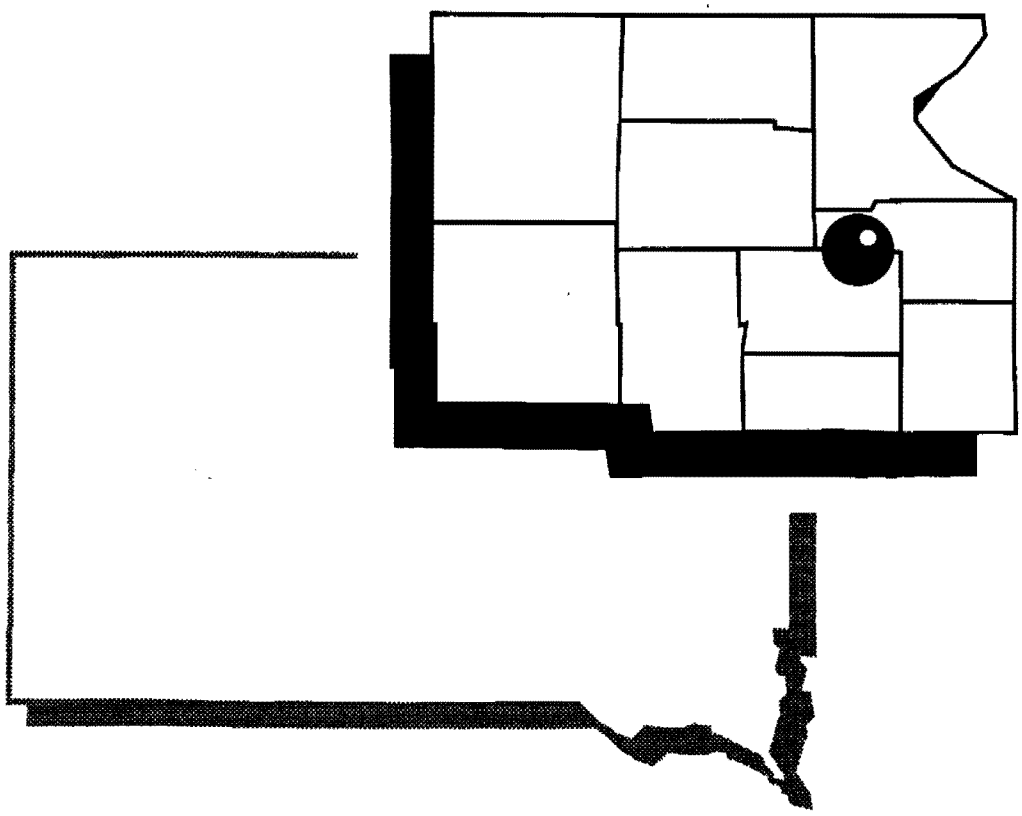
2001 Annual Progress Report

Plant Science Pamphlet No. 5

January 2002

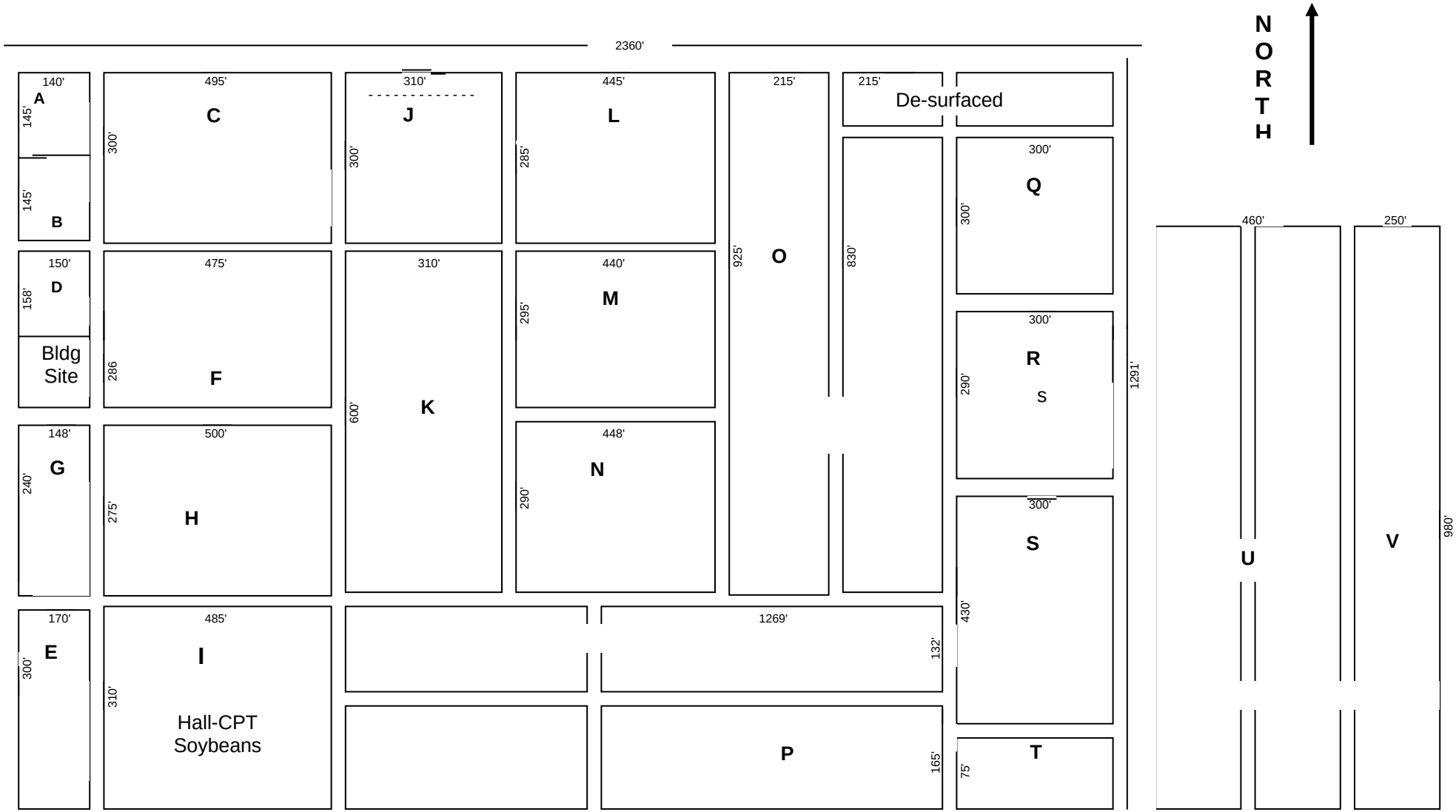


Northeast Research Station

Watertown, South Dakota

Plant Science Deptarment • South Dakota State University • Brookings, SD 57007

Northeast Research Station (Watertown)
2001 Land Use Plans



Plot Acreage:

A	0.49	H	3.15	O	9.57	V	5.5
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: 86
Experimental Acreage: 74

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2001
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* County Extension Educator
**SDSU Representatives

ANNUAL PROGRESS REPORT, 2001
Northeast Research Station

J. D. Smolik

The 2001 growing season was considerably longer than average (Table 1), and temperatures were generally seasonable. Precipitation was nearly five inches above average in April followed by near normal rainfall in May, June and July. August was very dry, September was near normal and October was below average. The total growing season precipitation (April-October) was about 1.5 inches above the long term average. Growing season precipitation over the past 46 years is summarized in Figure 1.

Growing conditions were generally favorable through July and all crops established and developed well. Small grain yields were well above levels of recent years. Spring wheat yields averaged 6 bushels above last year, oat yields were more than 20 bushels higher, and average barley yields were 32 bushels higher than in 2000. Adequate subsoil moisture reserves accompanied by timely rainfall through July aided the small grain crop. Also, with the exception of crown rust on oats, the incidence of foliar disease was light as were infection levels of Fusarium head blight (scab). Flax yields were slightly lower than the previous year.

The very dry August stressed the row crops, and both corn and soybean yields were reduced. Yield reductions were highest for the later maturing corn hybrids and the Group 1 soybeans.

Two tours were held in 2001. The summer tour included an overview of herbicide studies and updates on small grain varieties and small grain diseases. Other topics were soil fertility studies, biofuel potential of switchgrass, corn and soybean insects, and an update on bean pod mottle virus. The fall tour emphasized row crops and featured updates on herbicides, corn and soybean crop performance, soybean breeding, and row crop diseases. The performance of forage crops was also discussed. We thank the area Crop Improvement Associations for sponsoring the lunch following the summer tour. Thanks also to Orrin Korth and family for assistance with harvesting operations. We also thank Arlan Kannas for his assistance over the summer months.

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

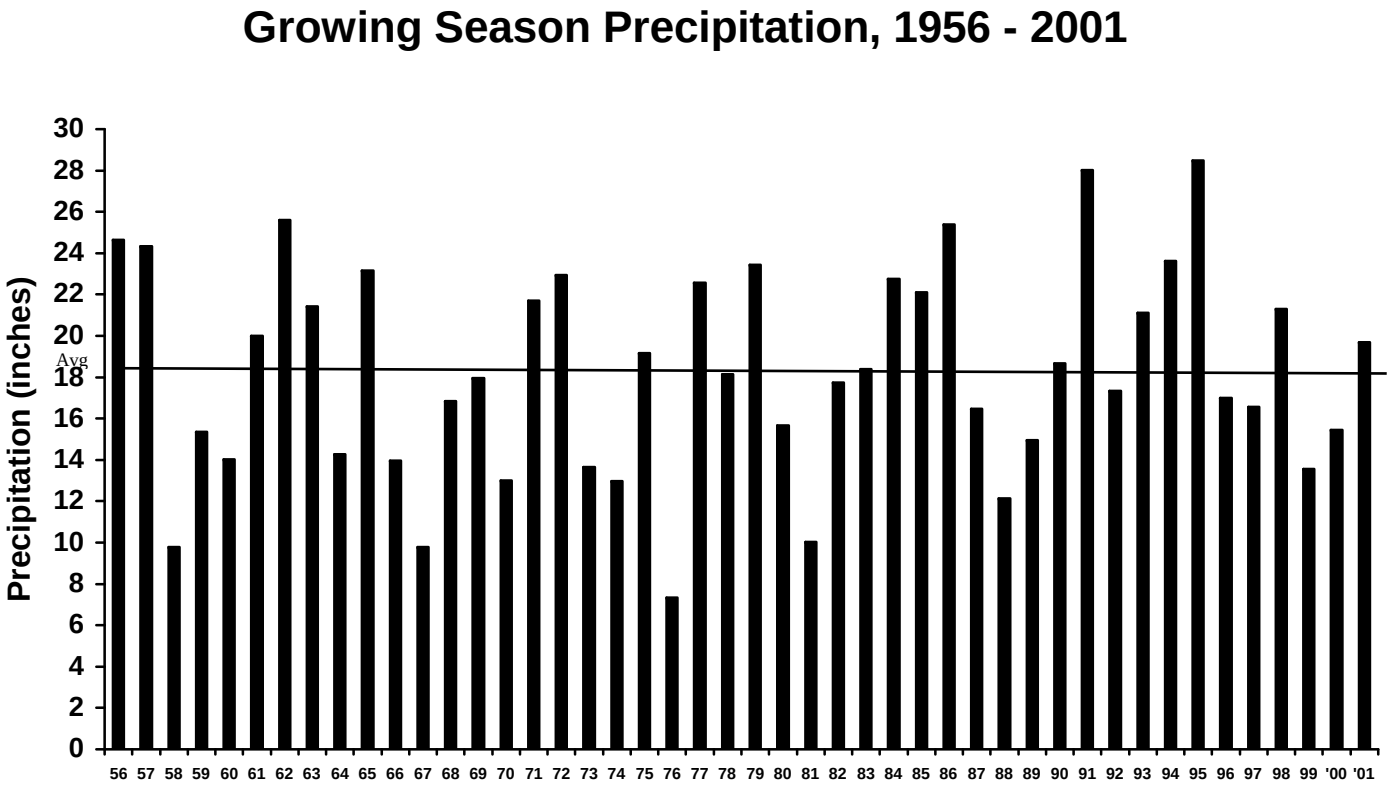
Special thanks to Lucinda Olson for her assistance in preparing this report.

Table 1. Growing Season Precipitation* (inches) 1956 - 2001

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	15.36	110
1960	1.53	3.84	4.05	0.79	1.03	1.30	1.50	14.04	123
1961	2.16	5.75	4.01	4.62	0.62	1.84	1.00	20.00	138
1962	1.39	5.48	3.98	10.36	1.89	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	0.69	4.58	1.05	1.13	1.06	0.35	9.78	129
1968	3.04	2.15	3.18	2.39	1.53	2.56	2.00	16.85	132
1969	1.52	3.44	1.96	4.52	2.48	1.86	2.18	17.96	109
1970	2.00	1.98	1.07	2.29	1.00	1.66	2.01	13.01	148
1971	1.33	1.78	7.61	1.02	2.93	1.46	5.56	21.69	168
1972	1.90	7.73	2.92	6.35	2.57	0.11	1.37	22.95	172
1973	1.14	2.87	1.12	2.05	1.27	3.81	1.39	13.65	183
1974	1.22	3.37	1.45	2.09	3.70	0.22	0.91	12.96	141
1975	4.15	2.18	4.76	1.25	2.89	2.28	1.64	19.15	139
1976	1.10	1.26	1.49	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	180
1978	3.38	5.15	2.26	2.08	2.43	2.32	0.53	18.15	178
1979	3.14	2.17	5.78	3.10	5.21	0.53	3.50	23.43	162
1980	0.43	3.09	4.97	1.96	3.82	0.72	0.68	15.67	150
1981	0.48	0.99	2.73	2.23	1.20	0.52	1.88	10.03	136
1982	0.35	5.50	1.37	4.05	0.64	2.73	3.11	17.75	175
1983	0.70	1.64	3.43	5.45	3.00	2.86	1.30	18.38	140
1984	2.88	1.66	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	4.64	3.62	4.14	3.11	4.19	0.13	25.38	159
1987	0.55	2.03	1.20	4.16	5.64	2.44	0.45	16.47	162
1988	0.59	2.76	0.69	0.86	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	146
1992	0.91	1.45	7.95	3.08	0.75	3.17	0.02	17.33	154
1993	1.69	2.53	6.58	6.70	1.40	2.05	0.17	21.12	149
1994	2.48	2.12	6.11	4.65	3.67	2.47	2.11	23.61	162
1995	2.92	3.66	2.89	8.05	6.09	2.45	2.43	28.49	152
1996	0.18	4.20	1.36	3.43	2.92	2.34	2.57	17.00	154
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
1999	1.45	2.57	4.96	1.56	0.49	2.29	0.25	13.57	165
2000	1.20	2.35	3.29	4.29	0.88	1.00	2.45	15.46	157
2001	6.96	2.75	3.94	2.85	0.18	2.35	0.67	19.70	165
Avg:	1.97	3.00	3.67	3.22	2.80	1.94	1.69	18.29	146

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

Figure 1.


Growing Season Precipitation, 1956 - 2001
Precipitation (inches)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Avg
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 99 '00 '01

2001 SMALL GRAIN VARIETY PERFORMANCE TRIALS

R. G. Hall, K. K. Kirby, and L. Hall

This is a report of the 2001 NE Research Farm performance trials hard red spring wheat, Durum wheat, oat, and barley varieties conducted by the South Dakota State University Crop Performance Testing (CPT) program. These trials were seeded and harvested by L. Hall, Research associate, SDSU Oat Breeding Project.

Experimental Procedures

Four replicates of each entry were seeded into plots measuring 5 X 20 feet and later cut back to a uniform dimension prior to harvest. A cone-drill seeder with a spinner directing seed to seven seed tubes spaced on 7-inch rows was used. The pure-live-seed for each entry was determined and all plots were seeded at 1.2 million PLS seeds per acre. Plots were seeded on April 25, 2001 into a Trent silt loam previously cropped to soybeans.

Measurements of Performance

Yield (bu/a) and bushel weight (lbs.) values are an average of four replicates. Yields are adjusted to 13.5% grain moisture (dry matter basis) and bushel weights of 60 (wheat), 32 (oats), or 48 lbs. (barley). Grain protein values are obtained from one sample per entry and are determined by NIRS methods. Yield, bushel weight and grain protein values are reported for year 2001 and for 3-years (1999-2001).

Performance results:

Hard red spring wheat yields in 2001 averaged 51 bu/a in Brookings, 65 bu/a at Watertown, 46 bu/a at Spink Co., and 62 bu/a at Brown Co. (Table 1a). At Brookings, Ember was the only entry in the top-yield group; while at Watertown there were 15 entries, at Spink Co. there were 11 entries, and at Brown Co. there were 5 entries in the top-yield group. Over the longer 3-year term there were a number of entries in the top-yield groups at Brookings, Watertown, and Brown Co. (Table 1a). As indicated in Table 1b, in 2001, the entries Alsen, Butte 86, Chris, Hanna, Ingot, Parshall, Reeder, SD3367, SD3506, and ND722 had above average protein values on a statewide basis. In addition, the entries Alsen, Ingot, Keystone, Knudson, SD3506, SD3546, and ND722 had above average bushel weight values. In yield performance on a statewide basis the entries Knudson, Norpro, Reeder, and SD3546 had top-yield percentages of 50% or higher. Likewise, the entries, Alsen, Butte 86, Ember, Forge, HJ98, Ingot, Ivan, Norpro, Oxen, Parshall, Reeder, Russ, Saxon, Walworth, and SD3367 had top-yield percentages of 50% or higher on a three-year average.

Oat yields in 2001 averaged 113 bu/a in Brookings, 101 bu/a at Watertown, 98 bu/a at Selby, and 106 bu/a at Brown Co. (Table 2a). At Brookings, Killdeer was the only entry in the top-yield group; while at Watertown there were two entries, at Selby there were 8 entries, and at Brown Co. there were 4 entries in the top-yield group. Over the longer 3-year term there were a number of entries in the top-yield groups at Brookings, Watertown, and Selby (Table 2a). As indicated in Table 2b, in 2001, the entries Hytest, Loyal, Paul (hulless), Riser, Settler, SD97039, SD97525, and SD97839 (hulless) had above average protein values on a statewide basis. In addition, the entries Hytest, Paul (hulless), and SD97839 (hulless) had above average bushel weight values. In yield performance on a statewide basis the entries Ebeltoft, Killdeer, SD96024, SD97250, and MN97239 had top-yield percentages of 50% or higher in 2001. Likewise, the entries, Don, Ebeltoft, Jerry, Loyal, Richard, Troy, and Youngs had top-yield percentages of 50% or higher on a three-year average. Note: Although Ebeltoft and

Youngs exhibited above average yield stability they are low in bushel weight on a statewide basis (Table2b).

