a with a test weight of 36.3 lbs/bu. The best selection yielded 108 bu/a with a test weight of 34.4 lbs/bu. The best performing nursery was our advanced test of midseason and late maturity selections. The 45 entries averaged 112 bu/a with the highest yield of 139 bu/a. Our preliminary early yield test performed very well as 72 entries averaged 105 bu/a with a test weight of 38.2 lbs/bu. Our preliminary late yield test also performed very well, with 60 entries averaging 107 bu/a with a test weight of 38.0 lbs/bu. The top yielder in this test produced 139 bu/a with a test weight of 38.8 lbs/bu. The CNOT test is a regional hulless oat trial, in this test the best hulless yielding line was 90.1 bu/a and the best test weight was 46.4 lbs/bu.

Plant breeding is a long drawn out process. It takes, on average, at least 10 years from the initial cross to varietal release. There are approximately 40,000 non-segregating lines evaluated for each variety released.

Winter Wheat Breeding and Genetics

Scott Haley, Steve Kalsbeck, and Rich Little

Summary of Activities: The Winter Wheat Breeding and Genetics Program utilizes 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, Watertown, Selby, Winner, 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 1998 included:

I) The Crops Performance Testing (CPT) Variety Trial, under the overall coordination of Bob Hall.
The trial included 35 entries, consisting of 23 released varieties (including new releases from other states), 9 advanced experimental lines from our program, and 3 experimental lines from Nebraska (two from the University of Nebraska and one from USDA-ARS-Lincoln). This trial was also grown at 14 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) The South Dakota Advanced Yield Trial (AYT).
The AYT included 45 entries, consisting of 35 advanced experimental lines and 10 checks. Due to limited seed supplies of certain entries, a limited set (32 total entries) was grown at the Northeast Farm. The AYT 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 Northern Regional Testing Program;

iii) A single-row winterhardiness nursery, consisting of short-row evaluations of several different breeding nurseries: the Regional Germplasm Observation Nursery (RGON, 450 entries); the Facultative and Winter Wheat Observation Nursery (FAWWON) from CIMMYT-Turkey (185 entries); the International Winter/Spring Wheat Screening Nursery (IWSWSN) from CIMMYT-Oregon State (101 entries); the Uniform Barley Winterhardiness (UBWHN) and the Eastern Soft Red Winter Wheat Nurseries (148 entries).

iv) A rye yield trial in cooperation with Dr. Dale Reeves, Oat and Rye Breeding Program.

Trial Conditions: The nurseries at the Northeast Research Station were planted no-till into oat stubble with very good soil moisture conditions on 9/5/97. While growth in the fall was excellent due to the favorable growing conditions, volunteer oats appeared to be excessive and detrimental to winter wheat establishment. Due to the abnormally mild winter, no differential winter injury was observed. Significant Fusarium head scab infection was observed among entries in the state variety trial. Yield and test weight data for the Advanced Yield Trial conducted at the Northeast Research Station are presented in Table 1.

Table 1

Watertown AYT	Trait Averages	
Entry	Grain Yield	Test Weight
SD93528	57.7	58
SD94210	57.1	56
SD94227	56.4	58
SD93267	55.7	58
SD95218	52.1	57
SD94241	52	58
Alliance	50.7	55
SD93338	50.6	56
Elkhorn	50.6	57
Jagger	50.4	57
SD93380	49.9	56
SD95203	49.2	54
SD94149	48.9	59
SD92107	48.7	55
SD95129	47.6	56
Crimson	46.6	57

Table 1. (continued)

Watertown AYT	Trait Averages	
Entry	Grain Yield	Test Weight
Scout66	46.5	60
SD93195	46.3	55
SD95174	46.2	60
TAM 107	45.3	55
Rose	40.7	56
Roughrider	35.8	54
SD94217W	34.3	52
Arapahoe	34.2	57
SD95139	33	56
SD94139W	32.1	55
Nekota	31.2	60
2137	31.0	52.5
SD94134W	29.5	55.0
Tandem	29.4	58.1
SD95146	26.9	55.0
SD95210	25.7	55.0

Acknowledgements: Each year, 800-1000 new cross combinations are made and 800-1000 new experimental lines are developed by the winter wheat breeding program. In addition to the excellent support of our wheat pathology programs (small grains pathology and virology), the solid and consistent financial support from the SD Wheat Commission and the SD Crop Improvement Association are vitally important to ensuring continued availability of improved winter wheat varieties for producers in South Dakota.

A Comparison of Two Row Spacing - Plant Population Combinations on Soybean Yield Trials at Two Locations

R.G. Hall and K. K. Kirby

Introduction: Recently many crop producers have converted some of their resources from small grains to soybeans. Often the most economical way for them to plant is to solid-seed using a drill. Consequently, producers are concerned that crop performance testing results do not reflect what they experience in the field because crop testing uses a 30-inch row spacing compared to narrow rows of 10 to 15 inches or solid-seeded rows of 6 to 8 inches.

Although we periodically see effects of row spacing on variety performance in individual research studies it does not necessarily mean all varieties interact with row spacing in yield trials. Research indicates soybean yields are more highly related to genetic potential than to a cultural practice like row spacing. Whether test methods use a 30-inch, 14-inch, or a 6- to 8-inch row spacing the higher yielding varieties at one row spacing will tend to be the higher ranking varieties at another row spacing. Likewise, low yielding varieties tend to rank at the bottom regardless of row spacing. In other words, as row spacing changes the relative yield ranking of varieties will tend to remain somewhat similar.

Objective: To determine if the yield ranking of soybean varieties seeded on 30-inch rows would change significantly if they were seeded on 14-inch rows.

Methods: Ten varieties each (public and private) of both group-0 and group-I maturity were included in trials at Watertown and Brookings. Each test included seven varieties, randomly selected from 1997 test results, and either a group-00, group-0, and group-I maturity check for the group-0 trial or a group-0, group-I, and group-II maturity check for the group-I trial.

Plots were either four 30-inch rows or four 14-inch rows X 20 feet long with center rows harvested for yield. Border rows (same as border plot spacing) were used to prevent border effects. The 14-inch row plots were seeded at 200,000 and the 30-inch row plots at 165,000 pure-live seed per acre. No seed inoculant was applied. The previous crop was corn at Watertown and small grain at Brookings. Both sites had a prior soybean and seed inoculant history. Trials were of a split plot design with row spacing as main plots and varieties as subplots.

The 14-inch row plots were seeded using a cone plot drill plugged to achieve a 14-inch spacing. The 30-inch plots were seeded using a Kinze two-row planter with two cones. Planters were adjusted to the same seeding depth at a location. Emergence at all sites was excellent.

A pre-emergence application of Lasso/Amiben at labeled rates was used for weed control at both locations. Additionally, at Watertown post-emergence applications of Poast Plus on June 16 and Pinnacle on June 24 were applied at labeled rates. Weed control was good at both locations. Yields were adjusted to 13% moisture, and are reported in tables 1 – 4.

Results and Discussion:

Watertown: In the group-0 test (table 1) the variable row space and the variety x row space interaction were not significant. Although Dekalb/CX105 appeared to yield significantly different between the two row spacings (P>F=.01), there was no significant row spacing effect across all varieties (P>F=.40). The rank correlation in each table indicates how the variety yield ranking from each row spacing compares to one another. A value of 1.000 indicates 100% agreement or perfect correlation while a value of 0.000 indicates complete disagreement or no correlation between the yield rankings. In this case a correlation of 0.73 indicates the rankings are somewhat similar to one another.

In the group-I test (table 2) there was no significant effect of row space or variety X row space on yield. A .82 correlation indicates the yield rankings of the two row space-plant population combinations are closer in agreement than was found in the group-0 trial (.73).

Brookings: In the group-0 trial (table 3) there was a significant variety X row space interaction (P>F=.04). In spite of this interaction the rank correlation of .95 approached a nearly perfect correlation. This indicates yield rankings are more dependent on genetic potential than on row spacing.

In the group-I test at Brookings (table 4) there again was no effect of row space or variety X row space on yield. The varieties Mycogen/5143 and Dekalb CX145 showed a significant row space effect (P>F=0.02 and 0.04, respectively) but the effect was not significant across varieties (P>F=0.50). In this trial a correlation of 0.72 was lower than in the group-0 trial (0.95) but similar to the correlation of 0.73 in the group-0 trial at Watertown.

Summary: The four rank correlations obtained from the two locations ranged from a low of .72 in the group-I at Brookings and .73 in the group-0 at Watertown, to an intermediate value of .82 in the group-I trial at Watertown, to a very high .95 in the group-0 at Brookings. These correlations of 0.72 to 0.95 are considered high and support previous research results that soybean variety yield rankings tend to follow their genetic yield potential and are much less likely to be affected by cultural practices like row spacing. This indicates yield results using 30-inch rows are applicable to producers using narrow row spacing including solid seeding. Producers should not be concerned that crop performance testing uses 30-inch rows in soybean yield trials.

Table 1. Group-0 variety comparison using 14" rows seeded to 200,000 plants per acre (PPA) versus 30" rows at 165,000 PPA, at Watertown, 1998.

Variety	Yield, Bu/A 14"	Yield, Bu/A 30"	Yield Rank 14"	Yield Rank 30"	Row Spacing Effect	Row Spacing P > F
DEKALB/CX105	60	52	1	6	S*	.01
MUSTANG/M-0958	59	56	2	2	NS	.33
MUSTANG/M-0995	57	56	3	1	NS	.80
ASGROW/A0868	55	53	4	4	NS	.43
DAIRYLAND/DSR-065	53	53	5	3	NS	1.00
PUBLIC/DAWSON-0-CK	52	50	6	7	NS	.55
PUBLIC/COUNCIL	51	50	7	8	NS	.55
G.COUNTRY/WINDSOR	50	52	8	5	NS	.46
PUBLIC/PARKER-I-CK	47	49	9	9	NS	.35
PUBLIC/MCCALL-00	38	39	10	10	NS	.72
Test Average:	52	51				
Row Space:						.36
Variety X Row Space:						.40
Rank Correlation:						.73#

* Effect: S = Significant, P =< .0500; NS = Non-Significant, P > .0500.
# Perfect correlation (Relationship) = 1.000; Zero correlation (No Relationship) = 0.000

Table 2. Group-I variety comparison using 14" rows seeded to 200,000 plants per acre (PPA) versus 30" rows at 165,000 PPA, at Watertown, 1998.

Variety	Yield, Bu/A 14"	Yield, Bu/A 30"	Yield Rank 14"	Yield Rank 30"	Row Spacing Effect	Row Spacing P > F
DEKALB/CX145	62	57	1	1	NS*	.21
G.COUNTRY/X3814	61	57	2	2	NS	.16
KRUGER/K-1444+	61	56	3	3	NS	.20
SANDS/SOI 169	60	56	4	4	NS	.19
MYCOGEN/5143	58	53	5	7	NS	.11
PUBLIC/PARKER-I-CK	56	55	6	5	NS	.87
PUBLIC/DAWSON-0-CK	54	50	7	9	NS	.25
PUBLIC/STURDY-II-CK	54	47	8	10	NS	.08
COYOTE/9519	53	52	9	8	NS	.89
G.HARVEST/H-1147	49	55	10	6	NS	.13
Test Average:	58	54				
Row Space:						.25
Variety X Row Space:						.26
Rank Correlation:						.82#

* Effect: S = Significant, P =< .0500; NS = Non-Significant, P > .0500.
# Perfect correlation (Relationship) = 1.000; Zero correlation (No Relationship) = 0.000

Table 3. Group-0 variety comparison using 14" rows seeded to 200,000 plants per acre (PPA) versus 30" rows at 165,000 PPA, at Brookings, 1998.

Variety	Yield, Bu/A 14"	Yield, Bu/A 30"	Yield Rank 14"	Yield Rank 30"	Row Spacing Effect	Row Spacing P > F
DAIRYLAND/DSR-065	59	53	1	1	NS	.05
MUSTANG/M-0958	56	50	2	4	NS	.06
DEKALB/CX105	53	51	3	3	NS	.38
ASGROW/A0868	52	53	4	2	NS	.77
G.COUNTRY/WINDSOR	52	50	5	5	NS	.58
PUBLIC/PARKER-I-CK	50	50	6	6	NS	.94
MUSTANG/M-0995	47	48	7	7	NS	.93
PUBLIC/DAWSON-0-CK	47	48	8	8	NS	.80
PUBLIC/COUNCIL	40	47	9	9	S*	.01
PUBLIC/MCCALL-00	37	34	10	10	NS	.31
Test Average:	49	48				
Row Space:						.63
Variety X Row Space:						.04
Rank Correlation:						.95#

* Effect: S = Significant, P = < .0500; NS = Non-Significant, P > .0500.
# Perfect correlation (Relationship) = 1.000; Zero correlation (No Relationship) = 0.000

Table 4. Group-I variety comparison using 14" rows seeded to 200,000 plants per acre (PPA) versus 30" rows at 165,000 PPA, at Brookings, 1998.

Variety	Yield, Bu/A 14"	Yield, Bu/A 30"	Yield Rank 14"	Yield Rank 30"	Row Spacing Effect	Row Spacing P > F
MYCOGEN/5143	62	54	1	4.5	S*	.02
SANDS/SOI 169	59	59	2	1	NS	.90
COYOTE/9519	58	56	3	3	NS	.56
PUBLIC/STURDY-II-CK	57	57	4	2	NS	.90
PUBLIC/PARKER-I-CK	57	53	5	6	NS	.23
G.HARVEST/H-1147	56	52	6	7.5	NS	.23
G.COUNTRY/X3814	55	52	7	7.5	NS	.34
DEKALB/CX145	55	48	8	10	S	.04
KRUGER/K-1444+	54	54	9	4.5	NS	.94
PUBLIC/DAWSON-0-CK	50	49	10	9	NS	.69
Test Average:	56	53				
Row Space:						.15
Variety X Row Space:						.50
Rank Correlation:						.72#

* Effect: S = Significant, P = < .0500; NS = Non-Significant, P > .0500.
# Perfect correlation (Relationship) = 1.000; Zero correlation (No Relationship) = 0.000

A Comparison of Soybean Seed Inoculation Across Four Eastern South Dakota Locations

R. G. Hall and K. K. Kirby

Introduction: In 1997 crop performance testing conducted a soybean inoculation study at Armour on a field with no known soybean history. The zero inoculant check yielded 48, the liquid seed treatment 55, and the granular soil treatment 60 bu/ac. When comparing the average of the liquid and granular treatment against the zero check the 9.5 bushel advantage from the liquid and granular treatments was highly significant. When comparing the liquid versus the granules the 5 bushel advantage of the granular treatment was significant at the .11 level of probability. In summary, inoculation was beneficial as either a liquid or a granular compared to zero inoculation when seeding into soils with no soybean history.

In 1998, crop testing again repeated a similar study on a field with no prior soybean production at Armour. In addition, the study was expanded to three more locations on fields where soybeans had been produced for a number of years. The objective was to determine whether the more common liquid method of inoculation and the more convenient but costly granular method compared to a zero treatment check across several locations in eastern South Dakota.

Methods: The inoculation trial without a prior soybean history was established at Armour (Robert Clark farm). The sites where soybeans had been produced for a number of years included Spink Co. (Steve Masat farm), the SE Research Farm (Beresford), and the NE Research Farm (Watertown). The cropping history at the Armour site included an extended period of alfalfa followed by no-till corn. The sites with a prior soybean cropping history generally included a soybean rotation with either corn or small grains. The treatments were as follows: (1) zero check, no inoculant, (2) granular soil inoculant, applied down the insecticide tube into the seed furrow, and (3) liquid seed inoculant, applied prior to seeding.

The granular inoculant (Granular Soil Implant + Nitragin Brand Inoculant for Soybeans) and the liquid inoculant (Cell-Tech 2000) used in this study were both manufactured by Lipha Tech, 3101 West Custer Ave, Milwaukee, WI 53209. The granular was applied at 6.5 lb/ac in 30" rows. This product was stored in a cold room prior to planting. A suggested retail price for this product is $50.50/40-lb container or $1.26/lb. This equals $8.19/ac.

The liquid inoculant was applied at 2.5 fl oz/bu seed or 2.5 fl oz on 60 lb/ac (165,000 seeds/ ac). The suggested retail price for this product is $42.00 /40 bu of seed or $1.05/bu treated. This treatment equates to about $1.05/ac.

Lipha Tech indicated the bacterial concentration in the liquid is higher than in the granules. However, they feel the efficacy of the products are similar in the field because once applied the granular bacteria in the soil appears to be in a better environment for inoculation than the liquid bacteria applied to the seed.

Plots consisted of four 30" rows 20' long. The plots were seeded in a zero check, granular, liquid treatment sequence in order to prevent cross contamination of seed cones on the planter. The number of replications varied over locations and included Armour with 10, Spink Co. and Watertown with 12, and Beresford with 15 replications. The center two rows were harvested for yield. Each trial consisted of three treatments with each treatment seeded into strips with 10 to 15 replications. The variety Parker was used at all locations and weed control was excellent using recommended soybean herbicides.