Barley yields in 2001 averaged 86 bu/a in Brookings, 97 bu/a at Watertown, and 97 bu/a at Brown Co. (Table 3a). At Brookings there were three entries, at Watertown four entries, and at Brown Co. all 10 entries in the top-yield group. Over the longer 3-year term there were a number of entries in the top-yield groups at Brookings, Watertown, and Brown Co. (Table 3a). As indicated in Table 3b, in 2001, entries differed by only 1.5% average protein value on a statewide basis. In addition, the two-row barley entries, Conlon and Logan, had above average bushel weight values. In yield performance on a statewide basis the entries Conlon, Logan, Drummond, Excel, Lacey, Legacy, and Stander had top-yield percentages of 50% or higher. Likewise, the entries Conlon, Logan, Drummond, Excel, Foster, Lacey, Robust, and Stander had top-yield percentages of 50% or higher on a three-year average.

Table 1a. HRS wheat variety testing yield averages (1999-2001) at four locations.

Variety	Location: Brookings '01	Brookings 3-yr	Watertown '01	Watertown 3-yr	Spink Co. '01	Spink Co. 3-yr	Brown Co. '01	Brown Co. 3-yr
	bu/acre							
Alsen	43	45+	66	45+	45	.	71+	48+
Butte 86	45	46+	68+	50+	44	.	64	45+
Chris,CK	35	32	43	31	30	.	53	33
Ember	71+	54+	66	49+	37	.	66	48+
Forge	65	55+	67	50+	46	.	69+	50+
GM40002	37	.	57	.	41	.	47	.
GM40016	49	.	57	.	37	.	52	.
GM40019	57	.	61	.	51+	.	65	.
Hanna	51	.	63	.	48+	.	61	.
HJ98	45	39	65	45+	43	.	66	45+
Ingot	48	48+	70+	53+	42	.	60	45+
Ivan	60	50+	61	47+	44	.	54	42+
Keystone	45	.	67	.	46	.	63	.
Knudson	51	.	68+	.	49+	.	59	.
Norpro	53	47+	66	48+	55+	.	57	41
Oxen	39	45+	68+	48+	51+	.	61	45+
Parshall	63	51+	63	49+	43	.	63	45+
Reeder	56	48+	70+	52+	54+	.	63	47+
Russ	57	53+	67	51+	49+	.	65	50+
Saxon	48	43	68+	45+	48+	.	62	41
Walworth	49	50+	67	54+	40	.	50	46+
Experimental lines:								
SD3367	50	50+	70+	54+	47	.	60	50+
SD3496	42	.	70+	.	49+	.	65	.
SD3506	54	.	69+	.	47	.	65	.
SD3540	52	.	72+	.	52+	.	68+	.
SD3546	53	.	71+	.	50+	.	68+	.
ND722	54	.	64	.	46	.	68+	.
Test avg. :	51	47	65	48	46	.	62	45
LSD (5%) $:	6	10	4	9	7	.	4	8
CV (%) #:	8	9	5	6	11	.	4	7

\+ Entry is in top-yield group.
$ LSD (5%) - how much two yield values must differ to be significantly different.
\# A measure of experimental error; a value of 15% or less is best.

Table 1b. State-wide performance averages for HRS wheat entries - 2001.

Variety	Relative Heading day	2001 Protein pct	2001 Bushel Weight lb	2001 Ht. inch	Yield-bu/a '01	Yield-bu/a 3-yr	Top Yield Percentage '01	Top Yield Percentage 3-yr
Alsen	3	14.9+	62+	34	45	41	33	63+
Butte 86	0	14.1+	60	37	44	41	22	50+
Chris,CK	3	14.9+	59	41	36	31	0	13
Ember	1	13.1	61	35	49	45	22	100+
Forge	-1	13.4	61	37	50	46	44	100+
GM40002	-	13.5	59	33	39	.	0	-
GM40016	-	14.0	59	33	41	.	0	-
GM40019	-	13.4	60	30	48	.	33	-
Hanna	2	14.4+	60	39	44	.	11	-
HJ98	4	13.8	60	33	46	41	22	63+
Ingot	-1	14.3+	63+	38	45	43	22	88+
Ivan	5	13.3	61	32	47	44	44	100+
Keystone	2	13.5	62+	36	45	.	0	-
Knudson	2	13.6	62+	33	49	.	67+	-
Norpro	5	13.8	60	33	50	44	55+	75+
Oxen	2	13.9	60	33	46	44	44	100+
Parshall	4	14.4+	61	38	45	44	0	88+
Reeder	3	14.3+	61	36	50	45	67+	100+
Russ	2	13.8	60	38	48	45	22	100+
Saxon	5	13.9	59	35	47	42	44	75+
Walworth	3	14.0	60	35	44	45	11	100+
Experimental lines:								
SD3367	-	14.2+	61	36	45	45	11	88+
SD3496	-	13.8	61	36	45	.	22	-
SD3506	-	14.1+	62+	38	47	.	22	-
SD3540	-	13.7	61	36	49	.	44	-
SD3546	-	13.9	62+	37	49	.	55+	-
ND722	-	14.5+	62+	38	46	.	11	-
State test avg.:	-	14.0	61	36	46	43	-	-

\+ Above average performance.
* Percent of time a variety appears in the top-yield group across nine (2001) or eight (1999-2001) test sites when experimental error was low as indicated by C.V. values of 15% or less.

Table 2a. Oat variety testing yield averages (1999-2001) at four locations.

Variety	Location							
	Brookings		Watertown		Selby		Brown Co.	
	'01	3-yr	'01	3-yr	'01	3-yr	'01	3-yr
	bu/acre							
Don	111	108+	97	98+	90	121	106	.
Ebeltoft	100	111+	101	110+	111+	146+	133	.
Hytest	98	89	91	81	80	106	101	.
Jerry	131	117+	97	99+	85	132+	116	.
Killdeer	146+	.	99	.	115+	.	143+	.
Loyal	134	121+	113	108+	103	133+	147+	.
Paul Hls	53	64	58	61	53	73	85	.
Richard	97	99	101	92	115+	129+	131	.
Riser	83	88	120+	102+	74	97	94	.
Settler	126	114+	83	93	86	130+	108	.
Troy	124	114+	92	97+	121+	147+	118	.
Youngs	129	122+	106	113+	101	144+	129	.
Experimental lines:								
SD96024	133	.	128+	.	116+	.	150+	.
SD97039	126	.	114	.	116+	.	138	.
SD97250	130	.	117	.	114+	.	140	.
SD97525	112	.	109	.	86	.	111	.
SD97839-Hls	96	.	79	.	85	.	95	.
MN97239	112	.	117	.	117+	.	148+	.
Test avg. :	113	104	101	96	98	123	122	.
LSD (5%) $:	11	19	10	19	12	18	9	.
CV (%) #:	7	6	7	7	9	7	5	.

\+ Entry is in top-yield group.
$ LSD (5%) - how much two yield values must differ to be significantly different.
# A measure of experimental error; a value of 15% or less is best.

Table 2b. State-wide performance averages for oat entries - 2001.

Variety	Relative Heading day	2001 Protein pct	2001 Bushel Weight lb	2001 Ht. inch	Yield-bu/a '01	Yield-bu/a 3-yr	Top Yield Percentage '01	Top Yield Percentage 3-yr
Don	0	14.8	36	31	92	100+	0	60+
Ebeltoft	8	15.1	32L	32	100+	114+	50+	100+
Hytest	3	18.3+	39+	36	81	83	0	0
Jerry	4	16.2	37	34	94	105+	0	80+
Killdeer	5	14.2	35	32	110+	.	75+	-
Loyal	7	17.2+	36	37	104+	109+	13	100+
Paul Hls	6	21.0+	43+	37	59	66	0	0
Richard	3	15.8	34	36	99+	102+	25	60+
Riser	0	18.6+	37	31	83	88	13	20
Settler	4	17.3+	36	35	91	100+	0	40
Troy	6	16.4	35	36	97+	105+	13	80+
Youngs	8	15.7	33L	36	99+	109+	0	60+
Experimental lines:								
SD96024	-	16.7	36	36	113+	.	75+	-
SD97039	-	17.2+	37	36	103+	.	25	-
SD97250	-	15.0	37	33	109+	.	50+	-
SD97525	-	17.8+	37	36	92	.	0	-
SD97839 Hls	-	18.9+	43+	33	75	.	0	-
MN97239	-	15.5	34	35	104+	.	50+	-
State test avg.:	-	16.8	37	34	95	98	-	-

\+ Above average performance.
L One of the lowest bushel weight varieties under test.
* Percent of time a variety appears in the top-yield group across eight (2001) or five (1999-2001) test sites when experimental error was low as indicated by C.V. values of 15% or less.

Table 3a. Barley variety testing yield averages (1999-2001 at three locations.

Variety	Location: Brookings '01	Brookings 3-yr	Watertown '01	Watertown 3-yr	Brown Co. '01	Brown Co. 3-yr
	bu/acre					
Two-row types:						
Conlon	82	73	107+	81+	94+	76+
Logan	87	78+	104+	81+	96+	75+
Six-row types:						
Drummond	74	70	106+	74+	96+	76+
Excel	100+	84+	98	79+	98+	78+
Foster	86	81+	94	77+	98+	78+
Lacey	94+	83+	99+	82+	101+	77+
Legacy	95+	.	89	.	96+	.
Mnbrite	79	72	92	73+	94+	73+
Robust	87	77+	94	76+	92+	72+
Stander	82	69	83	69	101+	78+
Test avg. :	86	76	97	77	97	76
LSD (5%) $:	9	8	8	11	ns$$	ns
CV (%) #:	7	9	5	7	6	7

+ Entry is in top-yield group.
$ LSD (5%) - how much two yield values must differ to be significantly different.
$$ Differences within a column are not significant.
A measure of experimental error; a value of 15% or less is best.

Table 3b. State-wide performance averages for barley entries - 2001.

Variety	Relative Heading day	2001 Protein pct	2001 Bushel Weight lb	2001 Ht. inch	Yield-bu/a '01	Yield-bu/a 3-yr	Top Yield Percentage '01	Top Yield Percentage 3-yr
Two-row types:								
Conlon	0	12.1	50+	28	72	65	63+	88+
Logan	2	11.9	49+	29	76+	68+	88+	100+
Six-row types:								
Drummond	2	12.2	47	31	70	62	50+	50+
Excel	3	11.6	47	30	74+	67+	50+	75+
Foster	2	11.4	47	31	71	66	38	88+
Lacey	0	12.2	48	30	74+	69+	75+	100+
Legacy	2	12.0	47	31	74+	.	88+	-
Mnbrite	2	12.8	48	32	67	61	13	38
Robust	3	12.6	48	32	67	63	13	75+
Stander	3	12.0	47	30	72	64	63+	75+
State test avg.:-		12.1	48	30	72	66	-	-

+ Above average performance.
* Percent of time a variety appears in the top-yield group across eight (2001) or eight (1999-2001) test sites when experimental error was low as indicated by C.V. values of 15% or less.

2001 SOYBEAN VARIETY PERFORMANCE TRIALS

R. G. Hall and K. K. Kirby

This is a report of the 2001 NE Research Farm performance trials for both conventional (non-Roundup-Ready) and Roundup-Ready soybean varieties conducted by the South Dakota State University Crop Performance Testing (CPT) program.

Experimental Procedures

Entries from various seed companies were placed in either a maturity group-0 or group-I test trial according to maturity ratings indicated by the participating company. Three replications of each entry were seeded with a plot of each hybrid randomly located within each of three blocks. Plots consisted of two 30-inch rows, 20 feet long. A two-row cone drill seeder consisting of a 31-cell cone mounted above a maxi-merge unit for each row was used to seed all plots. Plots were seeded on May 26, 2001 at 165,000 pure-live-seed to obtain a final population of about 150,000 plants per acre following emergence. Soybean inoculation was accomplished by applying granular Nitragin brand Soybean Soil Implant down the seed tube, according to label, during seeding. Weed control in the conventional soybean trials consisted of Lasso (labeled directions) pre-emergence followed later by Poast/Harmony (labeled directions) post-emergence. Weed control in the Roundup Ready test consisted of an application of Roundup Ultra (32 oz/acre) when weeds were 4-5 inches tall followed by the same application again 21 days later.

Measurements of Performance

Yield values (bu/a) were adjusted to 13% moisture (dry-matter basis) and a bushel weight of 60 pounds. Yield, least significant difference (LSD), and minimum top-yield values printed at the bottom of each yield column are rounded off to the nearest whole bushel per acre. Protein and oil values are for the 2000 season. One replication of every variety was tested using near-infrared-reflectance-spectroscopy (NIRS). Plant height was measured in inches from the soil surface to the top node of the main stem. Lodging score values are an average of how erect the main stem of all the plants were at maturity within each variety. 1 = all plants erect, 2 = slight lodging, 3 = lodging at a 45 degree angle, 4 = severe lodging, and 5 = all plants flat.

Check for the "least significant difference" (LSD) value at the bottom of each yield column. These values indicate how much the yield average must differ between two varieties before there is a real yield difference. If there are no real differences among the yield values within a column then variety yield differences are non-significant (NS).

This value may be used to identify the top-yielding group (TYG) for each test trial. For example, in the conventional maturity group-0 trial (Table 1) the highest three-year yield were 44 bu/a for Mustang/M-0958 and Kruger/K-0999+. In order to determine whether it is the only top yielding variety use the LSD value of 4 bu/a at the bottom of the 3-yr yield column. In order for varieties to be in the TYG they must yield 40 bu/a (44 - 4 = 40) or higher. Technically, a yield of 41 bu/a would be in the TYG while a yield of 40 bu/a would not be in the TYG. However, since all yield and LSD values are rounded to the nearest whole number, we can say 40 bu/a, because of the rounding-off, is the more appropriate minimum value for top-yield varieties in this test. This value is indicated as the min. top-yield value at the bottom of each yield column. Top-yield varieties are those that are equal or higher than the minimum top-yield value indicated at the bottom of each yield column. In this case seven varieties are in the TYG for the three-year

yield column (Table1). The LSD values may also be used to determine whether two varieties differ in performance. If the yield difference between any two varieties exceeds the LSD value they differ significantly in yield. If their yield difference is equal to or less than the LSD value their yield difference is not significant.

Entries at each location are numerically sorted from highest to lowest yields according to whether they have been tested for a 3-year, 2-year, and 1-year time period. **Entries tested for three years may also have a top-yield group value in the 2yr (2000-01) and 2001 yield columns. Likewise, entries tested for two years may also have a top-yield group value in the 2001 yield column.**

TRIAL RESULTS - CONVENTIONAL NON-ROUNDUP READY SOYBEAN VARIETIES
Note: Yields are three-year (1999-01), two-year (2000-01), or one-year (2001).

Group- 0 (Table 1): Varieties had to average at least 40 bushels (three-year), 36 bushels (two-year), or 37 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the three-year, two-year, and one-year data include 7, 9, and 12 entries, respectively.

Group- I (Table 2): Varieties had to average at least 42 bushels (three-year), 34 bushels (two-year), or 36 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the three-year, two-year, and one-year data include 5, 12, and 8 entries, respectively.

TRIAL RESULTS - ROUNDUP READY SOYBEAN VARIETIES

Group- 0 (Table 3): There were no significant yield differences among the varieties tested for three years. Varieties had to average at least 36 bushels (two-year) or 36 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the two-year and one-year data include 18 and 27 entries, respectively.

Group- I (Table 4): There were no significant yield differences among the varieties tested for three years. Varieties had to average at least 35 bushels (two-year) or 36 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the two-year and one-year data include 14 and 10 entries, respectively.

Table 1. Watertown, maturity group-0 soybean test results, 1999-2001.
N.E. Research Farm, seeded May 26.

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
MUSTANG/M-0958	44	38	39	35.8	16.8	28	1	120
KRUGER/K-0999+	44	40	40	36.8	16.3	28	1	121
MUSTANG/M-0700	43	40	40	34.8	18.1	30	1	106
PUBLIC/SURGE,0-CK*	42	37	36	36.3	17.1	31	1	111
TOP FARM/TF6077	40	37	36	33.8	17.7	28	1	111
PUBLIC/MN 0901	40	36	36	35.9	16.4	28	1	115
PUBLIC/PARKER,I-CK*	40	34	38	35.7	16.4	35	2	122
PUBLIC/DAWSON	39	35	36	35.5	16.7	33	2	107
PUBLIC/SD96-702	39	35	35	34.4	17.1	30	1	113
PUBLIC/HENDRICKS	39	36	35	34.9	17.1	28	1	115
PUBLIC/LAMBERT	35	30	31	34.9	17.4	29	1	111
PUBLIC/MCCALL,00-CK*	32	29	28	35.0	16.0	30	2	102
	Entries tested two years							
KRUGER/K-1333+	.	38	39	35.3	17.0	30	1	122
TOP FARM/TF6101	.	36	35	33.7	17.0	29	1	118
	Entries tested one year							
KRUGER/K-0707	.	.	40	.	.	29	1	111
GOLD COUNTRY/WINDSOR	.	.	39	.	.	26	1	110
TOP FARM/E5051	.	.	39	.	.	30	2	112
MUSTANG/MP 08	.	.	38	.	.	31	1	110
KRUGER/K-1313	.	.	37	.	.	31	1	123
MUSTANG/E-0800	.	.	37	.	.	28	1	119
KRUGER/K-1111	.	.	37	.	.	27	1	123
Test average:	40	36	37	35.2	16.9	29	1	114
LSD(5%) value ($):	4	4	3					
Min.top-yield value ($):	40	36	37					
Coef. of variation (#):	6	6	5					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein & oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
# Measure of experimental error: values of < 15% are desired.

Table 2. Watertown, maturity group-I soybean test results, 1999-2001.
N.E. Research Farm, seeded May 26.