Results and Discussion: The results of the study are indicated in the table presented below. When analyzed over four locations the treatment, location, and treatment x location interaction effects were all significant (P > F = 0.0001). The yields at these locations indicate there was no treatment effects within a location except at Armour. At Armour all three treatments were significantly different from one another. In this case the zero check yielded 61, the liquid 66, and the granular 70 bu/ac. This is similar to last year's data indicating the inoculant treatments out yielded the zero check. The Armour site with its lack of prior soybean history responded well to inoculation compared to the zero check. At the SE Farm, NE Farm, and Spink Co.) the yields among the treatments did not differ significantly.

When Armour is deleted from consideration the response of the inoculation treatments to soils with a previous soybean history becomes more clear (3-location treatment mean column). When analyzed over 3 locations, there is no significant treatment (P > F=0.3450) or treatment X location interaction (P > F=0.2338) effects over the locations SE Farm, NE Farm, or Spink Co. The treatment means averaged 54 bu/ac across all locations. There is however, a significant location effect (P > F=0.0001) over locations where yields averages ranged from a low of 50 at the NE Farm, 53 at Spink Co., to a high of 59 bu/ac at the SE Farm.

In summary, these results again indicate inoculation is important when seeding into soils with no previous soybean history. They also indicate inoculation when seeding into soils with a prior soybean history does not always increase yields. Many growers feel inoculation is necessary but inconvenient while others consider inoculation as cheap insurance. If you consider inoculation important then the liquid treatment is likely the most attractive option for two reasons. First, the liquid is about 8 times cheaper than the granular on 30" rows. Second, the liquid option permits more flexibility in the type of seeding equipment or method used. It may be applied as a seed treatment or sprayed into the seed furrow. Presently, most granular is applied via insecticide boxes which in turn tends to limit it to rowed as opposed to drilled soybeans. This study will continue in 1999.

Inoculantation Treatment	Location				Treatment Means	
	Armour	SE Farm	Spink Co.	NE Farm	4-Loc	3-Loc
			Bu/ac			
Zero check	61	60	53	49	55	54
Granular	70	59	54	50	58	54
Liquid	66	59	52	51	57	54
Location Mean	65	59	53	50		

Does the Estimated Processed Value of Soybean Decline Due to Delayed Planting and Maturity Differences?

Roy Scott and Kevin Kephart

In addition to market and crushing parameters, the estimated processed value of soybean depends on the relative levels of protein, oil, and yield obtained from the seed. These parameters must be evaluated for individual lines to develop soybeans that processors can use to respond to the growing demand for high quality soybean meal. The objective of this study was to evaluate the effects of planting dates and locations on the estimated processed value of soybeans in different maturity groups, and with different protein and oil concentrations. Ten soybean cultivars with maturities ranging from group 00 to II were planted on four dates at four environments across South Dakota in a strip block design with four replicates. Four-row plots were used with 14-foot length and 30-inch row spacings. Planting date intervals ranged from 10 to 18 days. Protein and oil determinations were done on whole seeds using near infrared reflectance spectroscopy (Model 500, NIRSystems, Silver Springs, MD). Estimated processed value per acre (EPVA) was calculated using current meal and oil prices, and crushing parameters in the region. Default values in the computer program of Brumm and Hurburgh (1990) were used for additional processing criteria that were required.

There were significant differences among planting dates and cultivars for yield, protein, and oil at all locations. There were yield reductions with delayed planting after the second planting date. Yield, protein and oil at individual locations were not consistent across the planting dates. Combined across locations, there were significant planting date, variety, and location differences for yield, protein, and oil. Yield, protein, and oil were not consistent across the different planting dates. Overall, protein increased and oil decreased with delayed planting. There were significant differences among planting dates and varieties for estimated processed value per acre (EPVA) at three locations. The EPVA of the varieties were not consistent across planting dates at any location. Three locations showed a decrease in EPVA with delayed planting. Low EPVA was observed with the high-protein variety, probably as a result of low yield and low oil; and with the 00 maturity group as a result of low yield. There were significant EPVA differences among dates, locations, and varieties. The EPVA did not start declining until after the second planting date. The EPVA values were not consistent across planting dates and locations. Mean EPVA of individual varieties at the different planting dates were consistent across locations, indicating that, at specific planting dates, EPVA did not change significantly because of the location where the variety was grown.

Summary and conclusions: The increased protein of the high-protein variety did not compensate for the decreased yield and oil concentration. Moderately high protein varieties which were able to maintain relatively high oil concentration and high yields were the most desirable for EPVA. Varieties maintained their relative EPVA from location to location when planted at similar dates. The EPVA declined only when planting was done later than May. Maturity differences did not seem to affect EPVA, except for the 00 cultivar, which was low yielding.

Row Spacing Effects on Hybrid Corn (*Zea Mays l.*) Yield

Dr. 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 was to evaluate 15 inch row spacing compared to conventional 30 inch row spacing in Eastern 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 shown that the larger, more consistent yield responses have seemed to occur in the northern cornbelt where sunlight, temperature, and rainfall are more limiting.

Methods: Eight Pioneer hybrids, two Dekalb hybrids and two early maturing hybrids ((Co392lfy x Co412lfy) x W117 and (Co392lfy x Co412lfy) x CM174) from Cornell University which contain genes for high leaf number and dwarfism were chosen to represent different genetic backgrounds and maturity. The study was set up in a split-plot randomized design, replicated three times. Six 15 and 30 inch rows were planted in plots 27.5 feet long and were thinned to a population of 27,878 plants/acre. A six-row John Deere 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 Deere Max Emerge planter equipped with planting cones. Weed control included a preemergant treatment of 2.25 lb of 90DF Bladex and 4.75 pts Eradicane per acre. The plot was planted May 4, thinned to the correct population on June 22 and harvested on October 9, 1998.

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 harvested plants. The 30 inch plots were mechanically harvested with a Gleaner K combine that is equipped with an electronic weight bucket and moisture tester. The 15 inch rows were hand harvested and ears were shelled and weighed using the Gleaner combine. Due to the extreme root and stalk lodging final population counts were not taken before harvest and yield was calculated based on the same population (27,878 Plants/Acre) per plot.

Results and Discussion: Table 1 shows the 1998 harvest results of this experiment, which includes the % moisture at harvest time, the % stalk lodging (stalks broken below the ear) and yield in bushels per acre adjusted to 15.5% moisture and a population of 27,878 plants per acre. Maturity is present as overall relative maturity provided by the seed sources. The numbers were calculated as the average of the three replications. Only two hybrids, Pioneer brand 3893 and CM174lfy, showed a significant ($p > .05$) yield difference between row spacings. One hybrid (Pioneer brand 3893) demonstrated a significant ($P > .05$) increase in % stalk lodging. Two hybrids (Pioneer brand 3563 and 3751) had a significant ($P > .05$) decrease in harvest moisture % by planting in narrow rows.

Table 1. 1998 row spacing average by hybrid.

Hybrid	Maturity (days)	Row Spacing	% Harvest Moisture	% Stalk Lodging	Yield (bu/A)
W117lfy	75	15	16.6	6.4	106.4
W117lfy	75	30	17.7	5.7	96.4
CM174lfy	70	15	17.4	9.9	100.7
CM174lfy	70	30	18.5	7.2	44.6
P3941	82	15	18.1	15.5	122.4
P3941	82	30	18.9	18.2	123.6
P3970	77	15	17.4	31.1	116.9
P3970	77	30	18.5	29.2	108.4
DK345	84	15	17.9	12.1	127.7
DK345	84	30	18.9	11.0	124.6
DK417	91	15	18.1	13.6	144.2
DK417	91	30	18.5	9.9	144.6
P3861	93	15	18.6	17.8	153.9
P3861	93	30	19.3	19.7	144.0
P3893	90	15	18.7	23.1	150.8
P3893	90	30	19.3	12.9	131.9
P3914	86	15	17.9	11.0	151.8
P3914	86	30	18.9	11.4	138.9
P3563	103	15	22.0	13.6	161.7
P3563	103	30	24.0	8.7	156.7
P3730	99	15	20.5	17.1	152.4
P3730	99	30	21.4	12.1	148.5
P3751	97	15	20.0	23.5	173.8
P3751	97	30	21.7	18.9	159.1
CV%			4.79	32.31	8.06
LSD(.05)			1.5	8.0	17.7
LSD(.10)			1.3	6.7	14.7

Table 2 compares the average harvested % moisture, % stalk lodging and yield among the 15 inch and 30 inch row spacings for 1998. The 15-inch row spacing yielded 11.8 bu (8.5%) better than the 30-inch row spacing. A 2.5% increase in stalk lodging occurred with the 15-inch row spacing as well as a 1% decrease in harvest moisture. All three measurements were significantly different between row spacings at the 95% probability level.

Table 2. 1998 average values by row spacing.

	% Harvest Moisture	% Stalk Lodging	Yield
Mean 15"	18.6	16.2	138.6
Mean 30"	19.6	13.7	126.8
CV%	4.79	32.31	8.06
LSD(.05)	0.4	2.3	5.1

Table 3 displays the combined two year (1997 and 1998) row spacing results of this experiment by hybrid. Only one hybrid (CM174lfy) showed a significant ($p>.05$) yield difference. This difference may be accounted for by an increase in harvest loss due to the low ear placement on this dwarf hybrid. Three hybrids (Pioneer brands 3563, 3730, and 3893) demonstrated a significant ($p>.05$) increase in % stalk lodging by planting in 15 inch narrow rows. Harvest % moisture differences between row spacings were significant ($p>0.5$) in five hybrids (w117lfy, Dekalb brand 345, and Pioneer brand 3563, 3751 and 3914).

The combined result of this experiment pooled over years and hybrids is displayed on table 4. At a population of 27,878 plants per acre there is no significant yield advantage or disadvantage by planting corn in a 15-inch row spacing compared to a conventional 30 inch row spacing. There was however a significant ($p>.05$) increase in % stalk lodging with 15 inch rows which may increase harvest losses. There was a significant ($p>.05$) decrease in harvest %moisture with 15 inch rows.

The effect of maturity on row spacing pooled over years is reported on table 5. Yield in all maturities responded with no difference between row spacings. The difference in % stalk lodging tended too increased between row spacings as maturity increased, however only the late maturing hybrids were significant ($p>.10$) between row spacings.

Table 3. 1997 and 1998 row spacing average by hybrid.

Hybrid	Maturity (days)	Row Spacing	% Harvest Moisture	%Stalk Lodging	Yield (bu/A)
W117lfy	75	15	17.5	5.7	90.2
W117lfy	75	30	18.5	4.2	85.9
CM174lf	70	15	16.7	5.5	84.4
CM174lf	70	30	17.2	5.1	65.4
P3941	82	15	17.6	15.1	107.5
P3941	82	30	18.3	14.8	117.8
P3970	77	15	16.9	31.9	103.6
P3970	77	30	17.4	27.9	98.4
DK345	84	15	16.8	10.4	103.1
DK345	84	30	17.9	7.2	108.2
DK417	91	15	18.1	16.0	123.2
DK417	91	30	18.5	10.4	121.3
P3861	93	15	18.9	18.0	123.4
P3861	93	30	18.5	16.8	125.1
P3893	90	15	18.5	21.2	124.8
P3893	90	30	18.7	14.9	120.2
P3914	86	15	17.5	12.9	120.4
P3914	86	30	18.7	11.3	122.7
P3563	103	15	24.3	14.2	133.3
P3563	103	30	25.3	7.9	136.8
P3730	99	15	19.7	18.3	119.8
P3730	99	30	20.1	13.1	128.6
P3751	97	15	19.9	21.7	131.1
P3751	97	30	21.1	18.6	139.4
CV%			4.60	31.56	9.55
LSD(.05)			1.0	5.18	12.5
LSD(.10)			.83	4.32	10.4

Table 4. 1997 and 1998 average values by row spacing.

	% Harvest Moisture	%Stalk Lodging	Yield
Mean 15 inch	18.5	15.9	113.7
Mean 30 inch	19.2	12.7	114.1
CV%	4.6	31.56	9.55
LSD (.05)	.3	1.5	3.6

Table 5. 1997 and 1998 row spacing average values by maturity.

	%Stalk Lodging	Yield
Early 15 inch	13.7	97.8
Early 30 inch	11.8	95.1
Mid 15 inch	17.0	122.9
Mid 30 inch	13.4	122.3
Late 15 inch	18.1	128.1
Late 30 inch	13.2	134.9
CV%	56.26	13.76
LSD (.05)	4.91	9.62
LSD (0. 1)	4.12	8.03

It is important to remember that these results are from only two years of data and one plant population. The 1997 data was reported in the 1997 farm report. The two row spacings reacted differently each year at this location indicating that environment may influence row spacing performance. There may be a specific genotype that performs better with narrow rows or a different plant population may be required for maximum yields. Planting a Bt hybrid may reduce stalk lodging, thus reducing harvest losses. Further testing is needed to see how environment, plant population, and genotype influence the yield of hybrid corn planted in a 15-inch row spacing.

Fertilizer and Soil Test Effects on Corn Yield, Watertown, SD

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 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 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. The experiment was initiated in 1996 with the same fertilizer nutrients applied to the same plots each year.

The check fertilizer treatment in this experiment received all fertilizer nutrients (50 lb/a N, 40 lb/a P_2O_5, 50 lb/a K_2O, 5 lb/a Zn) . Each subsequent treatment received three of the four nutrients allowing a comparison of the "full" fertilizer program to a treatment lacking one individual nutrient (Table 1). Nutrient rates were the same each year except nitrogen which was 95 lb/a in 1997. Fertilizer sources used were urea (46-0-0), super phosphate (0-46-0), potassium chloride (0-0-60) and zinc sulfate (35% Zn). Fertilizer was broadcast and incorporated prior to planting soybean (Stine 1284).

Plot size was 15 feet by 60 feet. Each treatment was replicated four times. Soybeans were harvested with a small plot combine.

Results and Discussion: Soil test results from samples taken in October 1997 are given in Table 2. The nitrate soil test was 27 lb/a 2 feet where no nitrogen had been applied in 1997. The residual nitrate level was raised to 56 lb/a where 95 lb N/a had been applied for corn in the spring of 1997. The 40 pounds of phosphorus and 50 pounds of potassium applied in 1996 and 1997 raised the phosphorus soil test from 6 to 8 ppm and the potassium test from 157 ppm to 177 ppm. Five pounds of zinc applied twice raised the zinc soil test from 0.77 ppm to 1.47 ppm.

Soybean yields ranged from 37 to 39 bu/a across all treatments and were not influenced by any of the treatments (Table 1). These yields follow the soil test predictions for zinc and potassium. The soil tests for these two nutrients were high, although just into the high range, and a response was not expected. The phosphorus test was low (6 ppm) and a response to fertilizer was expected. Past experience and experiments however, show that a response does not occur every year.

Nitrogen had no effect on soybean yield. That was consistent with past research which shows only infrequent soybean yield increases due to nitrogen fertilization when the field has a history of soybeans and they are nodulated.

This site will be rotated to corn or wheat in 1999. Similar fertilizer treatments (N rate will change) will be applied to the same plots in 1999. Yield and soil tests from the last two years of this study can be found in the 1996 and 1997 NE Farm Progress Reports or in the 1996 and 1997 SDSU Plant Science Department Soil/Water Science Research Annual Report, TB No. 99.

Table 1. Fertilizer Treatments and Soybean Yield, Fertilizer Experiment, Watertown Experiment Station, 1998.

Fertilizer[1]				
N	P_2O_5	K_2O	Zn	Soybean Yield
lb/a				bu/a
50	40	50	5	39
0	40	50	5	39
50	0	50	5	37
50	40	0	5	38
50	40	50	0	39
Pr > F				.11

[1] P, K and Zn applied in 1996,1997, and 1998, N rate in 1996 was 50 lb/a and in 1997 was 95 lb/a.

Table 2. Soil Tests for Fertilizer Experiment at Watertown Experiment Station, 1998.

Soil Test[1]	Fertilized	Unfertilized
Nitrate-N, lb/a 2 feet	56	27
Phosphorus, ppm Olson	8	6
Potassium, ppm	177	157
Zinc, ppm	1.47	0.77
pH	6.8	
Organic Matter, %	3.0	
Salt, mmhos/cm	0.4	

[1] Sampled 10/1/97

Performance of Bt-Corn Hybrids Exposed to Univoltine Corn Borers

Michael a. Catangui

Introduction: Peak moth flight in 1998 was recorded on July 1 at the SDSU Northeast Farm in South Shore (Figure 7). The number of moths collected in the light trap steadily declined thereafter. Thus, the corn borer moth flight in South Shore can be considered as of the one-peak or univoltine type. This type of moth flight differs markedly from that observed in Beresford, SD which is of the two-peak or bivoltine type (please see the Southeast Farm progress report for comparison). In the bivoltine life cycle, there is a lull in feeding activity in early August as the larvae metamorphose into pupae then adults. These adults lay eggs then larval feeding activity resumes for the second time in addition to the feeding done by the first generation or brood. In univoltine corn borer, however, there is no lull or break in feeding as the larvae feed continuously from July until corn is harvested. If the initial infestation were heavy (i.e., many egg masses hatched successfully), the potential for damage due to univoltine corn borer may be greater than the bivoltine type. In Beresford and areas where bivoltine corn borers occur, the first generation moths did not lay eggs successfully this year (1998) most likely due to the freezing temperatures which occurred in early June. In contrast, univoltine moths in South Shore were not affected since the peak moth flight occurred in July when evening temperatures were ideal for moth flight and egg-laying.

Transgenic (Bt) corn was planted in South Dakota for only the third season this year (1998). New hybrids are continuously being introduced by various seed companies. Although Bt-corn has been effective in preventing injury due to feeding by corn borer larvae, we have detected certain hybrids that do not necessarily improve yield when compared to an untreated conventional (non-Bt) isoline, or an isoline treated with a granular insecticide (please see our 1996 and 1997 reports for South Shore and Beresford). Furthermore, some (but not all) Bt hybrids do retain more grain moisture at harvest which may result in moisture dockage at the elevator or additional drying cost. Bt technology is not free. Seed companies charge technology fees which have not been standardized. Ideally, corn growers must be able to recoup the technology fee every time they choose Bt-corn (over the conventional corn borer control practice of scouting and treating whenever economic thresholds were reached). Since 1996, our objective has been to test various Bt-corn hybrids for efficacy in preventing corn borer damage, and investigate their potential economic advantage over untreated conventional hybrids and conventional hybrids treated with an insecticide. Results of our 1998 research at the SDSU Northeast Farm in South Shore, SD are reported in this article.

Materials and Methods: Five hybrid groups (Dekalb 493Bt-X, Garst 8773BLT, Golden Harvest EX8711, Maximizer 23, and Novartis 2555Bt) were evaluated for their performance against corn borers during the 1998 growing season. Experimental design was a split-plot with the main plots arranged as randomized complete blocks. Main plot treatments were the 5 hybrid groups while subplot treatments were the methods of controlling corn borers namely: (1) Hybrid with the Bt gene; (2) Non-Bt isoline of the hybrid; and (3) Non-Bt isoline treated with Pounce 1.5G granular insecticide at the rate of 8 pounds of formulated material per acre. Granules were applied on whorl stage corn. Main plot treatments were replicated 4 times. Each subplot was 4 rows wide (10 feet) by 100 feet long. Damage due to early and late season larvae were observed by splitting corn stalks and recording corn borer larvae feeding injuries in the stalks, ear shanks, and ears. Nocturnal moth flights of the corn borer moth were monitored using an ultraviolet light trap. Rows 2 and 3 were left intact and harvested for yield, moisture content, and test weight data. Gross income was calculated as grain fresh weight × (market value - moisture dockage). Corn market value was $1.60/bu, and moisture dockage was $0.05 per point over 15% grain moisture.

Results and Discussion: Figures 1-6 show relative performances of the corn hybrids tested during the 1998 season. Garst 8773BLT which contained the StarLink Bt gene had 47.5% less corn borer infested stalks at the end of the season compared to Garst 8773IT which did not contain a Bt gene (Figure 1). Garst 8773IT treated with Pounce 1.5G granular insecticide had 37.5% less infestation and was not significantly different from Garst 8773BLT. Whole plot by subplot treatment interaction was significant indicating that the hybrids responded differently to the corn borer control tactics utilized (i.e., Bt gene vs. granular insecticide). This interaction effect may have been due to the nature of Bt gene in the hybrid. For example, Maximizer 23 (with the KnockOut gene) only expresses the Bt gene in green tissues and pollen, thus, it tends to sustain more feeding by the corn borers at the end of the season (Figure 1). Dekalb 493Bt-X (Bt-Xtra gene) also had over 20% of stalks with tunnels. YieldGard genes in Golden Harvest and Novartis Bt hybrids are expressed in all cells of the corn plant, hence are advertized by their proponents as able to protect corn plants all season long. However, even hybrids containing the same brand of gene do not perform alike (Figure 1).

Hybrids without the Bt gene and untreated with insecticide also performed differently in terms of injury sustained due to corn borers. Golden Harvest 2292 appeared to have natural resistance to corn borer feeding sustaining only about 30% infestation of the stalks (Figure 1). This hybrid is sold by Golden Harvest as a hybrid with natural resistance to corn borers. The cumulative length of tunnels made by the corn borer larvae on each hybrid-treatment combination are presented in Figure 2.

Significant yield increases of 22, 15, and 28 bu/acre were recorded in the Bt hybrids of Golden Harvest, Maximizer, and Novartis, respectively (Figure 3). Yield increases of 3.9 bu/acre in Dekalb 493Bt-X and 4.9 bu/acre in Garst 8773BLT, compared to their respective untreated non-Bt isolines, were not statistically significant. Yield increases due to application with Pounce 1.5G (8 lb/acre) were similar to those of the Bt hybrids except in Golden Harvest where the Bt hybrid was better than the insecticide treatment.

Grain moisture content of some Bt hybrids and insecticide-treated conventional hybrids were greater than those of unprotected corn at harvest (Figure 4). However, no significant increases in moisture were observed in Golden Harvest EX8711 and Maximizer 23. This indicates that not all Bt hybrids have more moisture at harvest compared to conventional hybrids. Relative maturities of each hybrid is indicated at the bottom of each graph. Moisture contents were eventually reflected as moisture dockage when gross income was calculated.

Estimated gross income advantages of 35.68, 19.09, and $32.52/acre were recorded in Golden Harvest EX8711, Maximizer 23, and Novartis 2555Bt (Figure 6). In these hybrid groups, choosing Bt-corn over a similar non-Bt hybrid would have paid since typical technology fee was about $10.00/acre. Insecticide treatment with Pounce 1.5G (assuming a ≤$10/acre cost) may have also been cost effective in N4146 and N2555 which produced 19.83 and $25.61/acre advantages over untreated hybrids, respectively. However, Bt hybrids or treatment with an insecticide resulted to advantages of less than $5.00/acre in the Dekalb and Garst hybrid groups (Figure 6). It must be noted that central to gross income calculation were the yield, market value, moisture content at harvest, and moisture dockage. Different figures will result if market value changes, and dockage were eliminated by drying at little or no extra cost.

Acknowledgment: This research was supported in part by the South Dakota Corn Utilization Council, and the South Dakota Crop Improvement Association. I would like to thank Al Heuer for the agronomic care of the experimental plots, and Kevin Kirby for harvesting the crop.

South Shore, SD 1998 Date planted: May 5 Stalks rated: Oct 1-22

Fig. 1. Proportion of stalks with tunnels (end of season, %)

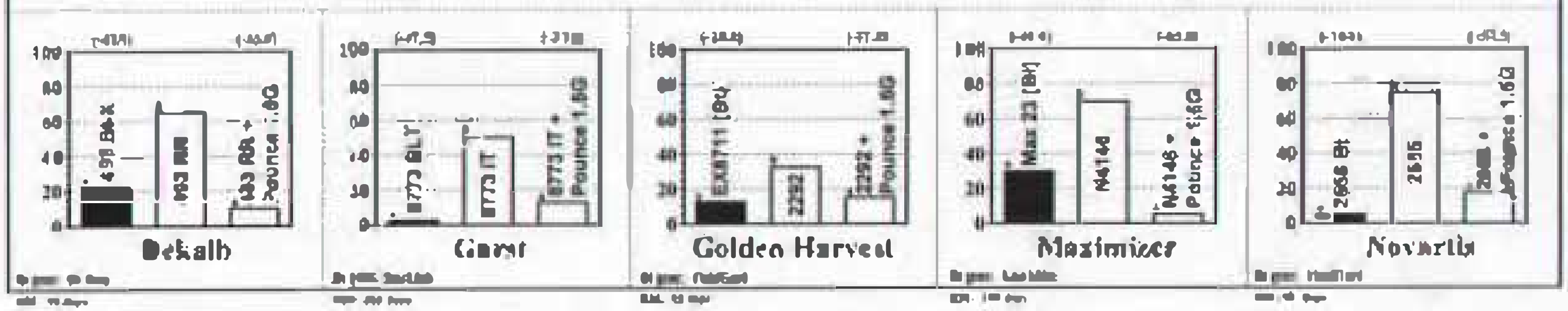
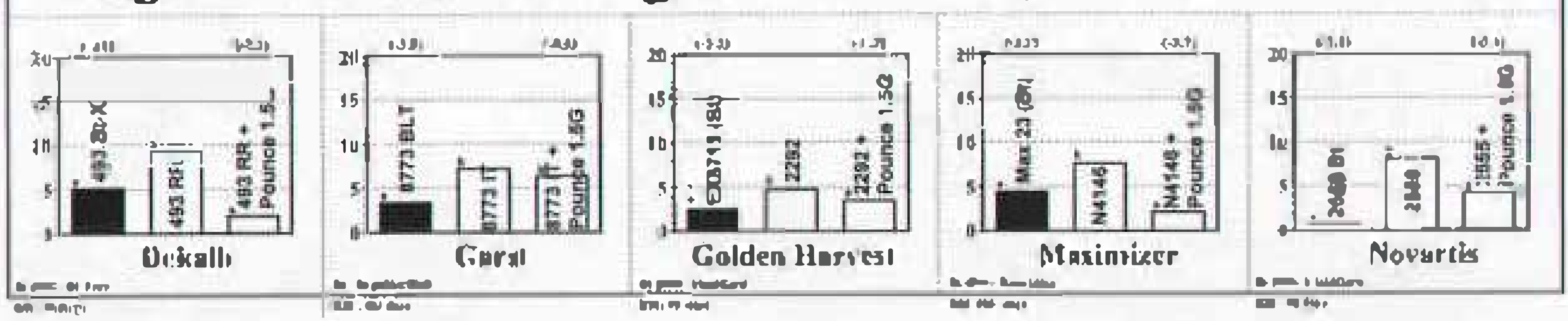


Fig. 2. Cumulative length of tunnels (end of season, *cm*)



• Bars (within a hybrid group) with the same letters are not significantly different (P > 0.05, Fisher's protected LSD)

South Shore, SD 1999 Date planted: May 5 Date harvested: Oct 27 Plant population: 24,000

Fig. 3. **Yield (*bu/acre* at 15% moisture)**

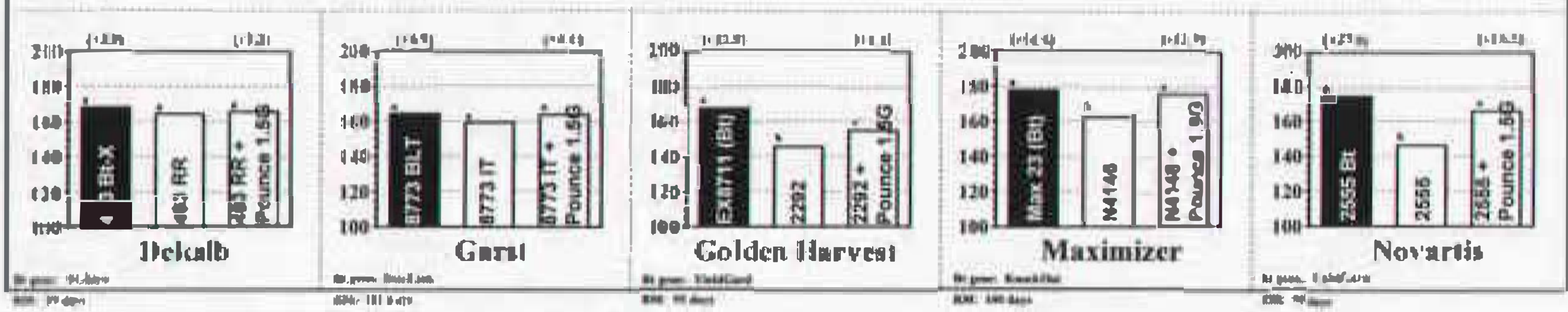
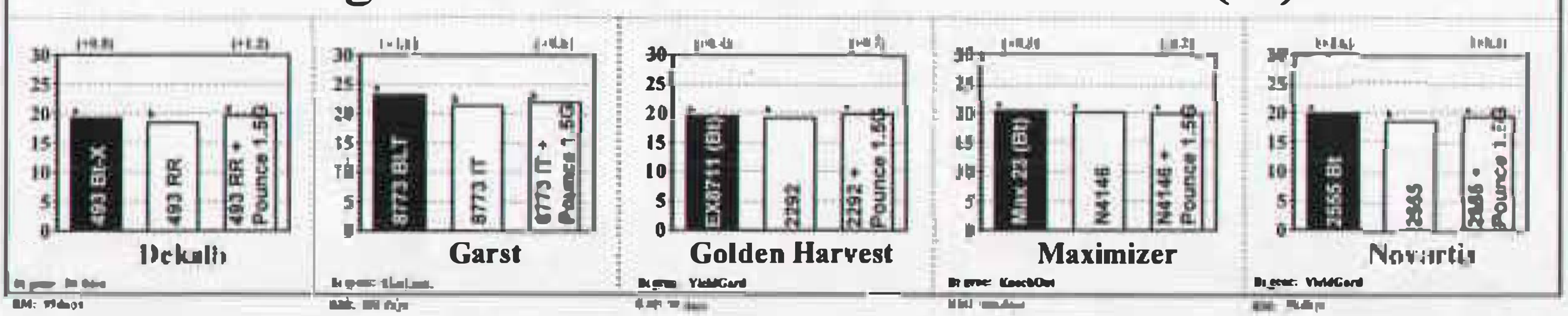


Fig. 4. **Moisture Content at harvest (%)**



* Bars (within a hybrid group) with the same letters are not significantly different (P>0.05, Fisher's protected LSD)

Fig. 5. Test Weight (*lb/bu*)

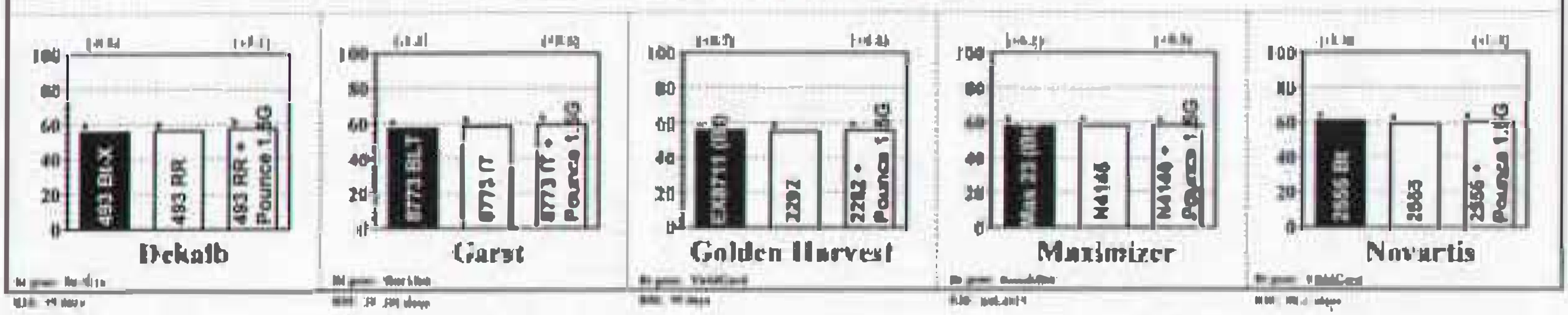
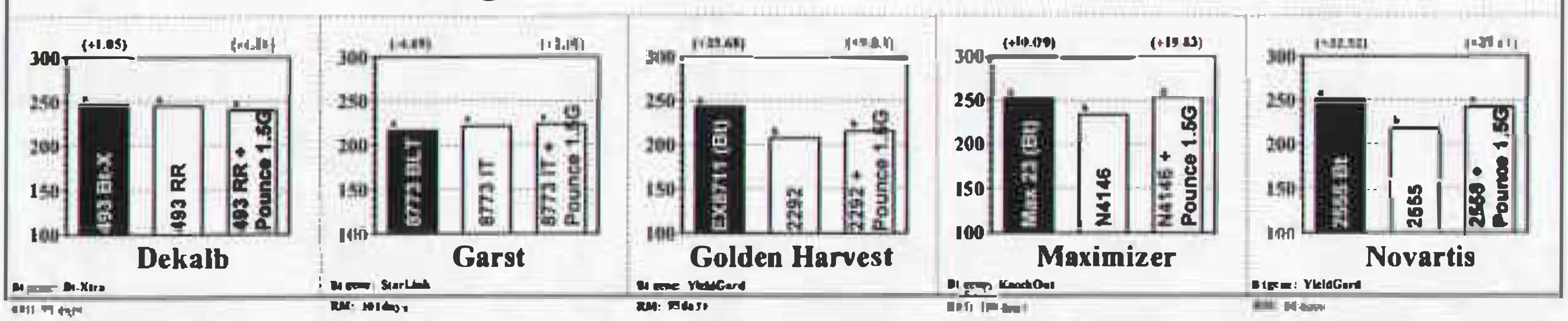
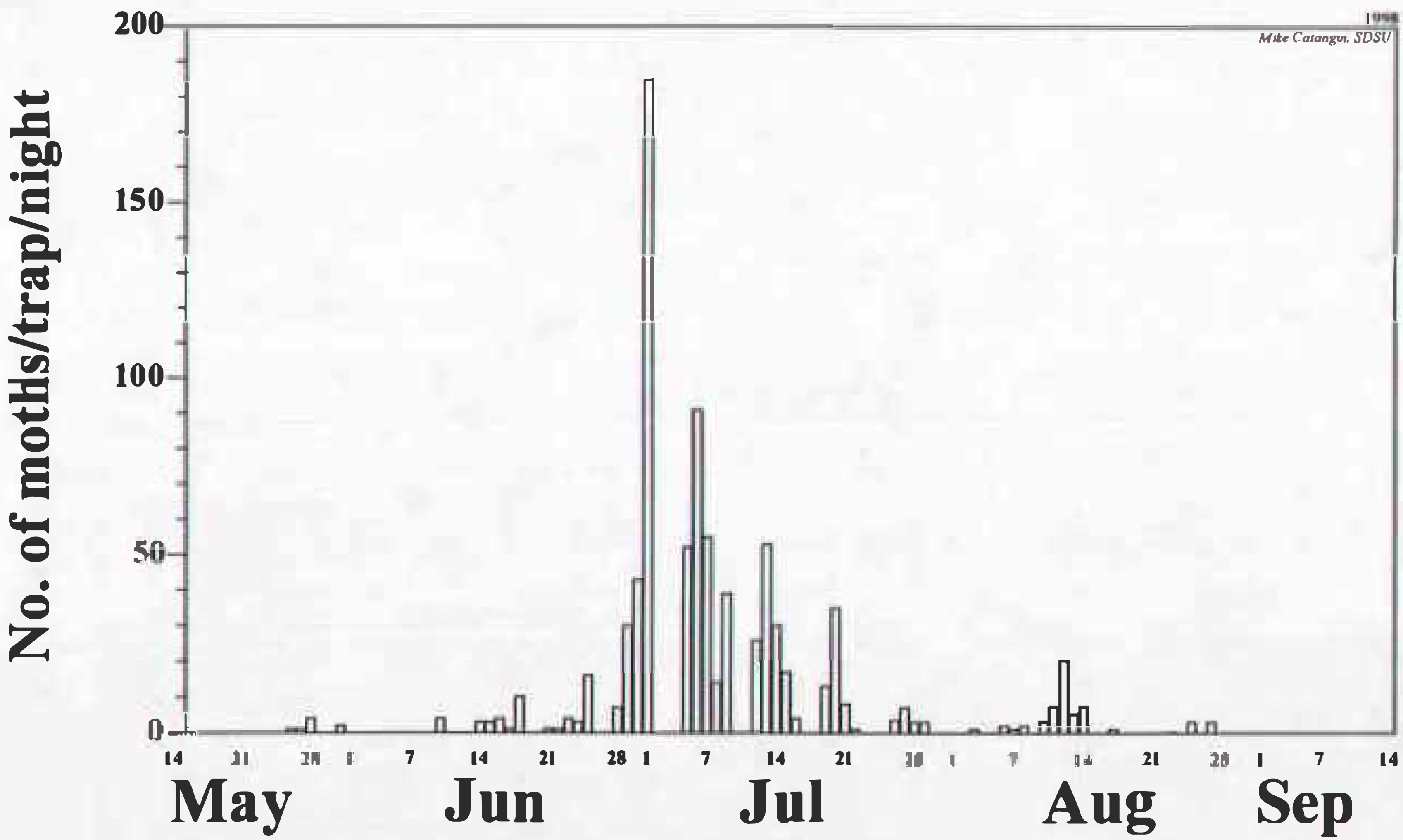