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
STINE/1386-6	45	37	37	35.7	16.6	29	1	122
KRUGER/K-1606	44	38	39	37.0	15.8	32	1	.
MUSTANG/M-1138	43	35	36	35.7	17.0	29	1	122
GOLD COUNTRY/BISCAY	43	37	38	36.4	16.4	30	1	121
PUBLIC/STRIDE	42	36	35	34.5	16.6	30	1	112
PUBLIC/SURGE,0-CK*	41	35	33	36.5	16.8	27	1	110
PUBLIC/PARKER,I-CK*	40	34	34	35.4	16.5	37	3	121
PUBLIC/STURDY,II-CK*	37	32	32	35.1	17.1	34	2	123
PUBLIC/BELL-SCN	35	30	30	35.3	17.3	28	1	124
	Entries tested two years							
KRUGER/K-1991	.	37	33	35.3	17.1	26	1	.
KRUGER/K-1919	.	36	34	35.0	16.9	28	1	.
KRUGER/K-1515	.	36	34	35.8	16.3	30	1	122
MUSTANG/M-1172	.	35	35	35.8	16.8	30	1	122
TOP FARM/TF6161	.	34	34	35.8	16.8	28	1	123
TOP FARM/TF6197	.	32	32	34.7	16.3	31	1	.
	Entries tested one year							
KRUGER/K-1808	.	.	38	.	.	29	1	124
PRAIRIE BR./PB172	.	.	37	.	.	30	1	.
LG SEEDS/C 9148	.	.	36	.	.	29	1	122
KRUGER/K-1909	.	.	36	.	.	33	1	.
PUBLIC/SD96-111(L)	.	.	36	.	.	35	1	120
PUBLIC/SD96-460K(D)	.	.	34	.	.	31	1	.
PUBLIC/SD96-111(D)	.	.	33	.	.	34	1	120
KRUGER/K-1818	.	.	33	.	.	30	1	.
PRAIRIE BR./PB194	.	.	33	.	.	30	1	.
US SEEDS/US E131	.	.	32	.	.	25	1	117
PUBLIC/SD96-460K(L)	.	.	32	.	.	30	1	.
PRAIRIE BR./PB171	.	.	32	.	.	27	1	123
US SEEDS/US S199	.	.	31	.	.	29	1	.
KRUGER/K-1809	.	.	30	.	.	26	1	.
KRUGER/K-1888	.	.	29	.	.	27	1	.
Test average:	41	35	34	35.6	16.7	30	1	120
LSD(5%) value ($):	3	4	3					
Min.top-yield value ($):	42	34	36					
Coef. of variation (#):	5	5	6					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein & oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
# Measure of experimental error: values of < 15% are desired.

Table 3. Watertown, maturity group-0 Roundup Ready soybean test results, 1999-2001, N.E. Research Farm, seeded May 26.

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
US SEEDS/US S0909RR	45	38	39	34.7	16.8	30	1	114
KRUGER/K-099+RR	45	39	39	35.4	17.1	30	1	111
MUSTANG/M-091RR	44	37	37	34.9	16.5	31	1	108
GOLDEN HARVEST/H0979RR	44	38	36	34.5	16.9	29	1	109
STINE/0990-4	44	39	41	35.4	16.5	31	1	112
PRAIRIE BRAND/PB0920RR	44	39	39	35.3	16.8	31	1	109
ASGROW/AG0801	44	40	41	33.9	17.7	36	1	108
WENSMAN/W 2098RR	44	38	38	34.8	16.5	28	1	108
PRAIRIE BRAND/PB1030RR	44	39	36	34.8	16.9	29	1	111
DEN BESTEN/DB0900RR	43	36	36	34.5	16.6	29	1	107
KRUGER/K-090RR	42	38	35	35.1	16.5	28	1	109
MUSTANG/M-079RR	42	37	36	34.6	16.6	30	1	109
SODAK GENETICS/SD1091R	41	35	34	36.2	17.1	32	1	111
	Entries tested two years							
STINE/0700-4	.	38	36	35.1	17.2	28	1	109
GOLD COUNTRY/2110RR	.	37	36	34.9	17.1	29	1	113
MUSTANG/M-082RR	.	37	38	34.1	17.2	29	1	110
KRUGER/K-133RR	.	37	36	35.4	16.4	30	1	119
GOLD COUNTRY/2109RR	.	36	37	34.5	16.7	29	1	109
WENSMAN/W 2100RR	.	36	34	34.9	17.1	29	1	114
DEN BESTEN/DB1102RR	.	35	34	34.3	16.7	28	1	115
DEN BESTEN/DB0802RR	.	35	33	33.8	17.4	27	1	108
MIDWEST SEED/GR0945	.	35	33	34.6	16.8	28	1	110
PRAIRIE BRAND/PB0550RR	.	34	31	35.0	17.3	31	1	110
PUBLIC/SD99-002R	.	33	33	34.6	16.9	37	1	117
PRAIRIE BRAND/PB0810RR	.	32	29	34.4	17.0	26	1	109
PUBLIC/SD99-001R	.	32	32	36.0	16.0	27	1	116
	Entries tested one year							
STINE/0806-4	.	.	42	.	.	31	1	117
NORTHSTAR/NS 0954RR	.	.	41	.	.	31	1	115
KRUGER/K-091-1RR	.	.	40	.	.	29	1	109
NORTHSTAR/NS 0923RR	.	.	39	.	.	30	1	112
BIO GENE/BG080RR	.	.	39	.	.	27	1	109
DEKALB/DKB10-51	.	.	38	.	.	33	1	112
LATHAM/EX-067RR	.	.	37	.	.	31	1	115
KRUGER/K-122RR	.	.	37	.	.	34	2	116
LG SEEDS/C 9093RR	.	.	36	.	.	31	1	110
MUSTANG/M-051RR	.	.	36	.	.	30	1	109
SANDS/SOI 0909RR	.	.	36	.	.	30	1	112
PRAIRIE BRAND/PB0561RR	.	.	35	.	.	29	1	110
LATHAM/EX-087RR	.	.	35	.	.	30	1	113
DEKALB/DKB09-51	.	.	35	.	.	29	1	113
KAYSTAR/K-0960RR	.	.	35	.	.	26	1	111

Table 3. Watertown, maturity group-0 Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
MALLARD/RRX0912	.	.	34	.	.	27	1	112
KRUGER/K-077-1RR	.	.	34	.	.	27	1	109
LATHAM/EX-097RR	.	.	34	.	.	34	1	112
KRUGER/K-121RR	.	.	34	.	.	27	1	116
DAIRYLAND/DSR-075/RR	.	.	34	.	.	31	1	113
KRUGER/K-077-2RR	.	.	33	.	.	26	1	110
CROWS/C0904R	.	.	33	.	.	28	1	112
PUBLIC/SD99-011R	.	.	33	.	.	32	1	123
PUBLIC/SD99-010R	.	.	33	.	.	28	1	116
DAIRYLAND/DSR-101/RR	.	.	33	.	.	30	1	116
GOLD COUNTRY/4107RR	.	.	32	.	.	31	1	119
MUSTANG/M-093RR	.	.	32	.	.	28	1	113
MUSTANG/M-052RR	.	.	32	.	.	30	1	109
GOLD COUNTRY/6208RR	.	.	32	.	.	27	1	109
PRAIRIE BRAND/PB0941RR	.	.	31	.	.	30	1	110
PUBLIC/SD99-013R	.	.	31	.	.	37	2	116
KRUGER/K-080-1RR	.	.	31	.	.	28	1	110
KRUGER/K-088RR	.	.	31	.	.	31	1	113
SEEDS 2000/2110RR	.	.	31	.	.	32	1	120
SEEDS 2000/2070RR	.	.	30	.	.	33	1	108
PUBLIC/SD99-003R	.	.	30	.	.	32	1	110
PUBLIC/SD99-009R	.	.	30	.	.	34	1	109
LATHAM/EX-107RR	.	.	30	.	.	33	1	115
SANDS/SOI 0820RR	.	.	29	.	.	25	1	108
LATHAM/EX-077RR	.	.	29	.	.	25	1	113
PUBLIC/SD99-061R	.	.	28	.	.	36	1	122
PUBLIC/SD92-1233T	.	.	27	.	.	29	1	115
MIDWEST SEED/GR0525	.	.	27	.	.	35	2	106
PRAIRIE BRAND/PB0621RR	.	.	12	.	.	28	1	110
Test average:	44	36	34	34.8	16.9	30	1	112
LSD(5%) value ($):	NS	4	6					
Min.top-yield value ($):	41	36	36					
Coef. of variation (#):	6	7	10					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein and oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
Measure of experimental error: values of < 15% are desired.

Table 4. Watertown, maturity group-I Roundup Ready soybean test results, 1999-2001, N.E. Research Farm, seeded May 26.

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
ASGROW/AG1301	41	37	34	34.7	17.3	30	1	115
KRUGER/K-180RR	40	34	28	34.3	17.4	26	1	123
GOLD COUNTRY/6016RR	38	34	32	34.2	16.4	35	2	121
GOLDEN HARVEST/H1565RR	38	34	33	33.2	16.8	33	1	119
KRUGER/K-222+RR	37	30	26	34.9	16.8	30	1	124
PRAIRIE BRAND/PB1620RR	36	32	30	33.0	16.5	34	1	120
MUSTANG/M-151RR	36	32	30	33.2	16.7	34	1	120
	Entries tested two years							
DEKALB/DKB16-51	.	39	41	35.1	16.9	33	1	122
MALLARD/RR1011	.	38	37	34.8	16.9	31	1	111
MUSTANG/M-132RR	.	36	34	34.7	16.9	31	1	119
MUSTANG/M-142RR	.	36	36	34.3	16.4	29	1	116
PRAIRIE BRAND/PB1540RR	.	36	34	35.4	16.5	30	1	119
PRAIRIE BRAND/PB1246RR	.	36	35	35.1	16.4	31	1	118
ZILLER/BT 7150R	.	36	34	34.0	16.5	35	1	120
ZILLER/BT 7101R	.	35	34	34.5	17.2	31	1	110
DEN BESTEN/DB1202RR	.	35	33	35.2	16.9	33	1	118
KRUGER/K-166RR	.	35	34	33.6	16.7	35	1	121
DAIRYLAND/DSR-130/RR	.	35	36	34.7	16.8	31	1	115
MUSTANG/M-152RR	.	35	33	35.8	16.3	32	1	119
ASGROW/AG1602	.	35	34	34.0	16.8	31	1	118
DEN BESTEN/DB1301RR	.	34	31	34.0	16.7	28	1	116
WENSMAN/W 2160RR	.	33	32	33.5	17.0	34	1	119
KRUGER/K-211ARR	.	33	30	33.5	17.0	31	1	.
TOP FARM/TF6149RR	.	33	33	35.7	16.3	33	1	118
DEKALB/DKB19-51	.	33	31	34.2	17.3	30	1	122
TOP FARM/E1971RR	.	33	30	34.3	17.3	28	1	124
DEN BESTEN/DB1601RR	.	31	27	34.5	16.7	30	1	123
MIDWEST SEED/GR1100	.	31	28	34.8	16.8	33	1	110
TOP FARM/TF6179RR	.	29	27	35.1	17.0	33	1	121
PUBLIC/SD99-048R	.	29	28	33.9	17.0	36	1	121
	Entries tested one year							
HY-VIGOR/H-174RR	.	.	41	.	.	28	1	121
PIONEER/90B93	.	.	38	.	.	31	1	109
KRUGER/K-212-2RR	.	.	37	.	.	28	1	.
DEN BESTEN/DB1502RR	.	.	37	.	.	35	1	117
WENSMAN/W 2153RR	.	.	37	.	.	33	1	118
CROWS/C1530R	.	.	36	.	.	32	1	118
KRUGER/K-155RR	.	.	35	.	.	31	1	119
PIONEER/91B64	.	.	35	.	.	31	1	116
WENSMAN/W 2131RR	.	.	35	.	.	31	2	120
NORTHSTAR/NS 1103RR	.	.	35	.	.	35	1	114

Table 4. Watertown, maturity group-I Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/a (13% moisture) 3yr	2yr	2001	2000 Prot. pct+	2000 Oil pct+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
NORTHSTAR/NS 1505RR	.	.	35	.	.	31	1	120
BIO GENE/BG120RR	.	.	35	.	.	29	1	115
DEN BESTEN/DB1902RR	.	.	35	.	.	27	1	.
LG SEEDS/C 1432RR	.	.	34	.	.	31	1	114
MALLARD/RR1511	.	.	34	.	.	32	1	119
MALLARD/RRX1312	.	.	33	.	.	31	1	118
PRAIRIE BRAND/PB1241RR	.	.	33	.	.	28	1	115
NORTHSTAR/NS 1624RR	.	.	33	.	.	35	1	120
GOLD COUNTRY/2213RR	.	.	33	.	.	31	1	118
KRUGER/K-221RR	.	.	32	.	.	28	1	.
STINE/1303-4	.	.	32	.	.	28	1	116
KRUGER/K-212RR	.	.	32	.	.	32	1	.
GREAT LAKES/GL1501RR	.	.	32	.	.	31	1	120
PRAIRIE BRAND/PB1981RR	.	.	31	.	.	29	1	.
SANDS/SOI 140RR	.	.	31	.	.	37	1	115
PRAIRIE BRAND/PB1721RR	.	.	31	.	.	29	1	.
KRUGER/K-161RR	.	.	31	.	.	29	1	124
MUSTANG/M-101RR	.	.	30	.	.	27	1	112
KRUGER/K-181RR	.	.	30	.	.	29	1	.
KRUGER/K-232-2RR	.	.	30	.	.	31	1	.
PRAIRIE BRAND/PB1781RR	.	.	30	.	.	30	1	124
PUBLIC/SD93-828RR	.	.	30	.	.	35	1	122
PUBLIC/SD99-022R	.	.	29	.	.	39	1	122
PRAIRIE BRAND/PB1561RR	.	.	29	.	.	27	1	122
PUBLIC/SD99-051R	.	.	29	.	.	37	1	121
DAIRYLAND/DSR-151/RR	.	.	29	.	.	29	1	120
DEN BESTEN/DB1802RR	.	.	28	.	.	28	1	123
DAIRYLAND/DSR-181/RR	.	.	28	.	.	31	1	.
KRUGER/K-202-1RR	.	.	28	.	.	29	1	.
NORTHSTAR/NS 1706RR	.	.	28	.	.	27	1	.
PUBLIC/SD99-024R	.	.	28	.	.	30	1	123
PRAIRIE BRAND/PB1521RR	.	.	28	.	.	27	1	121
TOP FARM/E1901RR	.	.	27	.	.	29	1	.
PUBLIC/SD99-053R	.	.	27	.	.	39	2	121
MUSTANG/M-171RR	.	.	27	.	.	28	1	.
KRUGER/K-151RR	.	.	26	.	.	30	1	123
PUBLIC/SD99-058R	.	.	25	.	.	38	2	122
KRUGER/K-151-1RR	.	.	24	.	.	28	1	122
Test average:	38	34	32	34.4	16.8	31	1	119
LSD(5%) value ($):	NS	4	5					
Min.top-yield value ($):	36	35	36					
Coef. of variation (#):	7	8	9					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein and oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
Measure of experimental error: values of < 15% are desired.

2001 CORN HYBRID PERFORMANCE TRIALS

R. G. Hall and K. K. Kirby

This is a report of the 2001 NE Research Farm performance trials for conventional corn hybrids conducted by the South Dakota State University Crop Performance Testing (CPT) program.

Experimental Procedures

Entries were placed into either early or late maturity trials. The arbitrary relative maturity break between the early and late test was 95-day. Each hybrid was randomly seeded in each of three blocks (three replications or plots) arranged in a randomized complete block design. Plots consisted of two 30-inch rows, 20 feet long. A two-row cone drill seeder consisting of a 31-cell cone mounted above a maxi-merge unit for each row was used to seed all plots. Plots were over-seeded 15% and following emergence thinned to a test population of 27,878 plants per acre. Plots were seeded on May 2, 2001 into a Brookings silty clay loam previously cropped to oats. A starter fertilizer of 100 pounds/acre of 37-18-00 was applied 2" below and to the side (2 x 2) of the seed row. Force insecticide was T-banded at label rates for corn rootworm control. A pre-emergence application of Lasso/Bladex at recommended rates was done shortly after planting.

Measurements of Performance

Yield values (bu/a) are reported at 15.5% moisture (dry-matter basis) and a 56 pound bushel weight. Moisture values are the percent of moisture in the shelled corn.

Check the "least significant difference" (LSD) value at the bottom of each yield column. This value may be used to identify the top-yielding group (TYG) for each test trial. For example, in the early maturity trial (Table 1) the highest 2001 yield was 160 bu/a for Dahlco/DS X-9963. In order to determine whether it is the only top yielding hybrid use the LSD value of 17 bu/a at the bottom of the 2001 yield column. In order for hybrids to be in the TYG they must yield 143 bu/a (160 - 17 = 143) or higher. Technically, a yield of 144 bu/a would be in the TYG while a yield of 143 bu/a would not be in the TYG. However, since all yields and LSD values are rounded to the nearest whole number. We can say 143 bu/a, because of the rounding-off, is the more appropriate minimum value for top-yield hybrids in this test. This value is indicated as the min. top-yield value at the bottom of the 2001 yield column. Top-yield hybrids for 2001 are those hybrids that are equal or higher than the minimum top-yield value. In this case there are 11 hybrids in the TYG.

Similarly, the top-group for other performance factors like bushel weight, grain moisture at harvest, green snap percentage, and stalk lodging below the ear percentage can be determined. For example, in the early maturity test (Table 1), the minimum bushel weight value to qualify for the top-group was 58 lbs. Bushel weights of 58 lbs. or higher are in the top-group for bushel weight. Note that yield and bushel weight values needed to qualify for the top-group are reported as a minimum top-group value. In contrast, the grain moisture, green snap, and lodging below the ear percentage values needed to qualify for the top-group are reported as a maximum top-group value. In other words, yield and bushel weight top-group values must exceed a certain value while grain moisture, green snap, and lodging below ear percentages must be equal to or less than certain values to qualify for the top-group depending on the

performance factor being considered. In the early maturity test (Table 1), current year yields must equal 143 bu/a or higher, bushel weight must equal 58 lbs. or higher, grain moisture must be 15% or lower, and stalk lodging below the ear must equal 1% or lower to be in the top-group for these performance factors in Table 1.

The LSD values may also be used to determine whether two hybrids differ in performance. If the yield difference between any two hybrids exceeds the LSD value they differ significantly in yield. If their yield difference is equal to or less than the LSD value their yield difference is not significant.

RESULTS - for two years (2000-01) and one year (2001)

The performance trial results for two years (2000-01) and one year (2001) are summarized below: Note: Green snap was non-significant (NS) among hybrids in 2001.

Early Maturity Trial (Table 1), 34 hybrid entries. The 2-year yield average was 135 bu/a; but differences among hybrids could not be determined because the relative yield ranking in 2000 was much different from the ranking in 2001. The 2001 average was 139 bu/a, hybrids had to average 143 bu/a or higher to be in the top-yield group, 11 hybrids qualified for the top-yield group, and hybrids had to differ by 17 bu/a to be significantly different in yield. In addition, bushel weight had to equal 58 lbs. or higher (13 hybrids), grain moisture had to equal 15% or less (23 hybrids), and stalk lodging below the ear had to equal 1% or less (31 hybrids) to be in the top-group for these factors.

Late Maturity Trial (Table 2), 52 hybrid entries. The 2-year average was 122 bu/a, hybrids had to average 120 bu/a or higher to be in the top-yield group, 7 hybrids qualified for the top-yield group and hybrids had to differ by 16 bu/a to be significantly different in yield. The 2001 average was 120 bu/a, hybrids had to average 131 bu/a or higher to be in the top-yield group, 10 hybrids qualified for the top-yield group, and hybrids had to differ by 14 bu/a to be significantly different in yield. In addition, bushel weight had to equal 57 lbs. or higher (12 hybrids) and grain moisture had to equal 14% or less (18 hybrids) to be in the top-group for these factors. Stalk lodging was non-significant.