Fig. 6. Gross Income (*$/acre*)



Bars (within a hybrid group) with the same letters are not significantly different (P>0.05, Fisher's protected LSD).

Fig. 7. **Corn borer moth flight (South Shore, SD)**



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

L. J. Wrage, D. L. Deneke, D. A. Vos, S. A. Wagner, and R. J. Stahl

Field demonstration plots provide side-by-side comparison and comparative performance data. 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. Plots are used for tours and are the basis for educational material.

1998 Tests

Conditions for most herbicide treatments was favorable; weed control ratings reflect adequate early precipitation and normal weed emergence patterns. Crop growth was slow initially; however mid- and late-season conditions were favorable resulting in exceptional yields in many tests.

Weed pressure was adequate in most test areas. Corn and soybean herbicide evaluations included comparisons of new products and systems for transgenic crops. Weed pressure was lighter than anticipated in the soybean demonstration. Evaluation of experimental broadleaf products was the primary focus of sunflower tests. The station is the site for flax, canola, and alfalfa establishment evaluations.

1998 Evaluation/Demonstration Tests

1. Corn Herbicide Demonstration
2. Herbicide Tolerant Corn
3. Large Grass Control in Corn
4. Sequentials Programs in Corn
5. Soybean Herbicide Demonstration
6. Herbicide Tolerant Soybeans
7. No-Till Soybean Herbicide Demonstration
8. Weed Control in "IMI" Canola - Regional Screening Trial
9. Sunflower Herbicide Demonstration
10. Weed Control in Sunflower - Regional Screening Trial
11. Flax Herbicide Demonstration
12. Alfalfa Herbicide Demonstration

Additional evaluation plots included initial tests with experimental herbicides, additives and tests for other crops. Data collected for additional tests are reported in the W.E.E.D. Project data summary.

Experimental Tests and Other Weed Control Evaluations

1. No-Till Herbicide Control in Tolerant Corn
2. Broadleaf Control in Corn
3. Weed Removal Timing in Corn
4. Weed Control in Corn
5. Weed Removal Timing in Soybeans
6. Pursuit Adjuvant Trial
7. Adjuvants with Roundup Ultra
8. Volunteer Corn Control
9. Canada Thistle Control
10. Weed Control in "IMI" Wheat
11. Burndown/Drift Injury to Sunflower

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

RCB; 2 reps
Variety: Pioneer 3733
Planting Date: 4/30/98
PPI/PRE: 4/30/98
EPOST: 5/26/98; Corn 3 lf, 1 collar; Grft 2-3 lf, 1-2 in; Wimu 1-3 in.
POST: 6/3/98
POST1: 6/13/98; Corn 6 lf, 2 collar; Grft 3-5 lf, 3 in; Wimu 5 in; Wibw 3 lf
Soil: Clay loam; 3% OM; 6.1 pH

Precipitation:

PPI/PRE	1st week	0.21 inches
	2nd week	1.35 inches
EPOST	1st week	0.15 inches
	2nd week	0. 26 inches
POST	1st week	0.34 inches
	2nd week	0.82 inches
POST1	1st week	0.77 inches
	2nd week	0.94 inches

Grft = Green foxtail
Wimu = Wild mustard
Wibw = Wild buckwheat

Table 1. Corn Herbicide Demonstration (Continued) . . .

COMMENTS: Heavy foxtail pressure; wild buckwheat somewhat variable. Excellent performance comparisons in 1998 for early season control; considerable late grass flush with early post treatments if no residual included. Test includes excellent soil applied and postemerge programs. Two-year averages reflect very unfavorable conditions for preemergence treatments in 1996.

		% Grft	% Grft	%Wimu	% Wibw	2-Yr Avg	
Treatment	Rate/A	7/6/98	7/30/98	7/30/98	7/30/98	%Fxtl	% Bdlf
Check	----	0	0	0	0	0	0
PREPLANT INCORPORATED							
Eradicane	4.75 pt	78	82	0	30	84	25
DoublePlay	5 pt	86	92	60	40	88	73
SHALLOW PREPLANT INCORPORATED							
Dual II Magnum	1.6 pt	87	87	50	10	---	---
Lasso	3 qt	89	85	95	50	68	63
Frontier	2 pt	97	92	40	60	56	25
Harness	2.3 pt	89	90	45	45	68	48
Surpass	2.5 pt	90	88	95	65	72	83
PREEMERGENCE							
Dual II Magnum	1.6 pt	92	94	40	20	57	30
Lasso	3 qt	90	92	20	25	66	30
Prowl	3.6 pt	77	76	20	55	56	25
Harness	2.3 pt	99	98	95	30	70	68
Surpass	2.5 pt	99	97	95	30	76	68
Frontier	2 pt	98	95	90	20	58	65
Axiom	22 oz	96	94	95	30	62	68
Balance	1.5 oz	78	68	90	10	---	---
Balance + Surpass	1.5 oz + 1.25 pt	91	91	95	40	---	---
Python + Dual II Magnum	1 oz + 1.6 pt	88	86	95	20	71	73
Axiom + atrazine	21 oz + 1.1 lb	97	94	99	99	---	---
Acetochlor + atrazine	1.67 pt + 1.1 lb	98	92	99	99	---	---
Lasso + atrazine	2 qt + 1.1 lb	90	86	99	98	66	77
Bicep Lite	4.8 pt	91	85	95	78	64	83
OpTill	38 oz	89	88	95	25	---	---
BAS 656	21 oz	85	89	99	10	---	---
PREEMERGENCE & POSTEMERGENCE(1)							
Ramrod&Clarity	4 qt&1 pt	79	82	99	97	---	---
Ramrod&Banvel	4 qt&.5 pt	75	64	99	99	60	97
Ramrod&2,4-D amine	4 qt&1 pt	76	30	98	48	38	92
Ramrod&Buctril	4 qt&1.5 pt	78	40	99	99	49	99

Table 1. Corn Herbicide Demonstration (Continued) . . .

Treatment	Rate/A	% Grft 7/6/98	% Grft 7/30/98	%Wimu 7/30/98	% Wibw 7/30/98	2-Yr Avg %Extl	2-Yr Avg % Bdlf
PREEMERGENCE & POSTEMERGENCE(1)							
Ramrod&Buctril + atrazine	4 qt&1 pt + .56 lb	84	70	99	99	66	99
Ramrod&Sen/Lex + atrazine	4 qt&2 oz + .56 lb	80	68	75	55	---	---
Ramrod&Laddok S-12 + COC + 28% N	4 qt&1.67 pt+ 1 qt + 1 qt	89	82	99	98	---	---
Ramrod&Shotgun	4 qt&3 pt	86	89	99	98	78	99
Ramrod&Permit + X-77	4 qt&.67 oz + .5%	78	75	90	50	76	93
Ramrod&Beacon + COC + 28% N	4 qt&.76 oz + 1 qt + 4 qt	90	95	98	35	---	---
Ramrod&Hornet + X-77 + 28% N	4 qt&2.4 oz+ .25% + 2.5%	76	82	99	85	---	---
Ramrod&Resource + atrazine + COC + 28% N	4 qt&4 oz+ .56 lb + 1 pt + 2 qt	80	88	99	98	---	---
Ramrod&Aim + atrazine + X-77	4 qt&.33 oz+ .56 lb+ .25%	82	85	99	35	---	---
Ramrod&Distinct + X-77 + 28% N	4 qt&6 oz + .25% + 1.25%	86	95	99	88	---	---
Dual II Magnum&Marksman	1.33 pt&2.5 pt	90	96	99	98	---	---
Surpass&Hornet + X-77 + 28% N	2.5 pt&2.4 oz+ .25% + 2 qt	98	98	99	84	---	---
Surpass&Hornet + Clarity + X-77 + 28% N	2.5 pt&2.4 oz + 4 oz + .25% + 2.6%	98	99	99	96	---	---
Dual II Magnum& Northstar+ X-77 + 28% N	1.67 pt& 4.75 oz + .25% + 2 qt	94	97	99	68	---	---
Dual II Magnum + atrazine& Northstar + X-77 28% N	1.67 pt+.75 lb& 4.75 oz + .25% + 2 qt	98	98	99	84	---	---
Balance&Buctril/Atrazine	1.5 oz&32 oz	88	85	99	98	---	---
Axiom&Sen/Lex + Clarity	21 oz&2 oz + .67 pt	97	90	99	92	---	---
Surpass&Accent + COC + 28% N	1.25 pt&.67 oz + 1% + 4 qt	96	97	99	10	---	---
Surpass&Accent + COC + 28% N	1.25 pt&.33 oz + 1% + 4 qt	93	92	99	20	---	---
Surpass&Besis Gold + Clarity + COC + 28% N	1 pt&14 oz+ 2 oz + 1% + 4 qt	97	95	99	99	---	---
Prowl&Accent + Clarity + X-77 + 28% N	3 pt&.67 oz + .5 pt + .25% + 4 qt	92	88	99	95	---	---

Table 1. Corn Herbicide Demonstration (Continued) . . .

Treatment	Rate/A	% Grft 7/6/98	% Grft 7/30/98	%Wimu 7/30/98	% Wibw 7/30/98	2-Yr Avg %Fxtl	2-Yr Avg % Bdlf
POSTEMERGENCE							
Accent + COC + 28% N	.67 oz + 1% + 4 qt	90	84	99	0	81	65
EARLY POSTEMERGENCE							
Prowl + Marksman	3.6 pt + 2.5 pt	86	58	99	99	---	---
Basis + COC + 28% N	.33 oz + 1% + 2 qt	78	50	99	99	60	99
Basis + Shotgun + COC+28% N	.33 oz + 3 pt + 1% + 2 qt	94	93	99	99	---	---
Basis Gold + COC+28% N	14 oz + 1% + 4 qt	93	95	99	98	---	---
Basis Gold + Harness + Clarity + COC + 28% N	14 oz + 1 pt + 2 oz + 1% + 4 qt	99	98	99	99	---	---
Prowl + Accent + Clarity + X-77+28% N	3 pt + .33 oz + .5 pt + .25% + 4 qt	87	72	99	98	70	99
Frontier + Accent + Clarity + X-77 + 28% N	1.25 pt + .3 oz + 1 pt + .25% + 4 qt	85	79	99	99	---	---
Accent + COC + 28% N	.67 oz + 1% + + 4 qt	62	20	99	20	49	65
POSTEMERGENCE							
Accent + Northstar + COC+28% N	.33 oz + 3.5 oz + 2 pt + 2 qt	90	88	99	25	---	---
Accent + Buctril/atrazine + X-77 + 28% N	.67 oz + 2 pt + .25% + 2 qt	88	78	99	99	---	---
Accent + atrezine + COC+28% N	.67 oz + .56 lb + 1% + 2 qt	84	72	99	87	---	---
Accent + Hornet + atrazine + COC + 28% N	.67 oz + 2.4 oz + .833 + .25% + 2.5%	90	80	99	98	---	---
Accent + Beacon + Clarity + X-77 + 28% N	.33 oz + .38 oz + 2 oz + 1 pt + 4 qt	92	91	99	20	---	---
Accent Gold + COC + 28% N	2.9 oz + 1% + 4 qt	95	94	99	15	---	---
Accent Gold + atrezine + COC+28% N	2.9 oz + .56 lb + 1% + 4 qt	94	89	99	99	---	---
Tough + Accent + Beacon + COC+28% N	1 pt + .33 oz + .38 oz + 1% + 4 qt	96	80	99	0	---	---

Table 2. Herbicide Tolerant Corn

Demonstration
Variety: See comments.
Planting Date: 4/30/98
PRE: 4/30/98
EPOST: 5/26/98
POST: 6/3/98; Corn 4 lf; Grft 3 lf
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:

PRE	1st week	0.21 inches
	2nd week	1.35 inches
EPOST	1st week	0.15 inches
	2nd week	0.26 inches
POST	1st week	0.34 inches
	2nd week	0.82 inches

Grft = Green foxtail
Wimu = Wild mustard
Wibw = Wild buckwheat

COMMENTS: Varieties planted were: DeKalb 493RR, 493SR, Legend 6889LL and 7595T. Foxtail was heavy, uniform; wild buckwheat somewhat variable. Yields expressed as percent of best treatment for group, reported to reflect extreme foxtail competition. Preemerge followed by postemergence programs provided excellent weed control.

Treatment	Rate/A	% Grft 7/15/98	% Grft 7/30/98	% Wimu 7/30/98	% Wibw 7/30/98	Yield % of Max
	LIBERTY LINK CORN					
Check	-----	0	0	0	0	5.3
EARLY POSTEMERGENCE						
Liberty + AMS	20 oz + 3 lb	70	65	99	99	53.3
Atrazine + Liberty + AMS	1.5 pt+20 oz + 3 lb	88	89	99	99	97.0
Liberty + AMS	(3X) + 3 lb	78	55	99	99	67.5
POSTEMERGENCE						
Liberty + AMS	28 oz + 3 lb	76	70	99	99	61.5
PREEMERGENCE & POSTEMERGENCE						
Atrazine&Liberty + AMS	1.5 pt&20 oz+ 3 lb	86	84	99	99	93.5
Surpass&Liberty + AMS	1.67 pt&20 oz + 3 lb	89	82	99	80	100.0
EARLY POSTEMERGENCE & LATE POSTEMERGENCE						
Liberty + AMS& Liberty + AMS	20 oz + 3 lb& 20 oz+ 3 lb	82	80	99	98	92.3
	IMI CORN					
Check	-----	0	0	0	0	5.9
PREEMERGENCE & POSTEMERGENCE						
Prowl&Resolve SG + X-77+28% N	3.65 pt&5.3 oz+ .25% + 2 qt	95	98	99	99	100.0
Surpass&Resolve SG + X-77 + 28% N	1.5 pt&5.3 oz + .25% + 2 qt	90	97	99	90	88.3

Table 2. Herbicide Tolerant Corn (Continued) . . .

Treatment	Rate/A	% Grft 7/15/98	% Grft 7/30/98	% Wimu 7/30/98	% Wibw 7/30/98	Yield % of Max
	IMI CORN (Continued . . .)					
EARLY POSTEMERGENCE						
Lightning + Sun-It II + 28% N	1.28 oz + 1.5 pt + 1 qt	91	96	99	78	89.8
Lightning + atrazine + Sun-It II + 28% N	1.28 oz + .56 lb + 1.5 pt + 1 qt	97	97	98	99	95.2
Lightning(3X) + atrazine + Sun-It II + 28% N	.56 lb + 1.5 pt + 1 qt	98	99	99	99	89.8
POSTEMERGENCE						
Lightning + Sun-It II + 28% N	1.28 oz + 1.5 pt + 1 qt	96	98	99	98	82.9
	SR CORN					
Check	----	0	0	0	0	16.7
PREEMERGENCE & POSTEMERGENCE						
Frontier&Poast Plus + Laddok S-12 + COC + 28% N	20 oz&1.5 pt + 1.67 pt + 1 qt + 2 qt	98	92	99	97	93.2
Frontier&Poast Plus + Clarity + COC + 28% N	20 oz&.5 pt + 1 pt + 1 qt + 2 qt	96	89	99	85	90.5
EARLY POSTEMERGENCE						
Frontier + Poast Plus + Laddok S-12 + COC + 28% N	20 oz + 1.5 pt + 1.67 pt + 1 qt + 2 qt	99	97	99	99	100.0
Poast Plus + Laddok S-12 + COC + 28% N	1.5 pt + 1.67 pt + 1 qt + 2 qt	91	86	99	98	94.1
Poast Plus(3X) + Laddok S-12 + COC + 28% N	1.67 pt + 1 qt + 2 qt	89	87	99	99	94.6
	ROUNDUP CORN					
Check	----	0	0	0	0	11.2
PREEMERGENCE & POSTEMERGENCE						
Herness&Roundup Ultra + AMS	1 pt&1 qt + 8.5 lb/100 gal	94	77	99	82	86.8
Harness&Roundup Ultra + AMS	2 pt&1 qt + 8.5 lb/100 gal	99	88	99	78	100.0
EARLY POSTEMERGENCE						
Roundup Ultra + AMS	1 qt + 8.5 lb/100 gal	85	65	99	65	83.9
POSTEMERGENCE						
Roundup Ultra + AMS	1 qt + 8.5 lb/100 gal	88	70	99	80	88.9
Roundup Ultra(3X) + AMS	3 qt + 8.5 lb/100 gal	90	68	99	60	89.7

Table 3. Control of Large Grasses in Corn

RCB; 4 reps
Variety: DeKalb 493
Planting Date: 5/11/98
PRE: 5/11/98
POST: 6/16/98; Corn 6 lf; Grft 2-5 lf, 2-5 in;
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation:

PRE	1st week	1.74 inches
	2nd week	0.26 inches
POST	1st week	0.13 inches
	2nd week	0.94 inches

VCRR = Visual Crop Response Rating
(0 = no injury; 100 = complete kill)

Grft = Green foxtail
Wimu = Wild mustard

COMMENTS: Moderate to heavy foxtail competition. All treatments controlled wild mustard. Weed control returned nearly 100 bu/A; only two treatments failed to provide adequate control for yields in the top group. Treatments with a preemergence component produced the highest foxtail control ratings.

Treatment	Rate/A	% VCRR 6/28/98	% VCRR 7/12/98	% Grft 7/12/98	% Wimu 7/12/98	% VCRR 7/30/98	% Grft 7/30/98	% Grft 9/22/98	Yield bu/A
Check	----	0	0	0	0	0	0	0	54
POSTEMERGENCE									
Accent Gold + atrazine + COC + 28% N	2.9 oz + .5 lb + 1% + 2 qt	5	4	77	97	1	65	68	144
Basis Gold + Hornet + COC + 28% N	14 oz + 1.2 oz + 1% + 2 qt	0	0	77	98	0	69	66	144
Accent Gold + Accent + atrazine + COC + 28% N	2.9 oz + .25 oz + .5 lb + 1% + 2 qt	0	0	82	99	0	72	70	145
PREEMERGENCE & POSTEMERGENCE									
Surpass&Accent Gold + Accent + Atrazine + COC + 28% N	1.25 pt&2.9 oz + .25 oz + .5 lb + 1% + 2 qt	0	0	98	99	0	97	97	156

Table 3. Control of Large Grasses in Corn (Continued) . . .

Treatment	Rate/A	% VCRR 6/28/98	% VCRR 7/12/98	% Grft 7/12/98	% Wimu 7/12/98	% VCRR 7/30/98	% Grft 7/30/98	% Grft 9/22/98	Yield bu/A
POSTEMERGENCE									
Accent Gold + Accent + atrazine + COC + 28% N	2.9 oz + .33 oz + .5 lb + 1% + 2 qt	0	0	85	98	0	75	73	147
Basis Gold + Accent + Hornet + COC + 28% N	14 oz + .25 oz + 1.2 oz + 1% + 2 qt	4	3	91	98	1	80	78	145
PREEMERGENCE & POSTEMERGENCE									
Surpass&Basis Gold + Accent + Hornet + COC + 28% N	1.25 pt&14 oz + .25 oz + 1.2 oz + 1% + 2 qt	0	0	97	99	0	95	97	155
POSTEMERGENCE									
Basis Gold + Accent + Hornet + COC + 28% N	14 oz + .33 oz + 1.2 oz + 1% + 2 qt	4	3	90	98	1	83	82	148
Accent + Beacon + COC + 28% N	.67 oz + .38 oz + 1% + 2 qt	6	5	92	98	3	87	88	139
Accent + atrazine + Clarity + COC + 28% N	.67 oz + .5 lb + 4 oz + 1% + 2 qt	4	4	77	99	1	65	71	141
Accent + Beacon + Clarity + COC + 28% N	.67oz + .15 oz + 2 oz + 1% + 2 qt	4	4	91	97	1	83	83	135
LSD (.05)		6	6	6	2	3	7	5	13

Table 4. Sequential Programs for Weed Control

RCB; 4 reps
Variety: DeKalb 493
Planting Date: 5/11/98
PRE: 5/11/98
EPOST: 6/13/98; Corn 4-5 lf; Grft 3 lf; Rrpw 4-6 in.
POST: 6/22/98; Corn 8-12 in; Grft 3 in; Rrpw 12-18 in.
Soil: Clay loam; 3.9% OM; 6.1 pH
VCRR = Visual Crop Response Rating
(0 = no injury; 100 = complete kill)

Precipitation:

PRE	1st week	1.74 inches
	2nd week	0.26 inches
EPOST	1st week	0.77 inches
	2nd week	0.94 inches
POST	1st week	0.94 inches
	2nd week	0.89 inches

Grft = Green foxtail
Rrpw = Redroot pigweed

COMMENTS: Uniform test area. Excellent early performance. Limited extended season emergence. Yield for most treatments similar; large increase over weedy check.

Treatment	Rate/A	% Grft 7/14/98	Corn % VCRR 7/30/98	% Grft 7/30/98	% Wimu 7/30/98	% Rrpw 7/30/98	% Rrpw 7/30/98	Yield bu/A
Check	----	0	0	0	0	0	0	58
PREEMERGENCE & EARLY POSTEMERGENCE								
Frontier&Marksman + X-77	2 pt&3 pt + 2.5%	98	0	95	98	99	95	159
Frontier&Clarity + X-77	2 pt&1 pt + 2.5%	95	0	92	99	99	94	152
BAS 656&Distinct + X-77 + 28 %N	21 oz&6 oz + .25% + 2.5%	98	0	97	99	99	97	153
Optill&Marksman + 28% N	38 oz&3 pt + 2.5%	98	4	93	99	98	96	152
PREEMERGENCE & POSTEMERGENCE								
Dual II Magnum&Beacon + Clarity + X-77 + 28% N	1.67 pt&.576 oz + 4 oz + .25% + 2.5%	93	4	84	97	97	87	152
Dual II Magnum&Peak + Beacon + X-77 + 28% N	1.67 pt&.25 oz + .576 oz + .25% + 2.5%	91	0	85	99	96	91	152
BAS 656&Distinct + X-77 + 28% N	21 oz&6 oz + .25% + 2.5%	98	3	97	99	98	98	153
Surpass&Hornet + X-77 + 28% N	2.5 pt&2.4 oz + .25% + 2.5%	99	0	58	99	99	76	157
Frontier&Laddok S-12 + 28% N	2 pt&1.67 pt + 2.5%	96	0	89	96	98	90	149
Dual II Magnum&Buctril	1.67 pt&1.5 pt	74	0	47	79	96	72	136
Frontier&Accent + BAS 183 11H + X-77 + 28% N	25 oz&.67 oz + 6 oz + .25% + 2.5%	97	0	94	99	99	97	157
LSD (.05)		4	3	9	4	3	3	17

Table 5. Soybean Herbicide Demonstration

RCB; 2 reps
Variety: Stine 1073
Planting Date: 5/28/98
SPPI/PPI/PRE: 5/28/98
EPOST: 6/29/98; Soybean 3-4 tri; Grft 3 lf; Wimu 4-6 in.
POST: 7/2/98; Soybean 3-4 tri; Grft 3 lf; Wimu 4-8 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:

PPI/PRE	1st week	0.15 inches
	2nd week	0.41 inches
EPOST	1st week	0.89 inches
	2nd week	0.12 inches
POST	1st week	0.89 inches
	2nd week	0.45 inches

Grft = Green foxtail
Wimu = Wild mustard

COMMENTS: Moderate foxtail, uniform in plot area. Mustard somewhat variable. Favorable performance in 1998; thirty-five treatments provided 90% or greater control of grass and broadleaves. Two-year average results similar to 1998.

Treatment	Rate/A	% Grft 7/30/98	% Wimu 7/30/98	2-Yr Avg. % Grft	2-Yr Avg. % Bdlf
Check	----	0	0	0	0
PREPLANT INCORPORATED					
Pursuit Plus	2.5 pt	92	93	---	---
Treflan	1.5 pt	86	85	89	86
Sonalan	2.67 pt	93	91	93	93
Prowl	3 pt	80	85	83	84
Treflan + Sen/Lex	1.5 pt + .5 lb	92	94	91	90
Treflan + Command	1.5 pt + 1.5 pt	90	88	91	91
Command + Sen/Lex	1.5 pt + .33 lb	88	97	86	97
Python + Treflan	1 oz + 1.5 pt	90	96	---	---
Prowl + Pursuit 2L	3 pt + 2 oz	92	97	90	95
Steel	3 pt	96	97	92	98
Treflan + FirstRate	1.5 pt + .75 oz	89	88	88	93
Treflan + Authority	1.5 pt + 4 oz	89	65	---	---
SHALLOW PREPLANT INCORPORATED					
Lasso + Treflan	2 qt + .5 pt	60	40	64	49
Command	1.5 pt	60	50	---	---
PREEMERGENCE & EARLY POSTEMERGENCE					
Command 3ME&Pursuit 2L + Sun-It II + 28% N	2 pt&2 oz + 1 qt + 1 qt	97	98	---	---
PREPLANT INCORPORATED & PREEMERGENCE					
Treflan&Sen/Lex	1.5 pt&.67 lb	98	98	96	92
Treflan&Authority	1.5 pt&4 oz	92	92	---	---
PREPLANT INCORPORATED					
Prowl	2.5 pt	60	75	---	---

Table 5. Soybean Herbicide Demonstration (Continued) . . .

Treatment	Rate/A	% Grft 7/30/98	% Wimu 7/30/98	2-Yr Avg. % Grft	2-Yr Avg. % Bdlf
PREPLANT INCORPORATED & POSTEMERGENCE					
Prowl&Pursuit 2L + Sun-It II + 28% N	2.5 pt&4 oz+ 1 qt + 1 qt	98	98	98	99
Treflan&FirstRate + X-77 + 28% N	1.5 pt&.3 oz+ .25% + 2 qt	86	98	---	---
POSTEMERGENCE					
Raptor + Sun-It II + 28% N	4 oz + 1 qt + 1 qt	98	98	---	---
PREEMERGENCE					
Lasso	3 qt	86	86	71	73
Dual II Magnum	1.67 pt	75	66	---	---
Frontier	2 pt	75	66	67	69
Pursuit 2L	4 oz	78	68	70	76
Authority+ Command ME	4 oz + 2 pt	89	85	---	---
Sen/Lex + Command ME	.5 lb + 2 pt	97	98	---	---
Axiom	22 oz	86	94	77	77
Frontier	20 oz	72	76	---	---
EARLY POSTEMERGENCE					
Raptor + Sun-It II + 28% N	4 oz + 1 qt + 1 qt	98	97	---	---
PREEMERGENCE & POSTEMERGENCE					
Sen/Lex&Manifest + COC+28% N	6 oz&3.5 pt + .625% + 1.25%	98	96	---	---
Lasso&Pursuit 2L + Sun-It II + 28% N	2 qt&4 oz + 1 qt + 1 qt	97	98	93	97
Lasso&Scepter + X-77	2 qt&.33 pt + .5%	97	97	90	97
Lasso&Basagran + +COC	2 qt&1 qt + 1 qt	90	98	60	62
Lasso&Blazer + X-77	2 qt&1.5 pt + .5%	96	97	68	97
Lasso&Stellar + COC + 28% N	2 qt&5 oz + .5% + 2.5%	90	92	59	91
Lasso&Cobra + COC	2 qt&.8 pt + .5 qt	91	90	68	94
Lasso&Flexstar HL + Sun-It II + 28% N	2 qt&12 oz+ 1% + 2.5%	94	98	67	99
Lasso&Galaxy + X-77 + 28% N	2 qt&2 pt + .5% + 2.5%	93	97	70	98
Lasso&FirstRate + X-77 + 28% N	2 qt&.3 oz + .25% + 2.5%	89	93	---	---
Lasso&Pinnacle + X-77	2 qt&.25 oz + .25%	89	97	66	98
Lasso&Classic + X-77	2 qt&.75 oz + .25%	93	97	69	97
Lasso&Reliance STS + X-77 + 28% N	2 qt&.5 oz+ .25% + 1 qt	89	93	---	---
Lasso&Reliance STS + COC + 28% N	2 qt&.5 oz+ 1% + 1 qt	93	95	---	---
Lasso&Basagran + Pursuit 2L + COC	2 qt&1 pt+ 2 oz + 1 qt	95	93	94	96
Lasso&Reliance STS + Pursuit 2L + X-77	2 qt&.5 oz + 3 oz + .25%	97	97	---	---
Lasso&Pursuit 2L + Cobra+ Sun-It II + 28% N	2 qt&4 oz + 6 oz+ 1 pt + 1 qt	98	95	98	97

Table 5. Soybean Herbicide Demonstration (Continued) . . .

Treatment	Rate/A	% Grft 7/30/98	% Wimu 7/30/98	2-Yr Avg. % Grft	2-Yr Avg. % Bdlf
PREEMERGENCE & POSTEMERGENCE	(Continued) . . .				
Lasso&Expert + X-77 + 28% N	2 qt&1.5 oz+ .5% + 2 qt	88	30	86	56
Lasso&Resource + Galaxy + X-77 + 28% N	2 qt&2 oz+ 2 pt + .5% + 2 qt	98	97	—	—
Lasso&Flexstar HL + Pursuit 2L + Sun-It II+ 28% N	2 qt&12 oz + 2 oz + 1% + 2 qt	98	97	—	—
Lasso&Flexstar HL + Pursuit 2L + Sun-It II + 28% N	2 qt&12 oz + 4 oz + 1% + 2 qt	98	97	—	—
Lasso&Reliance STS + Basagran + COC+28% N	2 qt&.5 oz + 1 pt + 1% + 1 qt	20	97	—	—
EARLY POSTEMERGENCE					
Select + Flexstar HL + Sun-It II+ 28% N	7 oz+ 12 oz+ 1% + 2 qt	98	97	—	—
Fusion + Flexstar HL + Sun-It II+ 28% N	10 oz+ 12 oz+ 1% + 2 qt	98	97	—	—
Poast Plus + COC	1.5 pt+ 1 qt	98	0	96	0
Poast Plus	1.5 pt	98	0	91	0
Raptor + Sun-It II+ 28% N	5 oz + 1 qt + 1 qt	97	96	95	98
Pursuit 2L + Sun-It II+ 28% N	4 oz + 1 qt + 1 qt	98	96	94	97
Pursuit 2L	4 oz	96	96	90	88
Poast Plus + Galaxy + COC	2.25 pt+ 2 pt+ 1 qt	98	95	92	79

Table 6. Herbicide Tolerant Soybeans

Demonstration
Varieties: Mustang M195 STS, 2704LL, and 1587RR
Planting Date: 5/28/98
PPI/PRE: 5/28/98
EPOST: 6/29/98; Soybeans 3-4 tri; Grft 3 lf; Wimu 4-6 in,
POST: 7/2/98; Soybeans 3-4 tri; Grft 3 lf; Wimu 4-8 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:

PPI/PRE	1st week	0.15 inches
	2nd week	0.41 inches
EPOST	1st week	0.89 inches
	2nd week	0.12 inches
POST	1st week	0.89 inches
	2nd week	0.45 inches

Grft = Green foxtail
Wimu = Wild mustard

COMMENTS: Purpose to evaluate herbicide programs with transgenic soybeans. Very limited weed emergence in plot area. Exceptional crop growth; early canopy. Excellent control with most treatments. Rates of 2X produced no visual response.