Table 1. Watertown early corn hybrid results, 2000-2001.
NE Research Farm, test relative maturity is 95-day or less.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	Yield - bu/a (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. pct	2001 Green snap pct	2001 Lodged below ear pct
		Entries tested two years					
KRUGER/EX-96	92	148	142	57	17	0	0
DEKALB/DKC42-22	92	142	156	59	16	0	2
TOP FARM/TFSX 2295	95	138	146	56	14	0	0
MUSTANG/3090	90	137	142	57	15	0	1
MUSTANG/402	95	137	147	58	16	0	0
EPLEY/E1027	87	136	148	59	14	0	0
GARST/8801IT	95	136	145	57	16	0	0
WENSMAN/MAX 007	93	132	131	58	16	0	0
WENSMAN/W 5258 BT	94	132	140	60	15	0	0
NC+/1320	95	131	142	57	14	0	2
DEKALB/DKC39-45	89	131	132	59	15	0	0
WENSMAN/MAX 127	95	123	122	60	16	0	0
		Entries tested one year					
DAHLCO/DS X-9963	95	.	160	57	18	0	1
MIDWEST/G 6961	95	.	156	58	17	0	2
DEKALB/DKC44-42	94	.	154	56	15	0	1
CROWS/171	95	.	154	57	15	0	1
WENSMAN/W 4212	95	.	149	57	18	0	0
KRUGER/EX-092BT	89	.	148	59	15	0	0
GOLD COUNTRY/X60094	94	.	141	57	17	0	0
RAGT/PG005	89	.	137	58	14	0	0
DAHLCO/DS 2286	83	.	136	58	14	0	0
GARST/N9946	89	.	135	56	15	0	0
WENSMAN/W 4152	90	.	135	59	15	0	0
WENSMAN/W 4164	93	.	135	59	15	0	1
DAIRYLAND/STEALTH-1089B	90	.	133	58	15	0	0
DAIRYLAND/STEALTH-1592	92	.	133	59	15	0	0
KAYSTAR/X0941	94	.	132	59	14	0	0

Table 1. continued Watertown early corn hybrid results, 2000-2001.
NE Research Farm, test relative maturity is 95-day or less.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	Yield - bu/a (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. pct	2001 Green snap pct	2001 Lodged below ear pct
			Entries tested one year				
KAYSTAR/X1921	92	.	131	56	14	0	0
LG SEEDS/LG 2474	95	.	131	56	14	0	1
TOP FARM/TFSX 2390	90	.	130	57	14	0	0
DAHLCO/DS X-0851	85	.	130	59	15	0	0
MYCOGEN/2720 BT	91	.	129	60	15	0	0
MYCOGEN/2395	95	.	126	60	17	0	1
MUSTANG/3103BT	93	.	106	56	14	0	0
Test average:		135	139	58	15	0	0
LSD (5%) values:		NS**	17	2	1	NS	1
Top-group values*- Minimum:		.	143	58			
Maximum:					15	0	1
No. entries in top group:		.	11	13	23	34	31
Coef. of variation#:		8	7				

* Top group value- within one LSD value of the highest yield or bushel weight values or the lowest grain moisture, green snap or lodging percentage values.
** Ranking of hybrid yields in 2000 was so different from those in 2001 (a significant year effect) that two-year yield differences could not be detected (hybrid effect for two-year yields was not significant).
NS indicates values within a column are not significantly different.
Measure of experimental error: values less than 15% are desired.

Table 2. Watertown late corn hybrid results, 2000-2001.
NE Research Farm, test relative maturity is 96-day or more.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	Yield - bu/a (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. pct	2001 Green snap pct	2001 Lodged below ear pct
		Entries tested two years					
DEKALB/DKC46-26	96	136	132	58	16	0	0
US SEEDS/US C969	96	127	111	54	15	0	0
KRUGER/K-9903BT	99	126	127	57	14	0	0
MYCOGEN/2525	100	125	117	55	15	0	0
KRUGER/K-9802BT	99	124	121	56	19	0	0
US SEEDS/US C971CL	97	124	118	54	14	0	0
EPLEY/E1160	98	123	124	55	14	0	1
TOP FARM/TFSX 2201	100	119	110	55	14	0	0
LG SEEDS/LG 2488	99	119	114	57	15	0	0
EPLEY/E1470BT	102	115	112	55	18	0	0
SEEDS 2000/2981	98	113	114	53	14	0	1
TOP FARM/TFSX 2299	100	109	106	57	16	0	0
		Entries tested one year					
MYCOGEN/4521 BT	108	.	145	56	14	0	0
CROWS/217 B	100	.	137	56	14	0	0
DEKALB/DKC50-72	100	.	136	57	16	0	0
MYCOGEN/3611	100	.	134	55	15	0	0
DEKALB/DKC48-15	98	.	132	57	16	0	0
KRUGER/K-9203	100	.	132	53	14	0	0
SEEDS 2000/EX2953	99	.	131	56	16	0	0
WENSMAN/W 4314	102	.	131	54	14	0	1
MUSTANG/4747	97	.	131	54	15	0	0
GARST/8779	99	.	130	56	14	0	0
KRUGER/K-9201	98	.	129	56	14	0	1
MIDWEST/G 6966 B	96	.	129	55	16	0	0
KRUGER/K-9206	102	.	128	55	20	0	1
MIDWEST/G 7101 B	100	.	126	57	14	0	1
WENSMAN/W 4388	105	.	125	55	15	0	0
MYCOGEN/2545 IMI	101	.	125	56	17	0	0
NC+/1551B	98	.	124	54	14	0	1
GARST/N9708	100	.	124	53	14	0	0
GOLD COUNTRY/X49896	96	.	124	55	15	0	0
RAGT/PG006	98	.	124	57	18	0	1
KRUGER/K-9203A	100	.	124	55	18	0	0
DAIRYLAND/STEALTH-1598	98	.	120	55	14	0	0
EPLEY/E1493	103	.	118	55	20	0	0
EPLEY/E1170	96	.	117	56	14	0	0
KRUGER/K-9204BT	100	.	116	56	19	0	0

Table 2. Watertown late hybrid results (continued).

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	Yield - bu/a (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. pct	2001 Green snap pct	2001 Lodged below ear pct
		Entries tested one year					
WENSMAN/W 4284	100	.	115	56	15	0	0
HOEGEMEYER/2590	96	.	114	55	16	0	0
DEKALB/DKC51-88	101	.	114	56	18	0	0
TOP FARM/TFSX 2297	97	.	113	55	15	0	0
GOLD COUNTRY/9803	98	.	113	57	17	0	1
PFISTER/1532	98	.	112	57	16	0	0
TOP FARM/TFSX 2301	100	.	110	55	14	0	1
HOEGEMEYER/598CL	96	.	110	53	22	0	0
MUSTANG/5151	100	.	108	56	18	0	0
KAYSTAR/X1961	96	.	107	54	13	0	0
PFISTER/1680	99	.	107	56	17	0	0
MYCOGEN/3631IMI	101	.	106	58	16	0	0
TOP FARM/TFSX 2300	102	.	106	55	20	0	0
KRUGER/EX-203-1	100	.	105	56	16	0	0
KRUGER/K-9104BT	100	.	103	57	17	0	0
Test average:		122	120	55	16	0	0
LSD (5%) values:		16	14	1	1	NS	NS
Top-group values*- Minimum:		120	131	57			
Maximum:					14	0	1
No. entries in top group:		7	10	12	18	52	52
Coef. of variation#:		6	7				

* Top group value- within one LSD value of the highest yield or bushel weight values or the lowest grain moisture, green snap or lodging percentage values.
NS indicates values within a column are not significantly different.
Measure of experimental error: values less than 15% are desired.

Corn Date of Planting at Brookings

R.G. Hall and K.K. Kirby

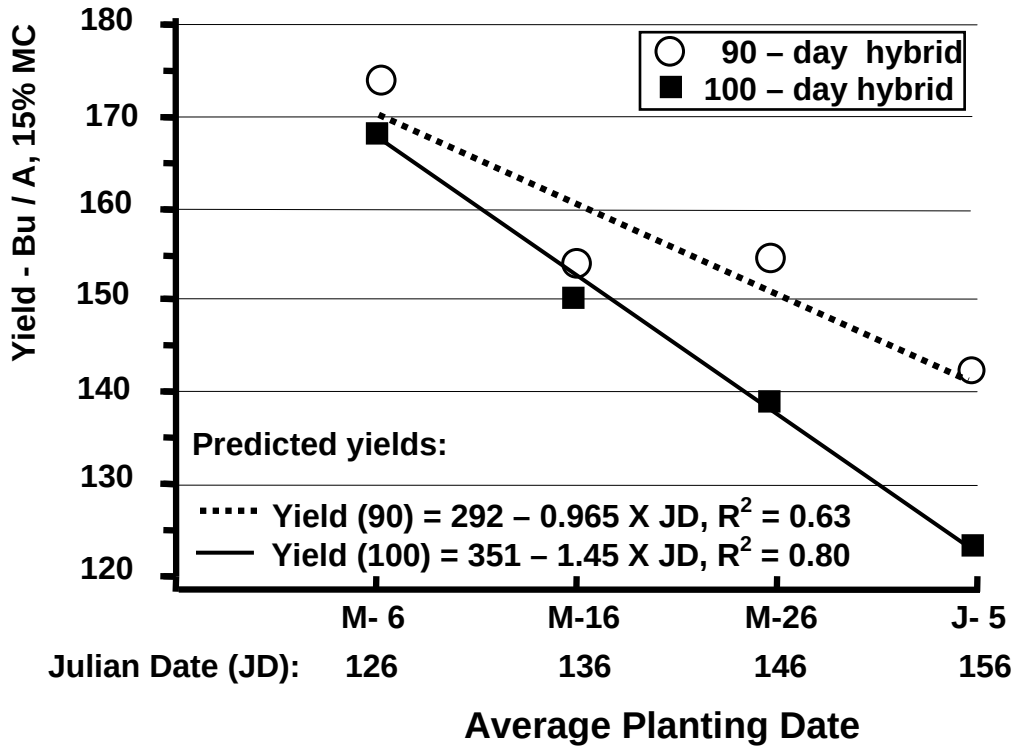
Introduction: It is well documented that corn hybrids that differ in relative maturity may also differ in their response to planting date. The purpose of this study was to determine the yield response of corn hybrids to planting date at Brookings, SD.

Methods: Two corn hybrids with relative maturity ratings of 90-day and 100-day were seeded adjacent to the SDSU Crop Performance Testing Program corn hybrid trials in 2001. Each hybrid was seeded in four-row plots, spaced 30-inches apart, and 20 feet long. The center two rows were harvested for yield. Experimental design was a strip-split-plot, with planting date and the two hybrids as strips. The experiment was replicated seven times. Plots were seeded with a two-row cone drill seeder with a 31-cell cone mounted above a maxi-merge unit for each row. Plots were seeded at 27,878 plants per acre with a 100 lb. per acre of starter fertilizer (37-18-00) placed 2-inches below and to the side (2 x 2) of the seed row. Force insecticide was T-banded at label rates for corn rootworm control. Weed control consisted of Lasso/Bladex applied pre-emergence shortly after planting. Planting date started on May 6 and was completed at 10-day intervals until the last date on June 5, 2001.

Results and Discussion: The average yield for each corn hybrid at each planting date (May 6, May 16, May 26, and June 5) is indicated in Fig. 1. Data analysis indicated there was a significant hybrid (relative maturity) X planting date interaction at the 0.05 level of probability. The May 6 planting date resulted in the highest yields from both hybrids; however, the yield difference of 5 bushels per acre between the hybrids was not significant. When planted 10 days later on May 16, both hybrids significantly dropped in yield by 18-19 bushels per acre. Again, yields differences between the two hybrids on May 16 were not significant. In both hybrids the yield reduction from May 6 to May 16 was about 1.8 bushel per acre per day. At the May 26 planting date the response of the two hybrids to planting date was different. The 90-day hybrid increased in yield one bushel and was not significantly different from the May 16 planting date. In contrast, the 100-day hybrid responded with another significant yield reduction of 11 bushels/acre. On May 26, the yield difference of 15 bushel/acre, between the two hybrids was significant. On the last planting date, both hybrids significantly dropped in yield again. On the last planting date of June 5, the 90-day and 100-day hybrids yielded 141 and 123 bushels/acre, respectively, and the yield difference was significant. During the May 16 to June 5 seeding dates the hybrids differed in the rate yield was lost as the result of delayed planting. The 90-day hybrid lost 12 bushels or about 0.6 bushels per acre per day. In contrast the 100-day hybrids lost 27 bushels during this same period at a rate of about 1.35 bushels per acre per day. These results follow the generally accepted fact that long season compared to short hybrids pay a higher penalty from late planting. Statistical regression and correlation

methods were used to predict or model the yield response of both hybrids over the four planting dates (Fig 2). The 90-day hybrid lost 1.0 bushel/acre/day from May 6 to June 5, 2001 as described by the model equation: yield = 292-0.965 (Julian date seeded), where 292 is the intercept. In contrast, the 100-day hybrid lost 1.5 bushels/acre/day and its response is described by model equation: yield = 351 – 1.45 (Julian date seeded), where 351 is the intercept. In both hybrids the coefficients 0.965 and 1.45 could be rounded-off to 1.0 and 1.5, respectively. The coefficients of determination (R^2) for the 90-day and 100-day hybrids were 0.63 and 0.80, respectively. This means date of planting accounted for 63% and 80% of the information associated with the regression equations for the 90-day and 100-day hybrids, respectively. Continuation of this study over a number of years is needed to determine a long-term base line for yield response to planting date at Brookings. In 2002 an attempt will be made to start the planting sequence 10 days earlier. This should enable us to determine whether an earlier seeding date is justified. In 2001, the starting date of May 6 corresponds to the historical date when 10% of the corn is seeded in Brookings County.

Fig. 1. Corn yield response to planting date, and predicted yield values from May 6 to June 5, 2001 at Brookings.



Winter Wheat Breeding and Genetics

Amir Ibrahim, Steve Kalsbeck, Rich Little

Summary of Activities

The Winter Wheat Breeding and Genetics Program utilizes the Northeast Research Station primarily to conduct winterhardiness evaluations and for the state Crop Performance Testing (CPT) Variety Trial. The breeding program also conducts field-testing at several other sites throughout South Dakota (Brookings, 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 2001 included:

i) The CPT Variety Trial, under the overall coordination of Bob Hall. The trial included 37 entries, consisting of 26 released varieties (including new releases from other states), 8 advanced experimental lines from our program, 2 experimental lines from General Mills, and one experimental line from Colorado. This trial was also grown at 15 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. Performance of 2001 CPT entries is noted in Table 1.

ii) A Winter Wheat Fusarium Head Blight Trial, in cooperation with Marty Draper, Extension Plant Pathologist.

iii) A two-row winterhardiness nursery, consisting of short-row evaluations of several different breeding nurseries: the Regional Germplasm Observation Nursery (RGON, 395 entries); the Facultative and Winter Wheat Observation Nursery (FAWWON) from CIMMYT-Turkey (106 entries); the Uniform Barley Winterhardiness (UBWHN, 54 entries); and the Eastern Soft Red Winter Wheat Nursery (SRWW, 344 entries). Thirteen Lines from Holland and 18 from the Czech Republic also were tested in this nursery.

Trial Conditions

The nurseries at the Northeast Research Station were planted into heavy soybean stubble with adequate soil moisture conditions on 21 September 2000. The observation nursery was planted on 5 October 2000. Starter fertilizer (10-34-0) was applied with the planter. Bronate was applied on 5 May 2001 at 1.5 pints per acre. Due to severe winter kill, significant variation was observed among lines for winterhardiness. Significant Stripe rust infection was observed in cultivars 'Hondo' and 'Nekota' in the CPT Variety Trial. Grain yield data for the CPT Variety is presented in Table 1.

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.

Table 1. Yield and Testweight Results of Entries in the 2001 Crop Performance Testing (CPT) Nursery at Highmore and 2- and 3-year Averages across Selected Locations.

	WATERTOWN				STATEWIDE††			
	2001		1999 and 2001†		2000-2001		1999-2001	
ENTRY	YIELD	TW	YIELD	TW	YIELD	TW	YIELD	TW
	bu/ac	lbs/bu	bu/ac	lbs/bu	bu/ac	lbs/bu	bu/ac	lbs/bu
RANSOM	79	59	69	59	53	58	53	58
WINDSTAR	75	58	63	57	54	58	57	58
JERRY	73	58	--	--	--	--	--	--
FALCON	69	58	--	--	--	--	--	--
HARDING	67	59	57	60	53	60	54	60
ARAPAHOE	66	58	59	59	56	59	58	60
SD92107-3	65	59	--	--	55	60	--	--
QUANTUM 7588	62	56	--	--	58	58	--	--
VISTA	61	58	53	58	56	59	56	59
SD97250	59	56	--	--	--	--	--	--
NEKOTA	59	59	52	59	54	60	56	60
CRIMSON	57	59	56	59	50	61	53	61
WESLEY	55	56	50	57	58	58	61	59
HONDO	55	58	50	57	49	60	53	60
ALLIANCE	54	56	47	56	57	59	59	59
MILLENNIUM	54	58	52	58	54	60	58	60
CULVER	54	56	52	58	53	58	56	58
ROSE	51	58	46	60	45	60	49	61
NUPLAINS	50	58	46	58	51	60	54	61
SD97049	50	56	--	--	--	--	--	--
TANDEM	49	57	48	58	52	59	53	60
SD92107-5	48	57	--	--	54	60	--	--
SCOUT66	47	57	46	58	46	60	45	60
TREGO	45	57	--	--	52	60	--	--
SD97457	41	53	--	--	55	59	--	--
SD97W609	39	55	--	--	49	59	--	--
NUHORIZON	39	56	--	--	--	--	--	--
TAM 107	37	53	31	52	51	57	52	58
WAHOO	33	51	--	--	54	57	--	--
SD97W650	32	52	--	--	--	--	--	--
SD97W604	32	53	--	--	49	59	--	--
AVALANCHE	31	55	--	--	--	--	--	--
2137	29	51	36	53	49	58	56	59
NUFRONTIER	28	51	--	--	--	--	--	--
STANTON	28	53	--	--	--	--	--	--
JAGGER	26	51	30	52	47	58	54	58
GOLDEN SPIKE	20	46	--	--	--	--	--	--
Mean	49	56						
LSD (.05)	17	3						
C.V. (%)	22	4						

†CPT plots were not harvested at the Northeast Research Farm in 2000.

††Averages for CPT entries at selected locations throughout South Dakota: 2001--Britton, Oelrichs, Wall, Watertown, Winner; 2000--Dakota Lakes Pea Stubble, Dakota Lakes Spring Wheat Stubble, Newell, Oelrichs, Platte, Wall, Winner; 1999--Dakota Lakes Pea Stubble, Dakota Lakes Spring Wheat Stubble, Oelrichs, Platte, Wall, Watertown, Winner.

SPRING WHEAT BREEDING

Ravindra Devkota, Jackie Rudd, and Greg Lammers

The objective of the breeding program is to develop Spring Wheat varieties for South Dakota. Before a new variety is released to South Dakota producers, it must be proven to be superior to existing varieties in grain yield and/or bread-baking quality. Since both of these traits are strongly influenced by the environment, we conduct yield trials at several locations in the state. We normally plant 9 locations of the Advanced Yield Trial (AYT) in the state, including two locations in the northeast. The AYT includes the experimental lines that are closest to being released as new varieties as well as the best current varieties for comparison. Yield data from the Northeast Research Station is presented below. Included in the table are the check varieties and the experimental lines that are near release. SD3348 (Walworth) was released this year and SD3367 is being considered for release in 2002.

Grain yield of the AYT at the Northeast Research Station averaged 47 bushels per acre. This is 6 bushels higher than 2000 and 12 bushels higher than 1999. Except for leaf rust, disease pressure was relatively mild this year. Leaf rust and scab resistance is shown in the table. A new race of leaf rust has been becoming more prevalent in the last few years. Some of the varieties are more susceptible to this new race; severity on Russ was quite high this year in some locations. Although recently released varieties have better resistance to scab than previous varieties, there is nothing that is better than intermediate.

The Northeast Research Station is an important location for the spring wheat breeding program. Over 1000 preliminary experimental wheat lines were grown on the station. Approximately 70% of these were eliminated due to susceptibility to disease or low yield. The remaining lines will be tested in more advanced trials next year. The step by step process of elimination and testing in multiple locations will produce varieties that are well adapted to the variable environment of South Dakota.

Thanks to producer support through check-off dollars and purchase of Certified seed, this breeding program is one of the most productive programs in the region. Six new varieties have been released since 1995. These varieties currently account for over 75% of the spring wheat acreage in South Dakota. 'Russ' is arguably the most widely grown spring wheat variety in the United States and 'Oxen' is close behind. Thanks again to the South Dakota Wheat Commission and the South Dakota Crop Improvement Association.

Table 1. Spring wheat breeding 2001 advanced yield trials (AYT).

	Northeast Station 2001	State Average 2001	State Average 2000	State Average 1999	State Average 99-2001	Test Weight (lbs/bu)	Heading (Days)	Height (cm)	Leaf Rust*	Scab*
----------Yield (bu/a)----------										
SD3367	52.8	44.3	44.7	41.4	43.5	56.2	176	78	R	M
WALWORTH	42.8	41.0	40.4	42.8	41.4	54.6	177	80	MR	M
RUSS	49.5	44.4	41.3	40.5	42.1	54.1	177	76	MR	MS
EMBER	49.1	43.6	37.6	39.4	40.2	55.5	176	79	MS	M
FORGE	46.7	44.6	40.2	39.1	41.3	49.5	177	78	MS	MS
OXEN	47.8	45.0	41.9	37.7	41.5	52.1	175	81	MR	MS
INGOT	45.7	43.0	39.5	37.2	39.9	54.7	176	79	MS	M
BUTTE 86	45.4	42.5	38.9	36.4	39.3	56.4	176	83	MR	MS
2375	46.7	39.9	33.8	29.6	34.4	56.1	177	80	MS	MS
CHRIS	28.6	32.2	24.4	21.2	25.9	55.4	176	85	MR	S
MEAN	46.7	42.5	39.5	38.7						
CV%	8.5	9.3	5.7	5.4						
LSD (.05)	5.6	2.2	1.4	1.3						

* R=Resistant, MR=Moderately Resistant, M=Intermediate, MS=Moderately Susceptible, S=Susceptible

Establishing a Root Rot Nursery for Evaluating Spring Wheat Germplasm

Y. Jin

Root rot complex of wheat, caused by several soil-borne fungal pathogens, can be a serious problem in wheat production when crops are exposed to nutritional and/or environmental stresses during the growing season. Common root rot has been particularly problematic in recent years in both spring wheat and winter wheat in South Dakota as well as in the region. The level of resistance/tolerance in wheat cultivars and breeding germplasm is not well known because of the lack of effective screening techniques. Over the past several years we have been attempting to establish a root rot screening nursery at the Northeast Research Farm.

A field 75' x 300' at the research farm was divided into three sections of equal size. One section has been planted with a spring wheat variety continuously since 1998, and a rotation of corn/wheat has been used for other two sections. Reduced tillage was used in all plots. We anticipated that populations of most root rot pathogens, such as *Cochliobolus sativus*, *Gaeumannomyces graminis* var. *tritici*, *Fusarium* spp. (*F. culmorum*, *F. graminearum*, and *F. avenaceum*), *Pythium* and *Rhizoctonia* spp. would gradually build up in the continuous wheat section, whereas the wheat/corn rotation section would favor population increases of *Fusarium* spp., *F. graminearum* in particular.

Over the past several seasons, we did not observe obvious differences in root rot or Fusarium head blight incidences on "Russ" wheat between the section of continuous wheat and that of the corn/wheat rotation. In the 2001 field season, 36 spring wheat lines, consisting of entries in the advanced yield trials from the spring wheat breeding program, were planted into row plots in the continuous wheat section. Minimal root rot occurred in the nursery and differences of root rot incidence among the test entries were insignificant. We will continue to utilize this rotation to eventually build up root rot inoculum to a level that will provide reliable screening of materials.

OAT RESEARCH

Lon Hall

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 consumers require different characteristics for specific needs. Several millers want a high protein oat; whereas, the livestock producer wants a high oil, high protein, and tall variety. The racehorse industry wants a white-hulled variety or high quality naked oat.

Twenty-nine breeding and regional nurseries grown at the Northeast Research Farm had a combined total of 2726 plots. The Tri-State regional nursery is made up of 30 lines and 6 checks. The 30 lines consist of 10 advanced lines from each breeding program in Minnesota, North Dakota, and South Dakota. The best lines will be entered in either the Uniform Early Nursery (UEO) or the Uniform Midseason Nursery (UMO) the following year. The UEO is a regional nursery made up of 27 early maturing lines from breeding programs across the United States. We entered three lines this year, out of these three, one looks very promising for release in 2002. Compared to Don, SD97525 has better test weight, higher yield potential, better crown rust resistance, and a similar maturity. The UMO is made up of 34 advanced medium and late maturing lines, usually 1 to 3 lines (we had three lines) from each of the participating state and Canadian breeding programs. One of the South Dakota lines, SD96024, was the top yielder in the UMO (2000) and the South Dakota Standard Variety Oat Trials in 2000 and 2001. The data collected from the regional nurseries provides valuable information needed for varietal release and germplasm selection for crossing in our program. The most advanced lines in the regional nurseries are simultaneously tested in the Standard Variety Oat trials across the state.

Plant breeding is a long drawn out process. The bulk breeding method takes, on average, at least 10 years from the initial cross to varietal release. This process can be speeded up a couple of years by using the single seed descent method, which involves two extra generations in the greenhouse. Seeds are hand picked from bulk lines (segregating crosses) on basis of color, kernel size, and kernel shape, busted tip (thin hull), and in the case of hulless oats a large, hairless, white groat. In the fall greenhouse 500 selected seeds per cross (from 50 crosses) are planted in four 6 inch pots, the plants are then inoculated with several crown rust strains, and the susceptible plants are discarded. The idea is to skew the population toward desired characteristics before they reach yield plots. A single seed from each plant is harvested; about 1600 are selected based on hull color or naked groats and are planted one to a pot in the spring greenhouse. The seeds from these single plants are planted in a 5-foot by 5-foot yield plot about the first of May. It is possible to have yield plots 2 years after the initial

cross is made using the single seed descent method. However, you don't want to put all your eggs in one basket, so a combination of the bulk and single seed descent methods seems to work well. For every oat variety released, approximately 40,000 non-segregating lines are evaluated.

Northeast Research Farm Annual Report
2001 Alfalfa Production

Vance Owens and Eva Omdahl

Alfalfa cultivars are tested at several South Dakota research stations. Our objective is to provide producers with yield data from currently available alfalfa cultivars to aid them in cultivar selection. Even though our yield trial does not contain all available cultivars, it should be a helpful tool in identifying cultivars suitable for your specific needs. Table 1 provides forage production data for 27 alfalfa cultivars that are currently on the market. Tons of dry matter yield are shown for three individual cuttings in 2001, total production for 2000 and 1999, and a cumulative total for 1999 through 2001. Cultivars are ranked from highest to lowest based on the 3-year production total. The least significant difference (LSD) listed at the bottom of the table is used to identify significant differences between the cultivars. If the difference in yield between two cultivars exceeds the given LSD, then they are significantly different.

The alfalfa cultivar yield trial was established in April, 1999. Six replications of each cultivar were planted at 15 lbs pure live seed/acre. Fifty pounds of super phosphate (P_2O_5) was applied preplant in 1999. Later fertilizer application was made when necessary as recommended by the South Dakota State Soil Testing Laboratory. Forage was harvested with a sickle-type harvestor equipped with a weigh bin for obtaining fresh plot weights. Random subsamples from the fresh herbage were taken to determine percent dry matter. Alfalfa cultivars were evaluated for maturity prior to harvest. Yield differences among cultivars were tested using the LSD at the 0.05 level of probability when significant F-tests were detected by analysis of variance (Table 1).

Another trial was established in 2001. Yield data were not obtained from this new trial in the seeding year, however.

Table 1. Forage yield of 27 alfalfa cultivars entered in the South Dakota State University alfalfa testing program. Trial is located at the Northeast Research Station near South Shore, SD.

	2001				2000	1999	99-01
Entries	31 May	9 July	6 Aug.	Total	Total	Total	Total
	----------Tons Dry Matter/Acre----------						
ABT 350	1.76	1.58	0.92	4.26	4.12	3.50	11.88
Rebound 4.2	1.63	1.74	1.00	4.36	3.98	3.46	11.79
645-11	1.62	1.64	0.97	4.23	3.84	3.72	11.79
Garst 6420	1.81	1.70	1.01	4.51	3.99	3.24	11.74
Garst 620	1.70	1.58	0.90	4.19	3.93	3.57	11.69
Pioneer Brand 53Q60	1.54	1.73	0.96	4.24	4.00	3.44	11.68
AlfaStar	1.60	1.52	0.96	4.07	3.97	3.61	11.65
Spirit	1.50	1.52	0.92	3.94	3.97	3.61	11.52
Pioneer Brand 54V54	1.67	1.66	0.94	4.26	3.95	3.25	11.46
Garst 6410	1.56	1.57	0.98	4.11	3.85	3.49	11.45
WinterStar	1.63	1.53	0.93	4.09	3.94	3.40	11.43
Abound	1.60	1.58	0.93	4.11	3.82	3.50	11.43
Macon	1.59	1.72	0.98	4.29	3.73	3.41	11.43
GH 766	1.66	1.55	0.89	4.09	3.90	3.41	11.41
WL232 HQ	1.56	1.61	0.96	4.14	3.77	3.37	11.28
FQ 314	1.52	1.53	0.90	3.95	3.80	3.50	11.26
FQ 315	1.53	1.57	0.97	4.07	3.74	3.42	11.23
Excalibur II	1.61	1.51	0.86	3.99	3.72	3.38	11.09
Sprint	1.68	1.45	0.89	4.01	3.81	3.23	11.06
A-395	1.58	1.54	0.88	3.99	3.63	3.32	10.95
DK124	1.57	1.57	0.87	4.02	3.61	3.32	10.94
WinterKing	1.61	1.53	0.80	3.94	3.61	3.37	10.91
DK140	1.50	1.50	0.89	3.89	3.79	3.19	10.87
Legend Gold	1.50	1.48	0.86	3.84	3.60	3.40	10.83
Vernal	1.53	1.46	0.90	3.89	3.80	3.11	10.80
Award	1.46	1.49	0.83	3.78	3.45	3.45	10.68
TMF 421	1.60	1.55	0.87	4.03	3.39	3.17	10.59
Mean	1.60	1.57	0.92	4.08	3.80	3.40	11.28
Maturity (Kalu & Fick)	3.8	4.4	4.4				
LSD (P=0.05)	NS	0.43	0.32	0.59	0.38	NS	0.93
CV (%)	12.0	8.9	8.8	6.5	8.9	8.5	7.0

NS = not significant at 0.05 level of probability

Biomass Production of Switchgrass Cultivars in Single-cut Management Systems

Arvid Boe and Robin Bortnem

Introduction

The United States Department of Energy (USDOE) has identified northeastern South Dakota as an area of excellent potential for profitable production of biomass/biofuel crops. In addition, USDOE has chosen switchgrass (*Panicum virgatum* L.) as a model species for biomass production research in the eastern half of the United States and southern Canada. In 1999 we received support from the USDOE Bioenergy Feedstocks Development Program to evaluate biomass production of several switchgrass cultivars in northeastern South Dakota.

Materials and Methods

On June 7, 1999, we planted eight switchgrass cultivars into a conventionally prepared seedbed at a rate of 50 pure live seeds/ft^2. Experimental designs were two sets of four replications of each cultivar in completely randomized block designs. One set was intended for harvest during mid September annually over a 3- to5-year period, whereas the other set was intended for harvest shortly after a killing frost (normally early October) during the same time period. Individual plot size was 4 feet by 20 feet. Row spacing was 6 inches. Atrazine was applied pre-emergence at 2 pounds active ingredient/acre (experimental treatment). No harvests were taken during the establishment year. We report here the results of biomass harvests made on September 18 and October 17, 2000 and September 12 and October 30, 2001.

Results and Discussion

Due to nonrandom patchiness in environmental variation within replications, cultivars generally failed to rank similarly across replications. Consequently, significant ($P<0.05$) differences were only found among cultivars for biomass production on September 18, 2000. On the other hand, highly significant ($P<0.01$) differences were found between years for both harvest dates (Table 1). This is a reflection of, as frequently occurs for native warm-season grasses, increased stand density and vigor during the first 2-3 years after planting. Biomass yields, averaged across cultivars, were more than 50 % greater in 2001 than in 2000 (Table 1). Averaged across the two years, biomass production of the September harvest was about 30 % greater than that of the October harvest. This difference in harvest date means is likely a result of dry matter loss due to natural senescence and freezing of plant tissues. Although waiting until after a hard frost to harvest the biomass may result in loss of some biomass, it allows time for the plants to translocate nitrogen out of the leaf and stem tissues and

into the crown (overwintering structure). Thus, this delayed harvest management scheme may ultimately reduce the amount of nitrogen inputs needed in the form of fertilizer.

Conclusion

Results to date strongly suggested that several commercially available switchgrass cultivars are capable of producing large amounts (i.e., greater than 3 tons/acre) of biomass in northeastern South Dakota. The experiment will be continued for several more years to determine if there are differences among cultivars for persistence. The latitudes of origin of the cultivars range from southern Illinois (Cave-In-Rock and Shawnee) to south central North Dakota (Dacotah). Although the southern cultivars have higher biomass yield potential (Table 1), it remains to be seen if they have enough winterhardiness to persist in our region.

Table 1. Dry matter biomass production for eight switchgrass cultivars harvested at two different dates during 2000 and 2001.

	Harvest date			
Cultivar	9-18-00	9-12-01	10-17-00	10-30-01
		Kg ha^{-1}		
Cave-In-Rock	5836	6673	4250	6287
Dacotah	2830	5697	2567	5028
Forestburg	2671	7456	3929	5114
OKNu94-2[+]	5801	9110	4847	6566
Sunburst	6315	7886	4387	7201
Shawnee	5339	8300	3673	5852
Summer	4363	7847	3586	5415
Trailblazer	5181	5802	3203	6561
LSD (0.05)	2321	ns	ns	ns
Grand Mean	4792	7346	3173	6003

[+] Experimental population from Oklahoma State University.

2001 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, and Webster, SD in 2001. The purpose of the trial was to provide performance data on released flax varieties to producers and compare performance of experimental lines to established checks in order to identify possible new varieties.

In 2001, six experimental lines from the NDSU flax breeding program and four experimentals from Canada were tested against twenty-four released varieties (checks). There were both early- and late-seeded trials at Brookings, including a trial planted in a field infested with the flax wilt fungus, *Fusarium oxysporum f.sp lini*. The Brookings Early, Watertown, and Webster trials were planted on May 2nd, Brookings Late on June 4th, and Brookings Wilt on May 29th, 2001.

Experiment design at each location was a randomized complete block with three replications. Plots consisted of seven rows 13 ft. long, with rows spaced seven inches apart. The Brookings early and late-seeded trials were lost due to damage from herbicide carryover and hail. Stands were fair to good at Webster. The Watertown trial had poor stands in the first replication and this rep was therefore excluded from the statistical analysis.

The growing season in east central and northeast South Dakota began with adequate to surplus topsoil and subsoil moisture. Webster was wetter than normal in April, May, and June. Brookings was much wetter than normal in April, slightly wetter than normal in June, but had below normal precipitation in May and July. Watertown had normal to slightly below normal precipitation in April through July. August was very dry at all locations.

Minimum temperatures were warmer than normal at all locations for the entire growing season. Maximum temperatures were cooler than normal at Watertown in April through July, and normal in August. Maximum temperatures at Brookings and Webster were lower than normal in April, but much above normal in June.

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. Oil content was determined by NMR analysis of oven-dried seed and then converted to a 10% moisture basis. Oil yield was calculated by multiplying seed yield by oil percent. Seed yield, oil %, oil yield and agronomic data on the 34 entries in the test are presented in Table 1. Yields and oil contents averaged over varieties were slightly higher at Webster than at Watertown. The highest yielding check variety over all locations in 2001 was Omega (21.5 bu/A). The highest yielding experimental was FP1069, which averaged 23.2 bu/A across two locations. FP1069 also had the highest oil content across locations, 42.0%.

Table 1. Data on flax varieties grown at the Watertown Northeast Research Station and Webster, SD in 2001.