Table 6. Herbicide Tolerant Soybeans (Continued) . . .

Treatment	Rate/A	% Grft 7/30/98	% Wimu 7/30/98
	STS SOYBEANS		
POSTEMERGENCE			
Reliance STS + COC + 28% N	.5 oz + 1% + 2 qt	0	98
EARLY POSTEMERGENCE			
Reliance STS + Assure II + COC + 28% N	.5 oz + 7 oz + 1% + 2 qt	85	94
PREPLANT INCORPORATED & EARLY POSTEMERGENCE			
Treflan&Reliance STS + Poast Plus + COC + 28% N	1.5 pt&.5 oz + 1.5 pt + .625% + 2 qt	98	98
PREPLANT INCORPORATED & POSTEMERGENCE			
Treflan&Reliance STS + COC + 28% N	1.5 pt&.5 oz + 1% + 2 qt	95	98
PREEMERGENCE & POSTEMERGENCE			
Authority&Reliance STS + Assure II + COC + 28% N	4 oz&.5 oz + 7 oz + 1% + 2 qt	93	98
Frontier&Reliance STS + Poast Plus + COC + 28% N	20 oz&.5 oz + 1.5 pt + .625% + 2 qt	98	98
	LIBERTY SOYBEANS		
POSTEMERGENCE			
Liberty (2X) + AMS	56 oz + 3 lb	97	94
Frontier + Liberty + AMS	20 oz + 20 oz + 3 lb	73	50
EARLY POSTEMERGENCE			
Liberty + AMS	28 oz + 3 lb	95	93
PREPLANT INCORPORATED & POSTEMERGENCE			
Treflan&Liberty + AMS	1.5 pt&20 oz + 3 lb	98	74
PREEMERGENCE & POSTEMERGENCE			
Prowl&Liberty + AMS	2.2 pt&20 oz + 3 lb	94	90
Frontier&Liberty + AMS	20 oz&20 oz + 3 lb	98	90
PREPLANT INCORPORATED & EARLY POSTEMERGENCE & POSTEMERGENCE			
Treflan&Liberty + AMS&Liberty + AMS	1.5 pt&20 oz + 3 lb&20 oz + 3 lb	98	98
	ROUNDUP READY SOYBEANS		
POSTEMERGENCE			
Roundup Ultra + AMS	1 pt + 8.5 lb/100 gal	98	95
EARLY POSTEMERGENCE			
Roundup Ultra + AMS	1 pt + 8.5 lb/100 gal	98	95
Roundup Ultra + AMS	1 qt + 8.5 lb/100 gal	98	98
PREPLANT INCORPORATED & EARLY POSTEMERGENCE			
Treflan&Roundup Ultra (2X) + AMS	1.5 pt&2 qt + 8.5 lb/100 gal	98	98

Table 6. Herbicide Tolerant Soybeans (Continued) . . .

Treatment	Rate/A	% Grft 7/30/98	% Wimu 7/30/98
PREPLANT INCORPORATED & EARLY POSTEMERGENCE & POSTEMERGENCE			
Pursuit Plus&Roundup Ultra + AMS& Roundup Ultra + AMS	2.5 pt&1 pt + 8.5 lb/100 gal& 1 pt + 8.5 lb/100 gal	99	99
PREPLANT INCORPORATED & POSTEMERGENCE			
Prowl&Roundup Ultra + Pursuit 2L + AMS	2.5 pt&1 pt+ 4 oz+8.5 lb/100 gal	98	98
PREEMERGENCE & POSTEMERGENCE			
Frontier&Roundup Ultra+AMS	20 oz&1.5 pt+8.5 lb/100 gal	98	97
Authority&Roundup Ultra + AMS	8 oz&1.5 pt+8.5 lb/100 gal	98	98
Authority&Roundup Ultra + AMS	5.33 oz&1.5 pt + 8.5 lb/100 gal	98	98
Broadstrike/Dual&Roundup Ultra + AMS	2.5 pt&1.5 pt + 8.5 lb/100 gal	98	98
Dual II Magnum&Resource + Roundup Ultra + AMS	1 pt&4 oz+ 1.5 pt+8.5 lb/100 gal	98	97
POSTEMERGENCE			
Roundup Ultra + AMS	1 pt + 8.5 lb/100 gal	97	96
PREEMERGENCE & EARLY POSTEMERGENCE			
Sen/Lex&Frontier + Roundup Ultra + AMS	6 oz&20 oz + 1.5 pt + 8.5 lb/100 gal	98	98

Table 7. No-Till Soybean Herbicide Demonstration

RCB; 2 reps
Variety: 1582RR
Planting Date: 5/28/98
EPP: 5/20/98
POST: 7/8/98; Soybeans 3 tri; Grft 4-5 in.
Soil: Clay loam; 3.9% OM; 6.3 pH

Precipitation:

EPP	1st week	0.27 inches
	2nd week	0.15 inches
POST:	1st week	0.45 inches
	2nd week	0.03 inches

Grft = Green foxtail

COMMENTS: Moderate weed pressure. Roundup 1 qt/A burndown. Yield variability; treatment yields similar; all yielded more than the untreated check.

Table 7. No-Till Soybean Herbicide Demonstration (Continued) . . .

Treatment	Rate/A	% Weed Comp. Stunt 7/30/98	% Grft 7/30/98	Yield bu/A
Check	----	0	0	26
EARLY PREPLANT				
Dual II Magnum + Sen/Lex	1.67 pt + .5 lb	0	75	54
Broadstrike + Dual	2.5 pt	0	80	50
Authority + Command 3ME	4 oz + 2 pt	0	71	55
EARLY PREPLANT & POSTEMERGENCE				
Command 3ME&Pursuit 2L + Sun-It II + 28% N	2 pt&2 oz + 1 qt + 1 qt	0	96	58
FirstRate&Poast Plus + COC	.75 oz&1.5 pt + 1 qt	5	97	61
Frontier&Galaxy + Poast + COC + 28% N	20 oz&2 pt + 1.5 pt + .0625% + 1.25%	10	97	64
Prowl&Raptor + Sun-It II + 28% N	3.65 pt&4 oz + 1 qt + 1 qt	8	95	54
Prowl&Pursuit 2L + Sun-It II + 28% N	3.65 pt&4 oz + 1 qt + 1 qt	5	95	54
Prowl + Sen/Lex&Cobra + COC	3.65 pt + 6 oz&.8 pt + 1 pt	10	60	50
Prowl&Cobre + COC	3.65 pt&.8 pt + 1 pt	8	70	53
Prowl&Reliance STS + COC + 28% N	3.65 pt&.5 oz + 1% + 1 qt	8	75	54
Prowl&Flexstar HL + Sun-It II + 28% N	3.65 pt&12 oz + 1% + 2 qt	5	73	53
Prowl&Flexstar HL + Pursuit 2L + Sun-It II + 28% N	3.65 pt&12 oz + 2 oz + 1% + 2 qt	3	92	57
Prowl&FirstRate + X-77 + 28% N	3.65 pt&.3 oz + .25% + 2 qt	0	72	57
Sen/Lex&Roundup Ultra + AMS	6 oz&1 qt + 8.5 lb/100 gal	0	98	63
Prowl&Roundup Ultra + Pursuit 2L + AMS	3.65 pt&1 pt + 4 oz + 8.5 lb/100 gal	0	98	56
Pursuit Plus&Roundup + AMS	2.5 pt&1 pt + 8.5 lb/100 gal	0	98	64
POSTEMERGENCE				
Roundup Ultra + AMS	1 qt + 8.5 lb/100 gal	10	98	59
Roundup Ultra + AMS	1 pt + 8.5 lb/100 gal	13	98	61
LSD (.05)		6	13	12

Table 8. Weed Control in "IMI" Canola

RCB; 4 reps
Variety: Pioneer 45A71
Planting Date: 4/29/98
PPI/PRE: 4/29/98
POST1: 5/20/98; Canola 3-4 lf; Grft 2-3 lf
POST2: 6/13/98; Canola 5-9 in; Grft 4 in.
Soil: Clay loam; 3.9% OM; 6.3 pH

Precipitation:

PPI/PRE	1st week	0.05 inches
	2nd week	1.51 inches
POST1	1st week	0.27 inches
	2nd week	0.15 inches
POST2	1st week	0.77 inches
	2nd week	0.94 inches

VCRR = Visual Crop Response Rating
(0 = no injury; 100 = complete kill)

Grft = Green foxtail
Bdlf = Redroot pigweed, lambsuqarter
Wibw = Wild buckwheat

COMMENTS: Plots established in wheat stubble. Seedbed preparation with fall chisel and spring field cultivator. Preplant herbicides incorporated with 2 passes using field cultivator. Excellent crop emergence and rapid early growth. Crop formed dense, early canopy. Weed emergence was delayed, low weed density, very limited early weed pressure. Late-season ratings for wild buckwheat and annual broadleaf (bdlf) weeds include light redroot pigweed and lambquarter. Most treatments provided excellent green foxtail control as rated in late season. Weed control was not a factor in seed yield; however visual crop response rating (VCRR) of 20 or greater tended to reduce yield.

Treatment	Rate/A	% VCRR 6/2/98	% VCRR 7/30/98	% Grft 7/30/98	% Grft 8/26/98	% Bdlf 8/26/98	% Wibw 8/26/98	Yield lbs/A
PREPLANT INCORPORATED								
Sonalan	2.5 pt	4	0	96	94	98	95	1746
Prowl	3 pt	0	4	95	93	94	92	1858
Treflan	1.5 pt	0	4	96	93	88	93	1899
Treflan	2 pt	0	5	97	94	97	94	1845
PREPLANT INCORPORATED & POSTEMERGENCE(1)								
Treflan&Stinger	1.5 pt&.33 pt	3	5	95	92	99	97	1903
Treflan&Banvel	1.5 pt&2 oz	4	5	98	95	98	96	1933
Treflan&Herbicide 273	1.5 pt&1 pt	0	3	98	96	94	92	1794
Treflan&Herbicide 273	1.5 pt&1.5 pt	0	6	98	97	98	96	1906
Treflan&Herbicide 273	1.5 pt&2 pt	0	8	98	97	98	96	1867

Table 8. Weed Control in "IMI Canola (Continued) . . .

Treatment	Rate/A	% VCRR 6/2/98	% VCRR 7/30/98	% Grft 7/30/98	% Grft 8/26/98	% Bdlf 8/26/98	% Wibw 8/26/98	Yield lbs/A
PREPLANT INCORPORATED & POSTEMERGENCE(1)								
Treflan&Muster + Class 17% Conc.	1.5 pt+.38 oz+1%	0	5	98	96	98	93	1857
Treflan&M6316 + Class 17% Conc.	1.5 pt&.4 oz+1%	14	6	98	97	99	97	1833
Treflan&Motive + Class 17% Conc. + 28% N	1.5 pt&2 oz+ 1.25% + 1.25%	1	4	98	98	98	96	1802
Treflan&Motive + Class 17% Conc. + 28% N	1.5 pt&4 oz+ 1.25% + 1.25%	3	5	99	99	99	95	1905
PREPLANT INCORPORATED & POSTEMERGENCE(2)								
Treflan&Herbicide 273	1.5 pt&1.5 pt	0	8	97	93	98	95	1834
Treflan&Motive + Class 17% Conc. + 28% N	1.5 pt&2 oz+ 1.25% + 1.25%	0	4	98	95	98	93	1789
Treflan&Motive + Class 17% Conc. + 28% N	1.5 pt&4 oz+ 1.25% + 1.25%	3	3	99	98	98	92	1792
SHALLOW PREPLANT INCORPORATED								
Dual II Magnum	1.6 pt	4	4	98	97	97	81	1786
Frontier	2 pt	15	13	97	94	94	87	1658
Surpass	3 pt	20	15	98	97	96	87	1502
PREEMERGENCE								
Dual II Magnum	1.6 pt	4	5	99	98	84	63	1724
Frontier	2 pt	9	9	98	96	84	76	1756
Surpass	3 pt	21	10	99	98	98	85	1596
POSTEMERGENCE(1)								
Assure II + Class 17% Conc.	8 oz+1%	1	4	97	93	0	0	1911
DPX-V9360 + Class 17% Conc.	.6 oz+1%	9	4	99	98	96	91	1851
Herbicide 273	1.5 pt	3	4	83	85	96	95	1720
Poast + Class 17% Conc.	17 oz+1.25%	4	0	98	95	0	0	1701
Assure II+M6316+Class 17% Conc.	8 oz+.4 oz+1%	18	9	98	95	96	96	1795
Assure II + Muster + Class 17% Conc.	8 oz+.38 oz+1%	4	3	99	97	96	68	1748
Assure II + Stinger + Class 17% Conc.	8 oz+.33 pt+1%	4	3	91	89	94	95	1841

Table 8. Weed Control in "IMI" Canola (Continued) . . .

Treatment	Rate/A	% VCRR 6/2/98	% VCRR 7/30/98	% Grft 7/30/98	% Grft 8/26/98	% Bdlf 8/26/98	% Wibw 8/26/98	Yield lbs/A
POSTEMERGENCE(1)								
DPX-V9360 + M6316 + Class 17% Conc.	.3 oz + .083 oz + 1%	9	4	98	96	97	78	1823
DPX-V9360 + M6316 + Class 17% Conc.	.6 oz + .083 oz + 1%	13	6	94	89	97	89	1807
Motive + Class 17% Conc. + 28% N	2 oz + 1.25% + 1.25%	4	3	96	92	94	84	1770
Motive + Class 17% Conc. + 28% N	4 oz + 1.25% + 1.25%	6	4	99	98	97	92	1755
Poast + F8426 + Preference	17 oz + .16 oz + .25%	45	26	40	43	39	19	1250
Poast + F8426 + Preference	17 oz + .32 oz + .25%	50	35	45	5	59	27	662
Poast + Herbicide 273 + Preference	17 oz + 1 pt + .25%	0	3	95	90	95	83	1729
BAS 514H + Destiny	2.67 oz + 1.25%	6	3	99	98	77	58	2010
BAS 514H + Destiny	5.33 oz + 1.25%	6	0	99	97	96	78	1900
POSTEMERGENCE(1) & POSTEMERGENCE(2)								
Poast + Class 17% Conc.& Herbicide 273	17 oz + 1.25%& 1 pt	0	3	89	84	97	92	1960
Assure II + Class 17% Conc.& M6316 + Class 17% Conc.	8 oz + 1%& .4 oz + 1%	0	8	98	97	95	90	1782
Assure II + Class 17% Conc.& Motive + Class 17% Conc. + 28% N	8 oz + 1%& 2 oz + 1.25% + 1.25%	0	1	99	98	81	53	1932
POSTEMERGENCE(2)								
Motive + Class 17% Conc. + 28% N	4 oz + 1.25% + 1.25%	0	6	97	93	93	82	1857
PREPLANT INCORPORATED & POSTEMERGENCE(1)								
Treflan&Motive + Class 17% Conc. + 28% N	1.5 pt&4 oz + 1.25% + 1.25%	0	3	99	98	97	95	1871
Check	----	0	0	0	0	0	0	1759
LSD (.05)		5	7	3	6	10	9	183

Table 9. Sunflower Herbicide Demonstration

Demonstration
Variety: Pioneer 6300
Planting Date: 5/20/98
PPI: 5/20/98
POST: 6/22/98; Sunflower 7-9 in;
Grft 4-5 in; Wimu 5-10 in.
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation:

PPI	1st week	0.27 inches
	2nd week	0.15 inches
POST	1st week	0.94 inches
	2nd week	0.89 inches

VCRR = Visual Crop Response Rating (0 = no injury; 100 = complete kill)
Grft = Green foxtail
Wimu = Wild mustard

COMMENTS: Purpose to evaluate labeled herbicides and experimental treatments for weed control and crop tolerance. Very heavy wild mustard and heavy foxtail pressure. Only two treatments gave adequate wild mustard control; foxtail control was satisfactory to excellent.