Variety	Origin -Year	Seed Yield (bu/A) Wtn	Web	Mean	Yield Rank	Oil % Wtn	Web	Mean	Oil Yield (kg/ha) Wtn	Web	Mean	Mean Height	Brkgs Wilt
				-2-				-2-			-2-	cm	(1-9)^
AC Carnduff	CAN-99	20.2	17.5	18.7	12	39.7	40.5	40.2	511	444	475	48	2.7
AC Emerson	CAN-95	11.8	11.6	11.8	25	39.3	40.1	39.7	325	294	310	55	3.5
AC Watson	CAN-97	12.2	21.4	17.8	14	41.1	40.7	40.9	315	541	455	49	5.4
Bison	ND-27	7.0	14.0	11.3	26	39.8	40.0	39.9	171	349	282	56	4.2
Cathay	ND-97	16.5	19.3	18.3	13	41.0	41.8	41.5	460	506	491	55	2.6
CDC Arras	CAN-00	11.6	23.6	18.9	11	41.3	41.0	41.1	287	602	480	54	4.1
CDC Bethume	CAN-00	16.3	20.6	19.1	10	41.4	41.1	41.2	413	529	486	51	3.9
CDC Normandy	CAN-96	18.5	16.7	17.5	15	40.1	40.2	40.2	464	418	440	51	3.7
CDC Valour	CAN-97	20.3	13.8	16.5	20	40.0	40.3	40.2	503	347	413	46	6.1
Day	SD-90	16.6	17.4	17.2	18	41.7	38.9	40.0	428	426	431	49	5.3
Flanders	CAN-90	10.6	17.3	14.8	23	37.5	41.0	39.6	241	444	367	53	2.8
Linora	CAN-92	20.5	21.7	21.4	4	40.9	41.0	41.0	523	559	548	51	2.9
Linott	CAN-66	14.5	15.8	15.4	22	39.8	40.2	40.0	374	395	391	53	1.9
McDuff	CAN-93	18.7	21.7	20.7	7	40.1	41.4	40.9	471	568	533	55	2.3
McGregor	CAN-82	11.4	16.2	14.4	24	39.5	40.5	40.1	279	416	366	50	4.7
Neche	ND-88	20.0	21.6	21.1	5	41.1	40.0	40.5	484	538	520	54	5.0
Omega	ND-90	14.4	26.0	21.5	3	40.1	40.1	40.1	380	650	546	51	5.8
Pembina	ND-97	14.9	18.8	17.4	16	40.0	41.3	40.8	388	487	451	55	1.7
Prompt	SD-89	17.4	16.5	17.0	19	39.3	40.5	40.0	425	415	423	46	5.6
Rahab 94	SD-94	21.5	14.1	17.2	17	40.8	40.7	40.7	557	361	443	50	4.8
Selby	SD-00	19.9	21.2	20.8	6	41.0	40.8	40.9	536	543	544	55	4.9
Verne 93	SD-93	22.5	17.1	19.4	9	39.3	40.8	40.2	550	438	487	56	3.1
Webster	SD-98	20.6	18.8	19.6	8	41.2	41.6	41.4	529	489	509	57	3.3
CI 3423	ND-exp.	17.1	15.5	16.3	21	41.1	40.0	40.4	432	386	409	50	5.7
FP1069	CAN-exp.	19.9	25.2	23.2	1	41.6	42.2	42.0	495	671	605	51	4.5
N9719	ND-exp.	25.9	18.4	21.5	2	41.8	40.8	41.2	644	466	541	55	3.5
FP1094	CAN-exp.	22.5	--	--	--	38.5	--	--	538	--	--	--	--
FP1096	CAN-exp.	12.5	--	--	--	40.2	--	--	318	--	--	--	--
FP2000	CAN-exp.	25.7	--	--	--	40.4	--	--	644	--	--	--	--
N0003	ND-exp.	16.3	--	--	--	41.1	--	--	408	--	--	--	--
N0005	ND-exp.	11.8	--	--	--	41.2	--	--	303	--	--	--	--
N0008	ND-exp.	9.0	--	--	--	41.6	--	--	235	--	--	--	--
N0010	ND-exp.	23.8	--	--	--	40.8	--	--	522	--	--	--	--
NorLin	CAN-82	18.8	--	--	--	39.4	--	--	462	--	--	--	--
Grand Mean		17.1	18.5	18.0		40.4	40.7	40.6	430	472	459	52	4.0
LSD.05		5.7	5.5	5.1		2.0	1.5	1.3	145	148	132	4	ns
Min. yield of top yield group*		20.2	20.5	18.1					499	523	473		
C.V.		16.4	18.2	22.5		2.4	2.2	2.5	16.5	19.1	22.9	6.6	39.2

* Top yield group = varieties yielding within one LSD value of the variety with the highest numerical yield.

^ Wilt rated on a scale of 1 to 9, where 1=good and 9=poor.

Watertown and Webster plots were planted May 2, 2001.

SOYBEAN BREEDING REPORT

Project Leader: Roy Scott
Research Associate: Curt Reese
Research Technicians: Steve Stein and Chris Engbrecht

Conventional Tests

We tested 128 advanced conventional group 1 soybean lines and checks at Northeast Farm in 2001. Yields among these lines ranged from 26-46 bushels/acre, with a mean yield of 34 bushels/acre. Checks used were 'Parker', 'Surge', 'SOI 169' and Pioneer Brand 'P9163'. About 2% of the lines were 3-7 bushels/acre higher yielding than the highest yielding check, and 43% of the lines were similar to the highest yielding check. Protein concentrations ranged from 39-44%. Several lines with acceptable yields were high protein lines, and many lines with acceptable yields also had acceptable protein concentrations. Approximately 10% of these lines will be advanced for further testing in 2002.

We tested 52 advanced conventional group 0 lines and checks. The highest yielding line was SD96-702, for which Foundation seed was produced in 2001, and which is being recommended for release in 2002. About 75% of the lines in this test were similar in yield to the highest yielding check. Yields in this test ranged from 26-41 bushels/acre, with a mean yield of 34 bushels/acre. Protein concentrations of these lines ranged from 38-44. The best high protein line was about 5 bushels/acre lower in yield than the highest yielding lines and checks.

Roundup Ready Tests

We tested 15 advanced group 0 and 24 advanced group 1 lines in 2001 at Northeast Farm, in addition to Tolstoy, Brookings, and Bruce.

<u>Group 0</u>
Overall mean yields at Northeast Farm were higher than the other locations. The highest yielding lines at Tolstoy and Bruce were higher than the highest yielding lines at Northeast Farm. Yields ranged from 31-43 at Tolstoy, 32-43 at Northeast Farm, 26-34 at Brookings, and 31-49 and Bruce. Rankings were fairly consistent across the 4 locations. About 53-67% of the lines in this test were similar in yields to the highest yielding check.

<u>Group 1</u>
Overall mean yields of Roundup Ready group 1 lines were highest at Northeast Farm. Yields of the highest yielding lines at Northeast Farm were greater than at Tolstoy and Brookings. Yields ranged from 36-45 at Northeast Farm, 30-43 at Tolstoy, 30-44 at Bruce, and 28-41 at Brookings. Line rankings were not consistent across the 4 locations. About 46% of the lines at Northeast Farm were similar in yield to the highest yielding check.

Regional Tests

The most advanced Roundup Ready and conventional lines were compared to advanced conventional lines from other universities in the region in a group 0 and group 1 test. Maturity was presented as plus or minus the maturity date of the check, plant height in inches, lodging and seed quality as ratings of 1 = best to 5 = worst. Among group1 lines, SDEXP-01, which is a new Roundup Ready group 0 line being recommended for release in 2002, was not significantly different in yield from the highest yielding line (Table 1). The highest yielding of the 52 lines in this test was Surge. Mean yields in this test ranged from 26-43 bushels/acre. Among group 0 lines SDEXP-01 ranked 8 of 32 lines for yield (Table 2). In this test Surge ranked 5. Mean yields in this test ranged from 27-37.5 bushels/acre.

Table 1. Performance of SDSU conventional and Roundup Ready lines, compared to lines from four other breeding programs.

ENTRY	NAME	YIELD	RANK	PLANT HEIGHT	LODGING	MATURITY	100 SEED WEIGHT	SEED/POUND	SEED QUALITY
49	Surge	43.4	1	30	1	-4	15.8	2873	2
40	SD97-105	42.0	4	37	2	0	11.6	3914	2
51	SDEXP-01	38.6	6	35	1	-3	13.2	3439	3
44	SD98-1632	36.3	9	32	1	0	12.5	3632	2
52	SOI169	36.3	10	34	2	5	11.7	3880	3
1	Parker (I)	36.0	12	42	4	9/21	14	3243	2
4	Lambert (0)	35.9	13	32	2	-8	13.3	3414	2
50	SD1091RR	35.0	15	31	1	-4	14	3243	3
41	SD98-98	34.9	17	33	2	3	13.7	3314	3
2	IA1008 (SCN)	33.8	22	35	1	2	14.3	3175	3
3	IA2050 (L) (BSR)	33.1	26	33	2	II	13.1	3466	2
43	SD98-123	32.6	30	37	2	-1	12.2	3721	2
45	SD98-3457	30.2	43	31	1	-1	13.8	3290	3
	GRAND MEAN	33.6							
	CV	8.4							
	LSD	5.7							
	MIN. MEAN	26.2							
	MAX. MEAN	43.4							

Total of 52 lines tested. Experimental lines from other breeding programs were not presented here.

Table 2. Performance of SDSU conventional and Roundup Ready lines, compared to lines from four other regional breeding programs.

ENTRY	NAME	YIELD	RANK	PLANT HEIGHT	MATURITY	LODGING	100 SEED WEIGHT	SD/LB	SEED QUALITY
1	**Lambert (0)**	**37.5**	**1**	**35**	**9/9**	**1**	**12.0**	**3783**	**3**
16	ND95-931 (Barnes)	37.2	2	30	-6	1	12.7	3575	2
3	**Surge (0)**	**37.0**	**3**	**31**	**3**	**2**	**16.0**	**2838**	**2**
25	SD96-702	36.8	5	33	2	1	12.5	3632	2
32	**SDEXP-01**	**35.4**	**8**	**30**	**4**	**1**	**13.0**	**3492**	**2**
2	Parker (I)	35.3	9	34	13	1	13.6	3338	2
27	SD97-2154	33.7	15	31	0	2	15.9	2855	3
28	SD97-2585	32.2	19	27	0	1	15.1	3007	2
29	SD97-2915	32.1	21	30	3	2	14.5	3131	3
26	SD97-749	30.7	25	32	6	1	12.4	3661	2
4	Traill (E)	30.1	27	27	-6	2	12.3	3691	2
30	**SD1091RR**	**29.3**	**28**	**28**	**5**	**1**	**14.4**	**3153**	**2**
5	MN0902CN (SCN)	29.1	30	30	3	2	11.5	3948	2
	GRAND MEAN	33.0							
	CV	12.6							
	MIN. MEAN	27.0							
	MAX. MEAN	37.5							

32 lines tested. Experimental lines from other breeding programs were not presented here.

COMPARISON OF BT-CORN AND FIPRONIL (REGENT 4 SC) AGAINST THE UNIVOLTINE ECOTYPE OF THE EUROPEAN CORN BORER

Mike Catangui, Charlie McCone, and Dave Mills

INTRODUCTION

Fipronil, the active ingredient in an insecticide called Regent 4SC (Aventis CropScience USA LP), is a phenyl pyrazole compound used as a contact and stomach poison insecticide (Thomson 1994). Regent 4SC is currently sold to corn growers as a soil insecticide (applied in-furrow with the corn seeds at planting) to control larvae of corn rootworms and other soil-inhabiting insect pests of corn. What is unique about Regent 4SC is the claim on its label that it also controls larvae of the first-brood European corn borer that infest the corn plant later in the season. Corn borer larvae hatch out of eggs laid by moths on the leaves of whorl-stage or knee high corn.

SD counties along I-29 north of Dell Rapids have the so-called univoltine ecotype of European corn borer. The univoltine corn borer does not have a clear-cut first- and second-brood that the bivoltine corn borer has in the southeast (Catangui 2001). The moth flight of the univoltine corn borer does not peak until the first two weeks of July. In comparison, the first-brood moth flight of the bivoltine ecotype corn borer peaks in mid-June. It is not known whether enough fipronil remains in the corn plant to control the larvae of the univoltine corn borer in the corn leaves and stalks. This research was therefore conducted to investigate the efficacy of fipronil against univoltine corn borers in northern SD. We compared fipronil against a Bt-corn hybrid expressing the YieldGard gene that provides season long protection against corn borers.

A similar research was also conducted in 2001 in the Southeast SD Experiment Farm near Beresford to verify the efficacy of Regent 4SC against both broods of the bivoltine ecotype corn borer that occur in southeastern SD. Please refer to the 2001 SE SD Experiment Farm Progress Report for comparison.

MATERIALS AND METHODS

All experiments were conducted at the SD Northeast Research Station near South Shore during the 2001 growing season. The following treatments were tested:

1) Bt-corn (H6648Bt, 91 day RM).
2) Untreated Non-Bt corn (H6573, 90 day RM)

3) Non-Bt corn (H6573) treated with Regent 4SC (in-furrow at planting) using the ONE-PASS Application System. The rate was at 4.2 liquid ounces of Regent 4SC per acre mixed with 3 gallons per acre of water. The tank pressure was at 23 p.s.i. and the tractor traveling at 4 m.p.h.

The corn seeds were planted using a John Deere MaxEmerge 2 planter on May 10, 2001. Plant population was at 24,500 per acre. Each treatment listed above was replicated 4 times and assigned in a randomized complete block fashion on each experimental unit. Each experimental unit was composed of four rows (120 ft. long) spaced 30 inches apart. One row per plot was destroyed ans dissected for corn borer injuries. Three rows were kept intact then harvested at the end of season (October 16, 2001). Ten consecutive plants on one row were dissected on September 24 using a curved knife and examined for corn borer larval tunnels, tunnel length, and live corn borer larvae in the stalk, ear shank, and ear. Data were analyzed using SAS (SAS Institute 1989) after appropriate data transformations to normalize the data (Gomez and Gomez .1984).

Activities of corn borer moths at night were monitored with a light trap equipped with a 15-watt “black light” fluorescent bulb. An insecticide-impregnated rubber strip (dichlorvos) was placed in the collection container of the trap to quickly kill all insects attracted to the light trap. The light trap operated 24 hours a day from May 14 to September 14 during the growing season. Corn borer moths collected by the trap were counted regularly.

RESULTS AND DISCUSSION

Corn borer moth flight. Peak corn borer moth flight occurred on July 13 with 55 moths captured per light trap in one night (Figure 1). This number is about five times greater than the peak number the previous season. During the outbreak years of 1996 and 1997, peak moth numbers were at about 75 moths per trap per night. Historical moth flights in the NE Experiment Station can be found online at the Extension Entomology Web site (www.abs.sdstate.edu/plantsci/ext/ent).

Yield. Yield advantages over untreated non-Bt corn were recorded both in the Bt hybrid, and the non-Bt hybrid treated with Regent 4 SC (Figure 2). The Regent 4 SC treatment had about 15 bushels per acre yield advantage over its untreated counterpart, while the Bt corn hybrid had an advantage of about 6 bushels per acre. These yield advantages, however, were not significant according to the statistical analysis performed. The moisture contents of grain at harvest were similar among the treatments (Figure 4).

Stalk injury. In the untreated non-Bt hybrid, 100% of the stalks were infested with corn borer larvae by the time the stalks were dissected on

September 24 (Figures 3). The average length of the tunnels or cavities per infested stalk was about 8 inches in the untreated non-Bt hybrid (Figure 5).

Merely 2.5% of the stalks in the Bt hybrid were infested with corn borers indicating that the YieldGard gene provided good protection against corn borer infestation throughout the growing season. Even in the infested Bt stalks, the tunnel length was only about 1 inch long.

In the Regent 4SC treatment, 65% of the stalks were infested with corn borers (Figure 3). The tunnel length per infested stalks was about 4 inches long on the average. Based on these observations, it appears that fipronil, the active ingredient in Regent 4SC, has some activity against the univoltine corn borers at the rate used in this current experiment. A 35% reduction in stalk infestation and a 4-inch reduction in tunnel length per infested stalk were significant although quite modest compared to the 98% reduction in stalk infestation and 7-inch reduction in tunnel length in the Bt hybrid with the YieldGard gene.

Summary. Regent 4 SC provided moderate (35% reduction in corn borer infestation of the stalk) but statistically significant protection against univoltine corn borer larvae. A yield advantage of 14.7 bushels per acre was also recorded over untreated non-Bt corn. Regent 4SC was applied at planting using the ONE-PASS liquid application system at the rate of 4.2 fluid ounces (in 3 gallons of water) per acre.

Corn Breeding and Genetics
Project Activities at NE Research Farm

Zeno W. Wicks, III, Project Leader
and
Patrick Beauzay, Research Associate II

The corn project at South Dakota State University continued to evaluate experimental germplasm at the Northeast Research Farm in 2001. The main objective of conducting research at this site is to evaluate the performance of developmental germplasm, including populations and inbred lines, in an environment that is generally cooler and has a shorter growing season than other corn production areas of South Dakota. This leads to release of germplasm that is adapted to earlier environments.

In 2001, 50 experimental inbred lines in advanced generations of development were evaluated in testcrosses at the Northeast Research Farm. The testers used were sister-line hybrids LH300/LH301 and LH176/LH177, which are early maturing lines with good general combining ability from two different heterotic backgrounds. These are used to determine the heterotic background and genetic contributions of experimental lines. Agronomic traits measured were grain yield, % moisture at harvest, stalk lodging, green snap, and disease resistance/tolerance. Of these 50 lines, approximately 10 will be advanced and planted in testcross trials again in 2002, with release of advanced elite lines in 2003. This will provide seed companies with new, early maturing lines adapted to this part of the state.

A large part of our project is devoted to the development of early maturing white food corn. We currently have 7 recent releases of early white corn inbred lines that are in use by private companies. These lines range in maturity from 90 to 105 DRM. We are developing even earlier material (85-90 DRM) and will begin testing at the Northeast Farm in 2002.

We would like to acknowledge the efforts of the following people and institutions for making this research possible: the members of the South Dakota Corn Utilization Council and corn producers in the state of South Dakota; Allen Heuer, Northeast Research Farm Manager; Dr. Jim Smolik, Northeast Farm Coordinator; Kevin Kirby and Jess Hall of the SDSU Crop Performance Program; and Kyle Kepner, Corn Project technician.

WEED CONTROL – W.E.E.D. PROJECT

L. Wrage, D. Deneke, D. Vos, S. Wagner, and B. Rook

INTRODUCTION

Evaluation and extension demonstration plots provide weed control data for northeastern South Dakota. 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.

2001 Tests

Crop growth was favorable during the season. Weed pressure was moderate to heavy; very uniform in most plot areas. Mid-season moisture stress for a short period produced excellent yield response for weed control. Test area in adjacent site provided extra opportunity for evaluation plots.

Tests completed include corn, soybeans, sunflower, flax, spring wheat, edible beans, canola, oats, and alfalfa. Herbicide resistant weed control programs were evaluated for corn, soybeans, sunflower, wheat, and canola.

2001 Evaluation/Demonstration Tests Reported

1. Corn Herbicide Demonstration
2. Herbicide Tolerant Corn
3. Rates of Pre Products in Corn
4. Weed Control Programs in Corn
5. Weed Control in Corn
6. Soybean Herbicide Demonstration
7. Herbicide Tolerant Soybeans
8. Weed Control with Glyphomax Programs in Soybeans
9. Glyphosate Comparisons in Roundup Ready Soybeans
10. Weed Control Programs in Soybeans
11. Raptor plus Adjuvants
12. Glyphosate Additives
13. Soybean Spraying
14. Weed Control in Sunflower
15. Weed Control in Canola
16. Weed Control in Flax Demonstration
17. Weed Control in Clearfield Wheat
18. Foxtail Control in Clearfield Wheat
19. Crop Safety in RR Spring Wheat
20. Weed Control in RR Spring Wheat
21. Weed Removal in RR Spring Wheat

Lambsquarter and pigweed are primary broadleaf weeds at the station and in the area. Yellow foxtail has become the predominant grassy weed in most blocks. This is representative of weed shifts in the northeast counties.

Additional evaluation plots include 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 Report.

1. Weed Removal in Corn
2. Standard vs. Tolerant Weed Control
3. Reduced Cost Weed Control in Corn
4. Callisto Additives
5. Weed Control with Define
6. Weed Control with Command Xtra
7. Weed Control in Sunflower
8. Weed Control in Clearfield Sunflowers
9. Weed Control in New Grass Seeding
10. Weed Control in Alfalfa Demonstration
11. Oat Herbicide Tolerance
12. Soybean Herbicides to Oats Follow Crop
13. Clearfield Wheat Tolerance
14. Tank-Mixes in Spring Wheat
15. Control of Volunteer RR Spring Wheat
16. Volunteer RR Spring Wheat Control in Stubble

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

NOTE: Data reported in this publication are results from field tests that include labeled product uses, experimental products or experimental rates, combinations or other unlabeled uses for herbicide products. Tradenames of products used are listed; there frequently are other products available. Refer to the appropriate weed control fact sheet available from county extension offices for herbicide recommendations.

Table 1. Corn Herbicide Demonstration

Demonstration	Precipitation:		
Variety: Asgrow RX445RR	SPPI/PRE:	1st week	0.02 inches
Planting Date: 5/9/01		2nd week	0.89 inches
SPPI/PRE: 5/9/01	LPRE:	1st week	0.53 inches
LPRE: 5/26/01		2nd week	1.42 inches
EPOST: 6/6/01	EPOST:	1st week	2.38 inches
POST: 6/16/01		2nd week	0.74 inches
POST1: 6/26/01	POST:	1st week	0.41 inches
Soil: Clay loam; 3.0% OM; 6.1 pH		2nd week	0.01 inches
	POST1:	1st week	0.03 inches
VCRR=Visual Crop Response Rating		2nd week	0.00 inches

(0=no injury; 100=complete kill)
Grft=Green foxtail
BDLF=Wild buckwheat, wild mustard, and redroot pigweed

COMMENTS: Uniform weed pressure. Primarily green foxtail; 10-20% yellow foxtail in late evaluation.

Treatment	Rate/A	Corn % VCRR Lodging 7/28/01	% Grft 7/28/01	% Grft 9/13/01	% BDLF 9/13/01
Check	----	0	0	0	0
SHALLOW PREPLANT INCORPORATED					
DoublePlay	5 pt	0	94	88	85
Surpass	2.5 pt	0	88	90	92
PREEMERGENCE					
Dual II Magnum	2 pt	0	85	88	82
Prowl	3.6 pt	0	79	75	92
Harness	2.3 pt	0	93	89	90
Harness	1.5 pt	0	87	86	88
Lasso	1.5 pt	0	61	50	77
LATE PREEMERGENCE					
Harness	2.3 pt	0	96	92	90
Harness+atrazine	2.3 pt+1 qt	0	98	97	98
PREEMERGENCE					
Outlook	21 oz	0	86	72	85
Degree	4.25 pt	0	84	85	82
Define	18 oz	0	84	82	82
Axiom	22 oz	0	88	87	94
Balance Pro	2.25 oz	0	79	75	95
Balance Pro+Surpass	2.25 oz+1.25 pt	0	94	94	97
Balance Pro+Surpass	1.5 oz+1.25 pt	0	88	90	97
Balance Pro+atrazine	2.25 oz+1 qt	0	91	88	97
Python+Surpass	1.25 oz+2.5 pt	0	92	90	97

2001 Corn Herbicide Demonstration
Northeast Research Farm

Treatment	Rate/A	Corn % VCRR Lodging 7/28/01	% Grft 7/28/01	% Grft 9/13/01	% BDLF 9/13/01
PREEMERGENCE (Continued . . .)					
Epic	13 oz	0	88	87	97
USA 2001	13 oz	0	83	85	95
Topnotch+Callisto	5 pt+6 oz	0	90	88	98
Fultime	3 qt	0	95	92	97
Bicep Lite II Magnum	2 qt	0	90	90	98
Guardsman	2.3 qt	0	88	87	99
Harness Xtra	2.1 qt	0	85	82	98
Surpass+atrazine+2,4-D ester	1.67 pt+1 qt+1 qt	0	86	86	98
PREEMERGENCE & POSTEMERGENCE					
Lasso&Clarity	1.5 pt&1 pt	0	76	75	98
Lasso&Distinct+NIS+28% N	1.5 pt&6 oz+.25%+1 qt	0	83	78	98
Lasso&2,4-D amine	1.5 pt&1 pt	0	61	50	98
Lasso&Shotgun	1.5 pt&3 pt	0	78	58	98
Lasso&PCC-196+LI-700	1.5 pt&3 pt+.25%	0	76	60	98
Outlook&Clarity+28% N	21 oz&8 oz+2 qt	0	82	85	99
Outlook&Marksman+28% N	21 oz&3.5 pt+2 qt	0	85	86	99
PREEMERGENCE & POSTEMERGENCE1					
Lasso&Permit+NIS	1.5 pt&.67 oz+.5%	0	76	58	96
Lasso&Starane+Hornet WDG+ LI-700+28% N	1.5 pt&.67 pt+3 oz+ .25%+2 qt	0	71	55	99
Lasso&Buctril	1.5 pt&1.5 pt	0	65	55	99
Lasso&Buctril/atrazine	1.5 pt&2 pt	0	70	50	99
Lasso&Sencor+atrazine	1.5 pt&2 oz+1.5 pt	0	65	55	99
Balance Pro&Buctril/atrazine	2.62 oz&1 qt	0	84	84	99
Surpass&Aim+atrazine+ NIS+28% N	2.5 pt&.33 oz+1 qt+ .25%+2 qt	0	82	82	99
Surpass&Hornet WDG+ NIS+28% N	2.5 pt&3 oz+ .25%+2 qt	0	86	85	99
PREEMERGENCE & POSTEMERGENCE1					
Surpass&HornetWDG+ atrazine+NIS+28% N	2.5 pt&3 oz+ 1.5 pt+.25%+2 qt	0	91	88	99
Dual II Magnum&Callisto+ COC+28% N	1.67 pt&3 oz+ 1%+2 qt	0	77	78	99
Dual II Magnum&Northstar+ NIS+28% N	1.67 pt&5 oz+ .25%+2 qt	0	81	80	99
Dual II Magnum&Tough 5L+ atrazine+COC+28% N	1.67 pt&1 pt+ 1 pt+1%+2 qt	0	77	77	99

Treatment	Rate/A	Corn % VCRR Lodging 7/28/01	% Grft 7/28/01	% Grft 9/13/01	% BDLF 9/13/01
PREEMERGENCE & POSTEMERGENCE					
Outlook&Distinct+ NIS+28% N	21 oz&6 oz+ .25%+1 qt	0	95	95	98
PREEMERGENCE & POSTEMERGENCE1					
Surpass&Accent+atrazine+ COC+28% N	2.5 pt&.33 oz+1.5 pt+ 1%+2 qt	0	98	98	99
Surpass&Accent+atrazine+ COC+28% N	1.25 pt&.67 oz+1.5 pt+ 1%+2 qt	0	96	98	99
Surpass&Accent+ COC+28% N	1.25 pt&.33 oz+ 1%+2 qt	0	96	97	97
Surpass&Accent+atrazine+ COC+28% N	1.25 pt&.33 oz+1.5 pt+ 1%+2 qt	0	95	96	97
Harness&Steadfast+ COC+28% N	1.25 pt&.75 oz+ 1%+2 qt	0	97	97	87
EARLY POSTEMERGENCE					
Prowl+Accent+Clarity+ NIS+28% N	3 pt+.33 oz+.5 pt+ .25%+2 qt	0	79	80	99
Basis+COC+28% N	.33 oz+1%+2 qt	0	78	76	87
Basis Gold+COC+28% N	14 oz+1%+2 qt	0	83	78	92
POSTEMERGENCE					
Accent+COC+28% N	.67 oz+1%+2 qt	0	81	76	65
Steadfast+COC+28% N	.75 oz+1%+2 qt	0	86	78	72
Accent Gold+COC+28% N	2.9 oz+1%+2 qt	0	85	82	82
Accent Gold+atrazine+ COC+28% N	2.9 oz+1.5 pt+ 1%+2 qt	0	84	82	96
Celebrity Plus+NIS+28% N	4.7 oz+.25%+2 qt	0	82	80	98
Accent+atrazine+Aim+ COC+28% N	.67 oz+1.5 pt+.33 oz+ 1%+2 qt	0	73	65	99
Accent+Northstar+ NIS+28% N	.67 oz+5 oz+ .25%+2 qt	0	82	80	90
Aim+Accent+atrazine+ COC+28% N	.33 oz+.67 oz+1 pt+ 1%+2 qt	0	77	74	99

Table 2. Herbicide Tolerant Corn

Demonstration
Variety: Asgrow RX445RR, Pioneer 37H26 LL, and Pioneer 37M38 IMI
Planting Date: 5/9/01
PRE: 5/9/01
EPOST: 6/16/01
POST: 6/26/01
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:

PRE:	1st week	0.02 inches
	2nd week	0.89 inches
EPOST:	1st week	0.41 inches
	2nd week	0.01 inches
POST:	1st week	0.03 inches
	2nd week	0.00 inches

Grft=Green foxtail
BDLF=Wild buckwheat, wild mustard, and redroot pigweed

COMMENTS: Varieties planted: Asgrow RX445RR, Pioneer 37H26 LL, Pioneer 37M38IMI. Uniform, moderate weed pressure. Excellent weed control for most treatments. Note lodging evaluations were not associated with growth regulator herbicide in these treatments.

Treatment	Rate/A	Corn % Lodging 7/28/01	% Grft 7/28/01	% Grft 9/13/01	% BDLF 9/13/01
	PIONEER 37H26LL				
Check	----	0	0	0	0
PREEMERGENCE & POSTEMERGENCE					
Balance Pro&Liberty+AMS	1.87 oz&28 oz+3 lb	0	96	98	99
Surpass&Liberty+ atrazine+AMS	2.5 pt&96 oz+ 1.5 pt+3 lb	0	98	98	99
EARLY POSTEMERGENCE					
Liberty+atrazine+AMS	32 oz+1 pt+3 lb	0	81	80	88
Liberty+AMS	32 oz+3 lb	5	77	75	82
POSTEMERGENCE					
Liberty+atrazine+AMS	32 oz+1 pt+3 lb	0	90	92	95
EARLY POSTEMERGENCE & POSTEMERGENCE					
Liberty+atrazine+AMS& Liberty+AMS	24 oz+1 pt+3 lb& 24 oz+3 lb	0	95	97	99
	PIONEER 37M38 IMI				
Check	----	0	0	0	0
EARLY POSTEMERGENCE					
Lightning+NIS+28% N	1.28 oz+.25%+2 qt	0	98	98	55
Lightning+Clarity+ NIS+28% N	1.28 oz+.5 pt+ .25%+1 qt	15	97	97	98
Lightning+atrazine+ NIS+28% N	1.28 oz+1.5 pt+ .25%+1 qt	20	98	96	98

2001 Herbicide Tolerant Corn
Northeast Research Farm
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Treatment	Rate/A	Corn % Lodging 7/28/01	% Grft 7/28/01	% Grft 9/13/01	% BDLF
EARLY POSTEMERGENCE					
Lightning+Distinct+ NIS+28% N	1.28 oz+4 oz+ .25%+1 qt	25	99	98	99
PREEMERGENCE & EARLY POSTEMERGENCE					
Surpass&Lightning+ atrazine+NIS+28% N	2.5 pt&3.84 oz+ 1.5 pt+.25%+1 qt	20	99	99	99
PREEMERGENCE & POSTEMERGENCE					
Outlook&Lightning+ Marksman+NIS+28% N	11 oz&1.28 oz+ 2 pt+.25%+1 qt	20	98	98	99
	PIONEER RX445RR				
Check	----	0	0	0	0
EARLY POSTEMERGENCE					
Roundup Ultramax+AMS	26 oz+2 lb	0	86	85	98
Harness+ Roundup Ultramax+AMS	2.3 pt+ 26 oz+2 lb	0	96	97	99
POSTEMERGENCE					
Roundup Ultramax+AMS	26 oz+2 lb	0	97	98	99
EARLY POSTEMERGENCE & POSTEMERGENCE					
Roundup Ultramax+AMS& Roundup Ultramax+AMS	26 oz+2 lb& 24 oz+2 lb	0	96	96	99
ReadyMaster ATZ+AMS& Roundup Ultramax+AMS	2 qt+2 lb& 26 oz+2 lb	0	98	98	99
PREEMERGENCE & POSTEMERGENCE					
Harness& Roundup Ultramax+AMS	1 pt& 26 oz+2 lb	0	99	98	99
Harness& Roundup Ultramax+AMS	2.3 pt& 26 oz+2 lb	0	98	99	99
Atrazine& Roundup Ultramax+AMS	1.5 qt& 26 oz+2 lb	0	97	97	99
Dual II Magnum& Touchdown 3L+AMS	1.67 pt& 1 qt+2 lb	0	98	98	99
Surpass& Glyphomax Plus+AMS	2.75 pt& 1 pt+2 lb	0	98	96	99
Surpass&Roundup Ultramax+ atrazine+AMS	2.5 pt&78 oz+ 1.5 pt+2 lb	0	97	97	99

Table 3. Rates of Pre Products in Corn

Demonstration
Planting Date: 5/11/01
Variety: Asgrow RX45RR
PRE: 5/11/01
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:
PRE: 1st week 0.02 inches
2nd week 0.96 inches

Yeft=Yellow foxtail
Rrpw=Redroot pigweed

COMMENTS: Purpose to evaluate performance of preemergence "grass" herbicides at reduced rates. Grass control was reduced with lower rates. Surpass provided the highest grass control. Pigweed control was less for all treatments.

Treatment	Rate/A	% Yeft 7/28/01	% Rrpw 7/28/01
Check	----	0	0
PREEMERGENCE			
Define (Full)	18 oz	64	47
Dual II Magnum (Full)	1.67 pt	76	54
Surpass (Full)	2.5 pt	89	76
Outlook (Full)	21 oz	68	65
Define (2/3)	12 oz	58	58
Dual II Magnum (2/3)	1.12 pt	53	58
Surpass (2/3)	1.675 pt	75	63
Outlook (2/3)	14 oz	72	63
Define (1/2)	9 oz	48	52
Dual II Magnum (1/2)	.84 pt	57	43
Surpass (1/2)	1.25 pt	75	48
Outlook (1/2)	10.5 oz	66	40

Table 4. Weed Control Programs in Corn

RCB; 4 reps
Planting Date: 5/9/01
Variety: Asgrow RX445RR
PRE: 5/9/01
POST: 6/26/01

Precipitation:

PRE:	1st week	0.02 inches
	2nd week	0.89 inches
POST:	1st week	0.03 inches
	2nd week	0.00 inches

VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Colq=Common lambsquarter

COMMENTS: Comparison of postemergence programs over Dual preemergence. Uniform, moderate weed pressure. All treatments gave excellent lambsquarter control. Northstar + Accent provided the best late season yellow foxtail ratings. All treatments increased yield over check (20-30 bu/A).

Treatment	Rate/A	Corn % VCRR 7/12/01	% Yeft 7/12/01	% Yeft 8/28/01	% Colq 8/28/01	Corn Yield bu/A
Check	----	0	0	0	0	97
PREEMERGENCE & POSTEMERGENCE						
Dual II Magnum&Callisto+ COC+28% N	2 pt&3 oz+ 1%+2 qt	0	79	78	98	124
Dual II Magnum&Callisto+ Atrazine+COC+28% N	2 pt&3 oz+ 1 pt+1%+2 qt	0	94	90	98	129
Dual II Magnum+Atrazine& Callisto+COC+28% N	1.8 pt+1.5 pt& 3 oz+1%+2 qt	0	87	86	98	129
Dual II Magnum&Northstar+ COC+28% N	2 pt&5 oz+ 1%+2 qt	0	88	88	98	121
Dual II Magnum&Northstar+ Atrazine+COC+28% N	2 pt&5 oz+ 1 pt+1%+2 qt	0	85	83	98	123
Dual II Magnum&Northstar+ Accent+COC+28% N	2 pt&5 oz+ .33 oz+1%+2 qt	0	83	96	99	123
Dual II Magnum+Atrazine& Northstar+COC+28% N	1.8 pt+1.5 pt& 5 oz+1%+2 qt	0	90	90	98	134
LSD (.05)		0	4	4	0	15

Table 5. Weed Control in Corn

RCB; 4 reps
Planting Date: 5/9/01
Variety: Pioneer 37M38
PRE: 5/9/01
EPOST: 6/16/01
POST: 6/26/01

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

Precipitation:

PRE:	1st week	0.02 inches
	2nd week	0.89 inches
EPOST:	1st week	0.41 inches
	2nd week	0.01 inches
POST:	1st week	0.03 inches
	2nd week	0.00 inches

Yeft=Yellow foxtail
Colq=Common lambsquarter

COMMENTS: Early postemergence timing provided greater grass control than postemergence timing. Grass was large at late post. All treatments yielded more than the check.