Treatment	Rate/A	% VCRR 7/8/98	% Grft 7/8/98	% Wimu 7/8/98	2-Yr Avg % Extl
Check	----	0	0	0	0
PREPLANT INCORPORATED					
Eptam	3.5 pt	0	90	25	79
Sonalan	2.67 pt	0	88	20	86
Treflan	1.5 pt	0	94	10	88
Treflan	3 pt	0	92	10	92
Prowl	3 pt	0	87	10	79
Dual II Magnum	1.33 pt	0	78	0	---
Dual II Magnum	1.67 pt	0	85	0	---
SHALLOW PREPLANT INCORPORATED					
Prowl	3 pt	0	92	0	71
PREEMERGENCE					
Prowl	3 pt	0	85	0	48
Dual II Magnum	1.67 pt	0	78	0	---
PREEMERGENCE & POSTEMERGENCE					
F6285&Poast + COC	4 oz&1 pt+ 1%	0	94	0	---
V-53482&Poast + COC	3 oz&1 pt+ 1%	0	98	80	---
R6447&Poast + COC	1.43 oz&1 pt + 1%	0	96	20	---
POSTEMERGENCE					
Poast + COC	1 pt+ 1%	0	98	0	95
Poast + Assert + COC	20 oz + 1.25 pt+ 1 qt	35	90	99	93
Select + COC	6 oz + 1%	10	96	10	94
Assure II + COC	7 oz + 1%	0	96	0	---
LSD (.05)					11

Table 10. Weed Control in Sunflower

RCB; 4 reps
Variety: Pioneer 6300
Planting Date: 5/20/98
PPI/PRE: 5/20/98
POST: 6/22/98; Sunflower 7-9 in;
Grft 4-5 in; Wimu 5-10 in.
Soil: Clay loam; 3.9% OM; 6.1 pH

Precipitation:

PPI/PRE	1st week	0.27 inches
	2nd week	0.15 inches
POST	1st week	0.94 inches
	2nd week	0.89 inches

Grft = Green foxtail
Wimu = Wild mustard

VCRR = Visual Crop Response Rating
(0 = no injury, 100 = complete kill)

COMMENTS: Heavy foxtail and mustard density. Excellent crop tolerance for treatments; slight stunting with high rate of V-53486 noted. Wind damage in late season; yields not harvested. Most treatments very weak for wild mustard control.

Treatment	Rate/A	% VCRR 7/8/98	% Grft 7/8/98	% Wimu 7/8/98
Check	----	0	0	0
PREEMERGENCE				
F6285	3.2 oz	0	39	0
F6285	4 oz	0	43	0
F6285	5.33 oz	0	36	0
Prowl	2.67 pt	0	36	8
PREPLANT INCORPORATED				
Treflan	1.5 pt	0	94	3
Sonalan	2.5 pt	0	92	21
Dual II Magnum	1.33 pt	0	84	8
Dual II Magnum	1.67 pt	0	90	0
F6285 + Treflan	4 oz + 1.5 pt	0	90	13
F6285 + Treflan	5.33 oz + 1.5 pt	0	87	28
V-53482 + Sonalan	3 oz + 3.5 pt	5	93	57
PREEMERGENCE				
F6285 + Prowl	4 oz+2.67 pt	0	57	9
F6285 + Prowl	5.33 oz+2.67 pt	0	82	11
V-53482 + Prowl	2 oz+2.67 pt	0	42	52
V-53482 + Prowl	3 oz + 2.67 pt	0	72	73
V-53482	2 oz	0	37	38
V-53482	3 oz	3	34	65
V-53482	6 oz	23	65	98
R6447	.71 oz	0	38	3
R6447	1.07 oz	0	28	15
R6447	1.43 oz	0	31	16
R6447	2.14 oz	0	43	32
R6447 + Prowl	1.07 oz + 2.67 pt	0	44	10
R6447 + Prowl	2.14 oz+2.67 pt	0	49	36

Table 10. Weed Control in Sunflower (Continued) . . .

Treatment	Rate/A	% VCRR 7/8/98	% Grft 7/8/98	% Wimu 7/8/98
PREEMERGENCE & POSTEMERGENCE				
F6285&Poast + COC	4 oz&1 pt+1%	0	96	8
F6285&Assure II+COC	4 oz&6 oz+1 qt	0	96	8
LSD (.05)		5	13	14

Table 11. Weed Control in Flax

RCB; 6 reps
Variety: VERNE93
Planting Date: 4/29/98
PPI: 4/29/98
POST: 6/3/98; Flax 4-5 in; Yeft 3-4 lf; Wimu 2-4 in; Pesw 2-4 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

VCRR = Visual Crop Response Rating; (0 = no injury; 100 = complete kill)

Precipitation:

PPI	1st week	0.05 inches
	2nd week	1.51 inches
POST	1st week	0.34 inches
	2nd week	0.82 inches

Yeft = Yellow foxtail
Wimu = Wild mustard
Pesw = Pennsylvania smartweed

COMMENTS: Heavy uniform weed pressure. Grass control was a critical factor for yield; visual crop injury ratings were not reflected in yield differences.

Treatment	Rate/A	% VCRR 7/8/98	% Yeft 7/8/98	% Wimu 7/8/98	% Pesw 7/8/98	Yield bu/A	3-Yr Avg % Fxtl	3-Yr Avg % Bdlf
Check	----	0	0	0	0	17	0	0
PREPLANT INCORPORATED								
Treflan	1.5 pt	28	91	0	58	22	87	68
POSTEMERGENCE								
MCPA amine	1 pt	0	0	99	58	17	0	73
MCPA ester	1 pt	0	0	99	60	15	0	75
Buctril	1 pt	13	0	98	99	17	0	92
Exp 31078	20 oz	10	0	95	99	17	---	---
Poast+COC	1 pt+1 qt	0	89	0	0	23	94	0
Poast+Buctril+COC	1 pt+1 pt+1 qt	25	91	92	98	22	94	94
Poast+Buctril	1 pt+1 pt	18	93	98	99	22	84	93
LSD (.05)		7	6	6	12	8	8	13

Table 12. Weed Control in Alfalfa

RCB; 2 reps
Variety: Pioneer 5312
Planting Date: 4/29/98
PPI: 4/29/98
EPOST: 6/3/98; Alfalfa 2 in;
Yeft 3-4 lf; Wimu 2-4 in.
POST: 6/13/98; Alfalfa 4 in;
Yeft 4 in; Wimu 4-8 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:

PPI	1st week	0.05 inches
	2nd week	1.51 inches
EPOST	1st week	0.34 inches
	2nd week	0.82 inches
POST	1st week	0.77 inches
	2nd week	0.94 inches

VCRR = Visual Crop Response Rating
(0 = no injury; 100 = complete kill)

Yeft = Yellow foxtail
Wimu = Wild mustard

COMMENTS: Excellent foxtail control; broadleaf control varied. Crop oil additive tended to increase crop injury with some treatments. Pursuit, Raptor and Exp 31078 + Poast Plus provided greater than 90% control of grass and broadleaf weeds.

Treatment	Rate/A	% VCRR 7/8/98	% Yeft 7/8/98	% Wimu 7/8/98	3 Yr Avg % Fxtl	3 Yr Avg % Bdlf
Check	----	0	0	0	0	0
PREPLANT INCORPORATED						
Eptam	2.9 pt	0	98	38	84	32
Treflan	1.5 pt	0	97	50	83	62
EARLY POSTEMERGENCE						
Poast Plus + COC	1.5 pt + 1 qt	0	98	0	97	0
POSTEMERGENCE						
Buctril + Poast Plus + COC	1 pt + 1.5 pt + 1 qt	23	99	83	93	88
Buctril	1.5 pt	0	0	98	0	94
EARLY POSTEMERGENCE & POSTEMERGENCE						
Poast Plus + COC&2,4-DB	1.5 pt + 1 qt&1.5 qt	10	97	80	90	80
EARLY POSTEMERGENCE						
Pursuit + Sun-It II + 28% N	4 oz + 1 qt + 1 qt	0	99	99	---	---
Raptor + Sun-It II + 28% N	4 oz + 1 qt + 1 qt	10	99	99	---	---
POSTEMERGENCE						
Exp 31078	30 oz	0	0	97	---	---
Exp 31078 + Poast Plus + COC	30 oz + 1.5 pt + 1 qt	13	96	90	---	---
EARLY POSTEMERGENCE						
Oats + Poast Plus + COC	1.5 pt + 1 qt	0	97	5	---	---
LSD (.05)		9	2	14	9	12

Rotation Studies

J. Smolik and A. Heuer

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, an 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 1998 are listed in Table 1.

Results: This was the fifth year of the study and one complete cycle of the rotations has been recorded in all the systems. The highest corn, soybean and spring wheat yields occurred in the Conv system (Table 2), and yields in this system were also higher than in 1997. Yields of oats, alfalfa and soybean in the Alt I system were higher than the previous year, while only oat and clover yields in the Alt II system exceeded those in 1997. Alfalfa yield in the Hay system was less than in 1997, and was also lower than in the Alt I system. Nematode populations were measured in Fall of 1998, and numbers of dagger nematodes were very high in the Hay system (Table 3). Based on results in previous studies these populations would significantly reduce growth of alfalfa, and were likely in part responsible for the lower alfalfa yield.

The highest soil test levels of N occurred in the Conv spring wheat (Table 2), which is in contrast to previous years results where the highest levels occurred folllowing clover in the Alt II system. The highest percentage of organic matter was measured in the Alt I system, which was similar to 1996 and 1997.

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

Table 1. Cultural practices in 1998 Rotation Studies

System/Crop	Fertilizer	Herbicide	Tillage: Pre-plant	Tillage: Post-Plant
Conv				
Corn	100 lb N + 20 lb P	Lasso 2 qt + Bladex 2 qt	Field cult & harrow	Cult 2x, fall moldboard plow
Soybean	20 lb P	Lasso 2 qt + Amiben 3 qt	Field cult & harrow	Cult 2x, fall chisel plow
Spring Wheat	100 lb N + 20 lb P	Bronate 1 qt	Field cult & harrow	Fall moldboard plow
Hay[a]	20 lb P		Field cult & harrow	
Alt - I				
Oat/alfalfa	2.1 T/A Manure (Fall)[b]		Field cult & harrow	
Alfalfa			—	Fall chisel plow
Soybean			Field cult & harrow	Rotary hoe 1x, cult 2x, fall chisel plow
Corn			Field cult & harrow	Rotary hoe 1x, cult 2x, fall chisel plow
Alt II				
Oats/clover			Field cult & harrow	
Clover			—	Chisel plow, (late summer)
Soybeans			Field cult & harrow	Rotary hoe 1x, cult 2x
Spring wheat			Field cult & harrow	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.

b\ 1.70 - 0.49 - 1.28 (% N-P-K).

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

System/Crop	Yield	N 0-24"	P 0-6"	K 0-6"	% O.M.
		Soil Test Results (Fall, 1998) ---lbs/A---			
Conv					
Corn	103.4 Bu/A	16.4	12	302	3.9
Soybean	38.8 Bu/A	25.2	10	300	3.2
Spring Wheat	50.2 Bu/A	112.4	8	272	3.2
Hay: 0.85+0.96+0.75=2.56 T/A[a]		12.4	8	276	3.8
Alt I					
Oats/Alfalfa:	59.7 Bu/A	15.6	14	338	3.9
Alfalfa: 1.26+1.42+1.34=4.02 T/A[b]		27.6	16	294	3.4
Soybean	36.6 Bu/A	22.4	8	272	3.3
Corn	76.6 Bu/A	10.0	14	270	4.2
Alt II					
Oats/Clover	61.7 Bu/A	12.8	6	280	3.4
Clover: 2.22 T/A (removed) 0.75 T/A[c]		32.0	4	260	3.6
Soybeans	30.3 Bu/A	18.4	4	282	3.4
Spring Wheat	37.5 Bu/A	50.4	8	292	3.1

[a] Analysis/cut (% N-P-K) = 3.03 - 0.33 - 2.72; 3.00 -0.26 - 1.98; 3.35 - 0.19 - 1.74.
[b] Analysis/cut (% N-P-K) = 3.17 - 0.26 - 1.92; 3.00 - 0.34 - 2.46; 3.30 - 0.29 - 2.42.
[c] First cutting (2.2 T/A) removed and second cutting was green manure (0.75 T/A). Analysis of 1st cut (%N-P-K) = 2.20 - 0.16 - 1.30 and green manure analysis was 2.46 - 0.16 - 1.71.

Table 3. Nematode oooulations, Fall, 1998.

System	Crop	Pin[a]	Dagger[a]	Microbial Feeding[a]	Predaceous[a]
Conv	Corn	0	0	465	265
	Soybean	400	135	2916	135
	Spring Wheat	0	0	265	65
Hay		0	850	785	416
Alt I	Oat/Alfalfa	135	0	150	85
	Alfalfa	0	85	2400	235
	Soybean	516	0	816	335
	Corn	85	85	1365	516
Alt II	Oat/Clover	2065	0	865	235
	Clover	85	50	1516	216
	Soybean	385	35	765	85
	Spring Wheat	285	0	1465	285

[a] Number per 100 cm^3 soil.

1998 Spring Wheat Foliar Fungicide Trial

M. Draper, B. Farber, M. Thompson and J. Rudd

Introduction: Wheat is subject to several foliar diseases caused by fungi. These diseases may be managed through the use of foliar fungicides. Among the most common diseases that may be prevented with fungicides are leaf rust (*Puccinia recondita*), tan spot (*Pyrenophora tritici-repentis*), and the complex of Septoria diseases (*S. tritici*, S. *avenae*, *S. nodorum*) and leaf or crown rust (*Puccinia coronata*). The purpose of this study was to determine the efficacy of various foliar fungicides on disease severity, yield and test weight of wheat grain.

Materials and Methods: Trials were conducted at the Northeast Research Station (NE Farm) and the Brookings Agronomy Station (Brookings). A third location at Groton, SD was lost due to flooding. Two varieties, Sharp and Oxen, were entered in the study. Five fungicides and an untreated check were included in the study, with fungicide applications at the five-leaf seedling stage, flag leaf stage, boot stage and ten days after the boot stage, as outlined in Table 1. The foliar fungicide treatments and number of plots were the same at all locations. Treatments were replicated four times. Plots were rated on a 0-5 scale for overall disease; percentage leaf area on the flag leaf consumed by disease, based on a random subsample of five leaves; yield and test weight. The products in the trial were propiconizole (Tilt), mancozeb (Dithane DF), tebuconizole (Folicur), fenbuconizole (Govern), and azoxystrobin (Quadris). The mancozeb and fenbuconizole treatments were applied with Latron, a spreader-sticker, and azoxystrobin was applied with a crop oil concentrate, as recommended on the label.

Table 1: Dates of planting, fungicide applications, plot rating and harvest for the two locations.

Location	Activity	Crop stage at treatment	Date
NE Farm	Planting		4/29/98
	Fungicide application	Early (5-leaf, ~ Feekes 2)	4/29/98
		Flag (Feekes 8-9)	6/09/98
		Boot (Feekes 10)	6/17/98
		Boot +10 days	6/26/98
	Rating		7/22/98
	Harvest		8/21/98
Brookings Agronomy Farm	Planting		4/24/98
	Fungicide application	Early (~ Feekes 2)	5/12/98
		Flag (Feekes 8-9)	6/7/98
		Boot (Feekes 10)	6/12/98
		Boot +10 days	6/22/98
	Rating		7/14/98
	Harvest		7/31/98

Results and Discussion: At various locations around the state in 1998, foliar disease was severe. Up to about 50% of the untreated flag leaf was diseased at the Northeast Research Station on Oxen and Sharp spring wheat at the soft dough stage (Feekes 11.2). At the NE Farm, leaf disease was not significantly reduced by any treatment applied at the seedling stage. However, This location was planted on a field that had grown corn in 1997. Under those conditions, early season disease pressure would be expected to be lower.

Results were variable between the two varieties. Sharp generally responded to treatment with a greater yield increase, while there was no significant yield increase in Oxen from any treatment. No product significantly increased test weight.

Fungicide applications to the flag leaf (Feekes 8.5) and later in crop development were generally very good on both Sharp and Oxen wheat. Tilt did not

Table 2: Disease ratings, yield and test weight for various fungicide treatments on spring wheat.

NE Farm	Ratings							
Treatment Rate & Crop Stage	Diseased Flag Leaves*		Foliar Disease /Plot†		Yield (bu/A)		Test Weight (lb/bu)	
	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp
Untreated n/a	49.3	48.8	3.9	4.0	48.4	43.8	54.1	51.9
Tilt 2 fl oz/A early	44.3	50.3	3.8	3.9	47.9	45.0	52.7	51.7
Tilt 4 fl oz/A flag	43.5	31.3	3.5	3.9	48.7	46.3	51.9	50.8
Mancozeb 1 lb/A early	47.5	32.3	3.6	4.0	45.3	42.6	52.9	48.6
Mancozeb 2 lb/A boot 2 lb/A boot+ 10	10.8	23.0	2.6	2.9	48.3	48.2	53.3	51.5
Mancozeb 1 lb/A early 2 lb/A boot 2 lb/A boot+ 10	9.0	11.2	2.4	3.3	50.2	44.6	54.0	51.1
Folicur 4 fl oz/A flag	31.3	28.1	3.3	3.6	50.3	47.9	52.0	51.9
Folicur 4 fl oz/A boot	20.8	13.3	2.8	3.1	49.3	47.9	53.4	51.9
Govern 1.4 oz/A boot 1.4 oz/A boot + 10	13.2	11.3	2.5	2.8	49.0	47.0	53.6	52.6
Govern 1.4 oz/A boot	21.9	16.3	2.9	3.1	48.1	46.3	53.1	49.2
Quadris 0.1 lb/A flag	22.8	40.0	3.5	3.8	47.0	45.7	52.6	50.8
Quadris 0.125 lb/A flag	31.5	38.5	3.4	3.6	45.1	46.4	52.2	51.1
LSD (0.05)	20.7	19.9	0.5	0.5	NS	3.4	NS	NS

Table 2 (cont.): Disease ratings, yield and test weight for various fungicide treatments on spring wheat.

Brookings Treatment Rate & Croo Stage	Ratings Diseased Flag Leaves*		Foliar Disease /Plot†		Yield (bu/A)		Test Weight (lb/bu)	
	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp
Untreated n/a	36.5	37.8	4.8	4.4	49.8	48.0	59.4	59.2
Tilt 2 fl oz/A early	34.8	36.5	4.8	4.6	51.5	47.7	59.6	59.6
Tilt 4 fl oz/A flag	22.3	21.0	4.3	4.3	53.0	47.8	59.2	59.2
Mancozeb 1 lb/A early	26.8	29.3	4.9	4.6	51.0	47.3	57.3	58.3
Mancozeb 2 lb/A boot 2 lb/A boot+10	22.3	17.0	4.0	3.8	53.1	49.0	59.4	59.4
Mancozeb 1 lb/A early 2 lb/A boot 2 lb/A boot+10	20.0	15.0	4.4	3.9	53.6	48.2	59.6	58.7
Folicur 4 fl oz/A boot	18.8	22.3	3.8	4.3	51.2	48.2	58.7	59.6
Folicur 4 fl oz/A flag	15.0	25.3	4.0	4.3	51.5	48.6	58.9	56.9
Govern 1.4 oz/A boot 1.4 oz/A boot+10	26.0	19.8	4.1	3.4	52.1	49.4	59.2	58.9
Govern 1.4 oz/A boot	20.5	21.5	4.6	4.4	51.1	48.4	59.2	59.7
Quadris 0.1 lb/A flag	25.0	23.0	4.5	4.3	51.2	49.4	58.9	59.2
Quadris 0.125 lb/A flag	23.3	23.3	4.3	4.1	52.8	46.9	58.7	58.3
$LSD_{(0.05)}$	13.6	13.4	0.6	0.5	2.2	2.5	1.8	2.1

* leaf area diseased/flag leaf (50 leaves)
† on a scale of 0-5 (0 = no disease, 5 = 100% disease)
‡ due to travel constraints, application was made at b+9

provide significant disease control, or yield increase, when applied to the flag leaf. Results similar to Tilt were obtained with the experimental product Folicur. When applied to the flag leaf of Oxen disease was not suppressed significantly. The same treatment on Sharp provided significant yield increase and significant disease suppression. Multiple applications of mancozeb (Dithane) provided the best disease suppression and yield increase of all treatments.

Also, slightly later fungicide applications, nearer the boot stage (Feekes 10) produced better response. This indicated that the disease epidemic was delayed, not becoming serious until several days after flag leaf applications were made. Two newer products expected for labeling soon, Quadris and Govern, produced mixed results. Each product produced numeric, but not significant yield increases with both varieties. A single or double application of Govern decreased disease severity, with no significant yield response. Quadris decreased disease on Oxen at the 0.1# a.i. rate, but the yield response was not significantly higher.

Similar results were obtained at Brookings with the same treatments. However, Oxen showed a favorable yield response while Sharp did not respond to the treatments with a significant yield increase. Tilt performed very well, significantly reducing disease severity on both Sharp and Oxen and resulting in a significantly higher yield with Oxen.

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1998 Spring Wheat Scab Foliar Fungicide Trial

M. Draper, B. Farber, M. Thompson and J. Rudd

Introduction: Fusarium head blight (Scab) has been a recurring problem in wheat grown in South Dakota since the 1993 epidemic. Scab is particularly a problem on spring wheat in the northeastern quarter of the state. Winter wheat, durum, and barley are also susceptible to scab, but because of smaller acreage, losses are not as significant. Scab can be managed through cultural methods, variety selection and fungicides. No one fungicide can eliminate the disease. As such, a multi-faceted management program must be followed in fields with a history of scab. Pending the release of highly resistant or tolerant varieties, fungicides offer promise in suppressing scab and reducing losses. Since fungicides can only suppress, rather than eliminate the disease, screening is ongoing to identify the most effective products available. This project was a part of a seven state, regional effort to evaluate fungicide performance for scab suppression under many different environments.

Materials and Methods: Trials were conducted at the Northeast Research Station (NE Farm) and a site in Day County, near Pierpont, SD. A third location at Groton, SD was lost due to flooding. Two varieties, Sharp and Oxen, were entered in the study. Nine treatments composed of five fungicides or fungicide combinations and an untreated check were included in the study. All fungicide treatments were applied at about 50% anthesis on the main tiller (Feekes 10.5), as outlined in Table 1. Treatments were rated 21 days after fungicide application, about the soft dough stage (Feekes 11.2). The fungicide treatments and number of plots were the same at both locations. Treatments were replicated six times. Ratings included scab incidence, the percentage of scabby heads per plot; scab severity, the proportion of scabby spikelets per infected head; scab index, the severity of disease in the plot (incidence X severity); percent diseased flag leaf area diseased (largely tan spot); and a whole plot evaluation of disease, based on a 0-5 scale for overall disease. After harvest (Table 1), treatments were compared with regard to grain yield and test weight, and for the level of vomitoxin or deoxynivalenol (DON) present in the harvested grain. The DON content was measured with ELISA, a serological method, through a public lab in Michigan.

Table 1: Dates of planting, fungicide applications, plot rating and harvest for the two locations.

Location	Activity	Crop stage at treatment	Date
NE Farm	Planting		4/29/98
	Fungicide application	Anthesis (Feekes 10.5)	7/01/98
	Rating		7/22/98
	Harvest		8/21/98
Day County	Planting		4/23/98
	Fungicide application	Anthesis (Feekes 10.5)	6/26/98
	Rating		7/17/98
	Harvest		8/12/98

The fungicides in the trial were propiconizole (Tilt), tebuconizole (Folicur), mancozeb (Dithane DF), benomyl (Benlate), and azoxystrobin (Quadris). Mancozeb was applied as a Benlate+mancozeb treatment. Quadris was evaluated by itself at three different rates and in a tank mix with Benlate at two rates (Table 2). The Quadris treatments were applied with crop oil concentrate. Other treatments did not include a surfactant.

Results and Discussion: A survey of grower fields indicated the scab was present at about 10% disease severity (scab index) in the northeastern quarter of the state. This level of disease was similar to disease levels at the NE Farm. Statewide losses were about 3%. Some surveyed commercial spring wheat fields had scab indeces higher than 20%.

At the NE Farm, all treatments except the high rate of Quadris significantly reduced the scab index on both varieties (Table 2). Similarly, all treatments reduced leaf disease significantly over the untreated control. These reductions in scab and foliar disease translated into a yield increase of about 2.5 to 5 bushels per acre. Folicur and all Quadris treatments except the low rate of Quadris alone resulted in a significant increase in grain yield over the untreated control. Only the high rate of Quadris+Benlate increased grain test weight.

Only the Benlate + mancozeb treatment reduced DON significantly. Some treatments reduced the level DON in the harvested grain numerically, but not significantly. Other treatments developed DON levels that were numerically higher than the untreated control.

Scab index and yield differences among the fungicide treatments were not as great with Sharp as with Oxen. Sharp is slightly more tolerant of scab than Oxen and the differences show on the untreated controls (Table 2). Scab index values were about two to three percent higher on Oxen at both the NE Farm and Day County. However, since Oxen is a higher yielding variety, differences in yield are not as apparent.

Disease pressure was generally low, about 3% scab, at the Day County site. Products performed similarly at Day County, but at lower levels of disease, differences were neither as great, nor as easily differentiated. Growers fields with the level of disease present at Day County, would not have realized significant losses from scab. Similarly, the cost of fungicide treatments would not have produced a net profit.

Table 2: Results of fungicide treatment on several parameters of scab and foliar disease suppression.

NE Farm

Treatment (Rate)	Ratings: Scab Index[a]		DON Content (ppm)[b]		Flag leaf disease (%)[c]		Foliar disease/plot[d]		Yield (bu/A)		Test weight (lb/bu)	
	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp	Oxen	Sharp
Untreated (n/a)	9.4	7.5	2.7	2.3	68.8	54.0	4.3	4.4	47.8	45.0	53.1	52.9
Tilt (4 fl oz/A)	5.2	3.3	1.9	1.6	14.7	25.9	3.3	3.6	52.2	46.3	54.9	54.1
Folicur (4 fl oz/A)	5.4	3.3	2.0	1.5	13.8	18.3	3.0	3.3	52.0	49.6	54.8	53.5
Mancozeb (1 lb/A) + Benlate (0.5 lb/A)	5.3	3.5	1.0	1.3	34.3	27.5	3.8	4.0	50.0	47.5	55.5	52.2
Quadris (0.125 lb ai/A)	4.8	4.1	2.2	1.9	10.1	34.0	2.5	3.5	50.8	46.9	53.8	52.6
Quedris (0.15 lb ai/A)	5.8	3.8	2.7	2.7	7.2	17.7	2.8	3.4	51.7	48.2	54.0	54.1
Quedris (0.2 lb ai/A)	6.4	5.7	1.9	2.1	16.1	23.0	2.8	3.7	52.5	48.3	55.2	52.7
Quadris (0.2 lb ai/A) + Benlate (0.5 lb/A)	5.6	3.8	2.0	1.5	10.3	35.7	2.3	3.5	53.2	49.1	55.1	55.6
Quadris (0.125 lb ai/A) + Benlate (0.125 lb/A)	5.9	3.5	3.1	2.0	10.2	20.3	2.5	3.0	50.7	49.0	53.6	53.5
LSD $_{(0.05)}$	3.4	2.8	1.0	1.0	15.3	18.8	0.5	0.6	2.8	4.1	1.6	2.1

[a] Scab Index = % scabby heads x % scab (50 heads)

[b] level of vomitoxin in sample

[c] % leaf area diseased/flag leaf (50 leaves)

[d] on a scale of 0-5 (0 = no disease, 5 = 100% disease)

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1998 Oat Foliar Fungicide Trial

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

Introduction: Oats are subject to a variety of foliar diseases. Among the diseases commonly encountered on oats are Septoria leafspot (*S. avenae*) and leaf or crown rust (*Puccinia coronata*). Locally, severe outbreaks of stem rust (*Puccinia graminis* f. sp. *secalis*) were also observed in parts of SD in 1998. These diseases, being caused by fungi, often can be suppressed or managed through the application of fungicides. Other diseases such as red leaf, caused by barley yellow dwarf virus, are common but would not be expected to respond to fungicides. In some years, a significant yield increase has been documented following multiple fungicide applications in the presence of light disease pressure. The purpose of the following study was to determine the effects of various foliar fungicide treatments on disease development at the end of the season, yield, and test weight of oats.

Materials and Methods: Trials were conducted at the Northeast Research Station (NE Farm), the Brookings Agronomy Station (Brookings), and the Southeast Research Station (SE Farm) during 1998. The cultivar 'Don' was used in this study as it has been for several years. Planting, treatment, and harvest dates are listed in Table 1. Three fungicides, eight treatments plus an untreated check were included in the trial (Table 2). The foliar fungicide treatments and number of plots were the same at all three locations. Treatments were replicated four times. Plots were rated during the dough stage on a 0-5 scale for overall foliar disease, where 0= no disease and 5= premature ripening. Yield and test weight were measured following harvest.

Tilt (propiconizole) and Folicur (tebuconizole) are triazole fungicides with locally systemic activity. Neither product is currently registered for use on oats. They were tested as experimental products because of their effectiveness against leaf disease on other cereal crops. Dithane DF (mancozeb) was applied to the crop with Latron as a spreader-sticker, as recommended on the label.

Results and Discussion: In 1998 there was little crown rust pressure at Brookings and the SE Farm. Disease pressure, largely from crown rust, was great at the NE Farm. As a result, the response to fungicide applications at the NE Farm were generally favorable. Tilt, while an effective fungicide on wheat, did not reduce disease, increase yield or test weight. Folicur significantly increased yield when applied at either flag leaf emergence or at the boot stage. Disease was reduced significantly only with the boot application. This response would suggest the onset of leaf disease occurred late in the growing season. However, when the mancozeb product was applied to the crop at any stage of crop development at the NE Farm, a significant yield increase resulted. Similarly, disease ratings were reduced with all mancozeb treatments, in most cases significantly. The best responses were obtained with two applications, at the boot stage and again 10 days later. However, a single mancozeb application at flag leaf emergence, boot, or ten days after boot also produced a significant increase in yield. As disease pressure decreased, benefits

Table 1: Dates of planting, fungicide applications, plot rating and harvest for the three locations.

Location	Activity	Product	Date
NE Farm	Planting		4/15/98
	Fungicide application	Early	5/21/98
		Flag	6/3/98
		Boot	6/9/98
		Boot +10 days	6/19/98
	Rating		7/22/98
	Harvest		7/27/98
Brookings Agronomy Farm	Planting		4/11/98
	Fungicide application	Early (5-leaf stage)	5/22/98
		Flag (Feekes 8.5)	6/3/98
		Boot	6/9/98
		Boot +10 days	6/19/98
	Rating		N/A
	Harvest		8/3/98
SE Farm	Planting	N/A	4/14/98
	Fungicide application	Early	
		Flag	
		Boot	
		Boot +10 days	
	Rating		N/A
	Harvest		7/23/98

were less reliable. At the SE Farm where there was only light disease pressure, only Folicur applied at the flag leaf stage and repeated mancozeb treatments at boot and 10 days later produced higher yields. Under conditions where disease did not develop (Brookings), all treatments increased yield numerically, but not significantly. Under light disease or no disease, test weights were increased by the same treatments that increased yield under those conditions.

Under heavy disease pressure the tebuconizole treatment has the potential of generating an additional $21.21 net profit on oats for grain and a single application of mancozeb could generate as much as $15.42 additional income (Table 3). Mancozeb has a preharvest interval of 26 days and cannot be applied after Feekes

Table 2: Disease ratings, yield and test weight for various fungicide treatments on Don oats.

Treatment Rate Crop Stage	Crown rust rating*	Foliar disease rating†	Yield (bu/A)			Test Weight (lb/bu)		
	NE Farm	NE Farm	SE Farm	Brookings	NE Farm	SE Farm	Brookings	NE Farm
Untreated (N/A)	32.1	4.5	78.5	84.7	96.0	27.2	35.3	33.2
Tilt 4 fl oz/A Flag	31.3	5.0	82.9	88.9	95.2	28.7	34.7	33.9
Folicur 4 fl oz/A Flag	9.0	3.6	93.8	87.9	123.0	29.8	34.8	35.8
Folicur 4 fl oz/A Boot	3.8	2.6	87.2	89.2	125.9	28.9	35.0	36.8
Mancozeb 1 #/A Early	19.0	3.6	83.5	86.6	108.1	28.5	34.3	34.9
Mancozeb 2 #/A Flag	15.0	3.8	83.2	86.8	115.4	28.5	35.2	35.3
Mancozeb 2 lb/A Boot	17.0	3.4	85.3	85.7	110.0	28.6	34.2	35.2
Mancozeb 2 lb/A Boot +10	8.6	2.8	70.1	89.7	118.6	26.3	34.8	35.4
Mancozeb 2 #/A Boot + 2 #/A Boot +10	1.6	1.9	93.1	88.3	126.4	29.1	34.8	36.9
LSD [illegible]	8.4	1.1	11.2	5.1	8.4	2.1	0.9	1.2

* on a scale of 0-100 (0 = no disease, 100 = 100% of flag leaf area diseased with crown rust)

† on a scale of 0-5 (0 = no disease, 5 = 100% leaf area necrotic/diseased)

10.5 (flowering). These restrictions should not be obstacles to the use of this product in oat production. One further restriction applies with mancozeb. Fields cannot be grazed before harvest if mancozeb has been applied. However, there is no restriction on the straw following harvest. Since Folicur is not currently labeled for oats no restrictions or tolerances have been established.

Based on these results, a decision to use a fungicide on an oat crop can be delayed until the boot stage. If crown rust is building and the variety is susceptible to the disease, a fungicide application may be warranted and would be expected to produce a significant and profitable yield increase. However, under light disease or no disease pressure, fungicides may not be profitable in a given year.

Table 3: Economic viability of using fungicides on 'Don' oats in 1998 at the NE Farm.

Treatment Rate & CropStage	Cost of fungicide	Cost of application	Total cost of treatment	Yield advantage over untreated control (bu/A)	Increase in profit from treatment ($1.20/bu)	Net profit from treatment
Untreated (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
Tilt 4 fl oz/A Flag	$11.72	$5.50*	$17.22	(0.8)	$(0.96)	$(18.18)
Folicur 4 fl oz/A Flag	$9.17	$5.50	$14.67	27.0	$32.40	$17.73
Folicur 4 fl oz/A Boot	$9.17	$5.50	$14.67	29.9	$35.88	$21.21
Mancozeb 1 #/A Early	$3.10	n/a†	$3.10	12.1	$14.52	$11.42
Mancozeb 2 #/A Flag	$6.20	$5.50	$11.70	19.4	$23.28	$11.58
Mancozeb 2 lb/A Boot	$6.20	$5.50	$11.70	14.0	$16.8	$5.10
Mancozeb 2 lb/A Boot+10	$6.20	$5.50	$11.70	22.6	$27.12	$15.42
Mancozeb 2 #/A Boot 2 #/A Boot +10	$12.40	$11.00	$23.40	30.4	$36.48	$13.08

* Assumes aerial application. Ground application rates would be lower.
† Assumes ground application as a tank mix with post emergence herbicide.

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