Treatment	Rate/A	Corn % VCRR 7/12/01	% Yeft 7/12/01	% Yeft 8/28/01	% Colq 8/28/01	Corn Yield bu/A
Check	----	0	0	0	0	105
PREEMERGENCE & EARLY POSTEMERGENCE						
Outlook&Marksman+AMS	21 oz&3.5 pt+2 lb	0	82	77	98	138
Outlook&Clarity+AMS	21 oz&16 oz+2 lb	0	75	75	98	132
PREEMERGENCE & POSTEMERGENCE						
Outlook&Distinct+ NIS+AMS	21 oz&6 oz+ .25%+2 lb	0	81	79	98	139
Outlook&Celebrity Plus+ NIS+AMS	10 oz&4.7 oz+ .25%+2 lb	0	73	95	98	135
Outlook&Lightning+ Distinct+NIS+AMS	10 oz&1.28 oz+ 4 oz+.25%+2 lb	0	80	95	98	137
POSTEMERGENCE						
Lightning+Distinct+ NIS+AMS	1.28 oz+4 oz+ .25%+2 lb	0	58	96	99	129
Celebrity Plus+NIS+AMS	4.7 oz+.25%+2 lb	0	65	86	98	129
EARLY POSTEMERGENCE						
Lightning+Marksman+ NIS+AMS	1.28 oz+2.5 pt+ .25%+2 lb	0	91	86	98	139
Define+atrazine+ COC+28% N	12 oz+1.5 pt+ 1%+2 qt	0	66	66	98	133
PREEMERGENCE & POSTEMERGENCE						
Axiom&Hornet WDG+ NIS+28% N	22 oz&3 oz+ .25%+2 qt	0	90	77	98	137
USA 2001&Hornet WDG+ NIS+28% N	13 oz&3 oz+ .25%+2 qt	0	83	75	98	132
Epic&Hornet WDG+ NIS+28% N	13 oz&3 oz+ .25%+2 qt	0	85	74	98	139
LSD (.05)		0	7	5	0	9

Table 6. Soybean Herbicide Demonstration

Demonstration
Variety: NK S14-M7
Planting Date: 5/26/01
PPI/PRE: 5/26/01
EPOST: 6/26/01
POST: 6/28/01
Soil: Clay loam; 3.9% OM; 6.2 pH

Precipitation:

PPI/PRE:	1st week	0.53 inches
	2nd week	1.42 inches
EPOST:	1st week	0.03 inches
	2nd week	0.00 inches
POST:	1st week	0.03 inches
	2nd week	0.00 inches

Yeft=Yellow foxtail
Rrpw=Redroot pigweed
Colq=Common lambsquarter

COMMENTS: Very light weed pressure. Excellent crop growth and canopy. Foxtail = 62 ft^2. Excellent control for most treatments. Low rates of foundation treatments required sequential postemerge.

Treatment	Rate/A	% Yeft 7/28/01	% Rrpw 7/28/01	% Colq 7/28/01	% Yeft 9/13/01
Check	----	0	0	0	0
PREPLANT INCORPORATED					
Treflan	1.5 pt	94	92	90	98
Sonalan	2.67 pt	96	95	97	98
Prowl	3 pt	92	93	95	92
Treflan+Sencor	1.5 pt+.5 lb	90	96	99	95
Treflan+Authority	1.5 pt+4 oz	92	97	99	96
PREPLANT INCORPORATED & PREEMERGENCE					
Treflan&Authority	1.5 pt&4 oz	94	98	99	94
PREPLANT INCORPORATED & POSTEMERGENCE					
Prowl&Pursuit DG+ MSO+28% N	2.5 pt&1.44 oz+ 1 qt+1 qt	99	99	96	99
Prowl&Raptor+ MSO+28% N	2.5 pt&4 oz+ 1 qt+1 qt	99	99	97	99
Prowl&Raptor+FirstRate+ MSO+28% N	2.5 pt&4 oz+.3 oz+ 1 qt+1 qt	99	99	99	99
Prowl&Raptor+FirstRate+ MSO+28% N	2.5 pt&2 oz+.3 oz+ 1 qt+1 qt	98	99	99	99
Prowl&Pursuit DG+FirstRate+ MSO+28% N	2.5 pt&.72 oz+.3 oz+ 1 qt+1 qt	99	99	99	99
Prowl&Pursuit DG+Flexstar+ MSO+28% N	2.5 pt&.72 oz+10 oz+ 1 qt+1 qt	97	99	99	98
Prowl&Raptor+Flexstar+ MSO+28% N	2.5 pt&4 oz+10 oz+ 1 qt+1 qt	96	99	99	97
Treflan&FirstRate+ MSO+28% N	1.5 pt&.3 oz+ 1 qt+1 qt	98	99	99	99
Treflan&FirstRate+Flexstar+ MSO+28% N	1.5 pt&.3 oz+10 oz+ 1 qt+1 qt	92	99	99	96

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Treatment	Rate/A	% Yeft 7/28/01	% Rrpw 7/28/01	% Colq 7/28/01	% Yeft 9/13/01
PREEMERGENCE					
Gauntlet	4A/pkt	78	99	99	45
Command Xtra	10A/pkt	83	98	99	80
FirstRate	.75 oz	20	91	98	10
Axiom	13 oz	45	79	95	20
Domain	14 oz	89	91	99	90
Boundary	2.5 pt	91	99	99	94
Boundary+Authority	1.5 pt+4 oz	94	99	99	92
PREEMERGENCE & POSTEMERGENCE					
Valor&Poast Plus+COC	3 oz&1.5 pt+1 qt	96	96	99	99
Valor+Python&	3 oz+1 oz&				
Poast Plus+COC	1.5 pt+1 qt	98	97	99	98
Authority+Lorox&	4 oz+24 oz&				
Assure II+COC	7 oz+1 qt	98	86	98	99
Gauntlet&Poast Plus+COC	4A/pkt&1.5 pt+1 qt	99	92	99	99
Command Xtra&	10A/pkt&				
Poast Plus+COC	1.5 pt+1 qt	99	91	98	99
EARLY POSTEMERGENCE & POSTEMERGENCE					
Poast Plus+COC&	1.5 pt+1 qt&				
Basagran+COC	1 qt+1 qt	98	45	98	98
Poast Plus+COC&	1.5 pt+1 qt&				
Ultra Blazer+NIS	1.5 pt+.25%	98	65	70	98
Poast Plus+COC&	1.5 pt+1 qt&				
Cobra+COC	.8 pt+1 pt	99	60	75	98
Poast Plus+COC&	1.5 pt+1 qt&				
Phoenix+COC	.8 pt+1 pt	99	65	60	98
Poast Plus+COC&	1.5 pt+1 qt&				
Flexstar+MSO+28% N	12 oz+1 qt+1 qt	98	50	78	98
Poast Plus+COC&	1.5 pt+1 qt&				
Flexstar+MSO+28% N	16 oz+1 qt+1 qt	98	74	75	98
Poast Plus+COC&	1.5 pt+1 qt&				
FirstRate+MSO+28% N	.3 oz+1 qt+1 qt	99	40	97	98
Poast Plus+COC&	1.5 pt+1 qt&				
Harmony GT+NIS	.083 oz+.25%	96	97	91	98
Poast Plus+COC&	1.5 pt+1 qt&				
Synchrony+NIS+28% N	.25 oz+.25%+1 qt	97	98	85	98
Poast Plus+COC&	1.5 pt+1 qt&				
Basagran+Pursuit DG+COC	1 pt+.72 oz+1 qt	96	89	81	96
Plust Plus+COC&Pursuit DG+	1.5 pt+1 qt&1.44 oz+				
Cobra+MSO+28% N	6 oz+1 pt+1 qt	97	98	55	97
Poast Plus+COC&Flexstar+	1.5 pt+1 qt&12 oz+				
Pursuit DG+MSO+28% N	.72 oz+1 qt+2 qt	98	99	68	98

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Treatment	Rate/A	% Yeft 7/28/01	% Rrpw 7/28/01	% Colq 7/28/01	% Yeft 9/13/01
EARLY POSTEMERGENCE					
Select+Flexstar+ MSO+28% N	7 oz+12 oz+ 1 qt+1 qt	98	83	95	99
Fusion+Flexstar+ MSO+28% N	10 oz+12 oz+ 1 qt+1 qt	81	78	89	78
FirstRate+Flexstar+Select+ MSO+28% N	.3 oz+10 oz+6 oz+ 1 qt+1 qt	96	60	70	88
Flexstar+Fusion+ Harmony GT+MSO+28% N	10 oz+10 oz+ .04 oz+1 qt+1 qt	76	70	82	40
Raptor+MSO+28% N	5 oz+1 qt+1 qt	83	93	87	82
Pursuit DG+MSO+28% N	1.44 oz+1 qt+1 qt	96	98	79	90
Raptor+Flexstar+ MSO+28% N	4 oz+8 oz+ 1 qt+1 qt	80	82	84	82
Raptor+Flexstar+ MSO+28% N	4 oz+12 oz+ 1 qt+1 qt	78	88	89	82
Raptor+FirstRate+ MSO+28% N	4 oz+.3 oz+ 1 qt+1 qt	96	93	86	84
Pursuit DG+FirstRate+ MSO+28% N	1.44 oz+.3 oz+ 1 qt+1 qt	98	97	89	90
Poast Plus+Pursuit DG+ FirstRate+Flexstar+ Resource+MSO+ NIS+28% N	.56 pt+.36 oz+ .075 oz+4 oz+ 1 oz+.25%+ .063%+1 pt	72	94	91	20
Check	----	0	0	0	0

Table 7. Herbicide Tolerant Soybeans

Demonstration	Precipitation:		
Planting Date: 5/26/01	PPI/PRE:	1st week	0.53 inches
Variety: NK S14M7		2nd week	1.42 inches
PPI/PRE: 5/26/01	EPOST:	1st week	0.03 inches
EPOST: 6/28/01		2nd week	0.00 inches
POST: 7/2/01	POST:	1st week	0.02 inches
Soil: Clay loam; 3.9% OM; 6.2 pH		2nd week	0.00 inches

VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Rrpw=Redroot pigweed

COMMENTS: Moderate foxtail (62/ft^2) and pigweed in plot area. All treatments provided nearly complete control. Excellent crop canopy.

Treatment	Rate/A	Soybean % VCRR 7/31/01	% Yeft 7/31/01	% Rrpw 7/31/01	% Yeft 9/13/01	% Rrpw 9/13/01
Check	----	0	0	0	0	0
EARLY POSTEMERGENCE						
Roundup Ultramax+AMS	.8 pt+2 lb	0	98	99	99	97
Roundup Ultramax+AMS	.8 qt+2 lb	0	99	99	99	99
Extreme+NIS+AMS	1.5 qt+.25%+2 lb	0	99	99	99	99
Extreme+Flexstar+ NIS+AMS	1.5 qt+12 oz+ .25%+2 lb	5	99	98	99	99
EARLY POSTEMERGENCE & POSTEMERGENCE						
Roundup Ultramax+AMS& Roundup Ultramax+AMS	.8 pt+2 lb& .8 pt+2 lb	0	98	99	99	99
PREPLANT INCORPORATED & POSTEMERGENCE						
Treflan& Roundup Ultramax+AMS	1.5 pt& .8 pt+2 lb	0	99	99	99	99
Prowl&Extreme+ NIS+AMS	2.5 pt&1.5 qt+ .25%+2 lb	5	99	99	99	99
PREEMERGENCE & POSTEMERGENCE						
Authority& Roundup Ultramax+AMS	4 oz& 1.2 pt+2 lb	0	99	99	99	99
Command 3ME& Roundup Ultramax+AMS	2 pt& 1.2 pt+2 lb	0	99	99	99	99
Python& Glyphomax Plus+AMS	1 oz& 1.5 pt+2 lb	0	99	99	99	99
Axiom& Roundup Ultramax+AMS	13 oz& 1.2 pt+2 lb	0	99	99	99	99
Domain& Roundup Ultramax+AMS	12 oz& 1.2 pt+2 lb	0	99	99	99	99

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Treatment	Rate/A	Soybean % VCRR 7/31/01	% Yeft 7/31/01	% Rrpw 7/31/01	% Yeft 9/13/01	% Rrpw 9/13/01
PREEMERGENCE & POSTEMERGENCE						
Domain+Authority&	9 oz+4 oz&					
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99	99	99
Boundary&	1.25 pt&					
Touchdown 3L+AMS	1.5 pt+2 lb	0	99	99	99	99
Gauntlet&	4A/pkt&					
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99	99	99
Valor&	2 oz&					
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99	99	99
Frontier&	20 oz&					
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99	99	99
EARLY POSTEMERGENCE						
Frontier+	20 oz+					
Roundup Ultramax+AMS	1.2 pt+2 lb	0	98	99	99	99
POSTEMERGENCE						
Roundup Ultramax+	1.2 pt+					
Resource+AMS	4 oz+2 lb	5	97	98	99	99
Roundup Ultramax+	.8 pt+					
Cobra+AMS	10 oz+2 lb	5	90	98	97	99
Roundup Ultramax+	.8 pt+					
Synchrony+AMS	.25 oz+2 lb	5	98	99	99	99
Roundup Ultramax+	.8 pt+					
Flexstar+AMS	8 oz+2 lb	5	97	99	99	99
Roundup Ultramax+	.8 pt+					
Supporrt+AMS	.5 oz+1 lb	5	96	99	98	99
Glyphomax Plus+	1.5 pt+					
FirstRate+AMS	.3 oz+2 lb	5	97	99	99	99
EARLY POSTEMERGENCE & POSTEMERGENCE						
Roundup Ultramax+AMS&	.8 qt+2 lb&					
Roundup Ultramax+AMS	.8 qt+2 lb	5	98	99	99	99
Roundup Ultradry+AMS&	1.2 lb+2 lb&					
Roundup Ultradry+AMS	1.2 lb+2 lb	0	99	99	99	99
Touchdown 3L+AMS&	1 qt+2 lb&					
Touchdown 3L+AMS	1 qt+2 lb	0	99	99	99	99
Glyphomax Plus+AMS&	1 qt+2 lb&					
Glyphomax Plus+AMS	1 qt+2 lb	0	99	99	99	99
Glyfos X-tra+AMS&	1 qt+2 lb&					
Glyfos X-tra+AMS	1 qt+2 lb	0	99	99	99	99

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Treatment	Rate/A	Soybean % VCRR 7/31/01	% Yeft 7/31/01	% Rrpw 7/31/01	% Yeft 9/13/01	% Rrpw 9/13/01
POSTEMERGENCE						
Roundup Ultramax (2X)+AMS	1.6 qt+2 lb	5	97	98	99	99
Roundup Ultradry (2X)+AMS	2.4 lb+2 lb	10	98	99	99	99
Touchdown 3L (2X)+AMS	2 qt+2 lb	5	99	99	99	99
Glyphomax Plus (2X)+AMS	2 qt+2 lb	0	99	99	99	99
Glyfos X-tra (2X)+AMS	2 qt+2 lb	0	98	99	99	99
EARLY POSTEMERGENCE & POSTEMERGENCE						
Roundup Ultramax+AMS&	.8 qt+2 lb&					
Roundup Ultramax(4X)+AMS	3.2 qt+2 lb	0	99	99	99	99
Roundup Ultradry+AMS&	1.2 lb+2 lb&					
Roundup Ultradry(4X)+AMS	4.8 lb+2 lb	0	99	99	99	99
Touchdown 3L+AMS&	1 qt+2 lb&					
Touchdown 3L(4X)+AMS	4 qt+2 lb	0	99	99	99	99
Glyphomax Plus+AMS&	1 qt+2 lb&					
Glyphomax Plus(4X)+AMS	4 qt+2 lb	0	99	99	99	99
Glyfos X-tra+AMS&	1 qt+2 lb&					
Glyfos X-tra+AMS	4 qt+2 lb	0	99	99	99	99

Table 8. Weed Control with Glyphomax Programs in Soybeans

RCB; 4 reps
Planting Date: 5/26/01
Variety: NK S14-M7
PPI/PRE: 5/26/01
POST: 6/28/01
Soil: Clay loam; 3.9% OM; 6.2 pH

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

Precipitation:

PPI/PRE:	1st week	0.53 inches
	2nd week	1.42 inches
POST:	1st week	0.03 inches
	2nd week	0.06 inches

Yeft=Yellow foxtail
Rrpw=Redroot pigweed

COMMENTS: Comparisons of broadleaf systems with Glyphomax Plus. Uniform site, moderate weed pressure. All treatments provided excellent control. Yield response over check 10 bu/A.

Treatment	Rate/A	Soybean % VCRR 7/31/01	% Yeft 7/31/01	% Rrpw 7/31/01	Soybean Yield bu/A
Check	----	0	0	0	20
PREEMERGENCE & POSTEMERGENCE					
Python&Glyphomax Plus+AMS	1 oz&1 qt+2 lb	1	99	99	31
Python&FirstRate+Select+ Cobra+COC+AMS	1 oz&.3 oz+6 oz+ 6 oz+1 pt+2 lb	1	97	94	31
POSTEMERGENCE					
Glyphomax Plus+FirstRate+AMS	1 qt+.3 oz+2 lb	5	99	99	30
PREEMERGENCE & POSTEMERGENCE					
Gauntlet&Glyphomax Plus+AMS	4A/pkt&1.5 pt+2 lb	0	97	99	32
Gauntlet&Glyphomax Plus+AMS	5A/pkt&1.5 pt+2 lb	0	99	99	34
PREPLANT INCORPORATED					
Gauntlet+Treflan	4A/pkt+1.5 pt	1	97	99	32
LSD (.05)		3	3	2	3

Table 9. Glyphosate Comparisons in Roundup Ready Soybeans

RCB; 4 reps
Planting Date: 5/26/01
Variety: NK S14-M7
EPOST: 6/28/01
POST: 7/5/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

EPOST:	1st week	0.03 inches
	2nd week	0.00 inches
POST:	1st week	0.00 inches
	2nd week	0.33 inches

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

Grft=Green foxtail
Rrpw=Redroot pigweed

COMMENTS: Comparison of glyphosate treatments in uniform test area. No apparent crop response noted as chlorotic leaf blotching or stunting. Moderate weed pressure. Excellent weed control for treatments. Very limited late weed flush; excellent canopy. Yield response over Check 20 bu/A.

Treatment	Rate/A	Soybean % VCRR 7/10/01	% Grft 8/5/01	% Rrpw 8/5/01	Soybean Yield bu/A
Check	----	0	0	0	9
EARLY POSTEMERGENCE					
Touchdown 3L+AMS	1 pt+8.5 lb/100 gal	0	97	98	32
Touchdown 3L+AMS	2 pt+8.5 lb/100 gal	0	99	97	34
Touchdown 3L+AMS	4 pt+8.5 lb/100 gal	0	98	99	37
Touchdown 3L	2 pt	0	97	98	36
Touchdown 3L	35.2 oz	0	98	98	34
Roundup Ultramax+AMS	.8 pt+8.5 lb/100 gal	0	95	97	33
Roundup Ultramax+AMS	1.6 pt+8.5 lb/100 gal	0	96	98	31
Roundup Ultramax+AMS	3.2 pt+8.5 lb/100 gal	1	98	99	37
POSTEMERGENCE					
Touchdown 3L+AMS	1 pt+8.5 lb/100 gal	0	93	97	30
Touchdown 3L	2 pt	0	95	97	30
Touchdown 3L+AMS	2 pt+4.25 lb/100 gal	0	95	95	33
Touchdown 3L+AMS	2 pt+8.5 lb/100 gal	0	97	97	32
Touchdown 3L+AMS	2 pt+12.7 lb/100 gal	0	97	97	34
Touchdown 3L+AMS	2 pt+17 lb/100 gal	0	96	97	36
Touchdown 3L	35.2 oz	0	96	96	34
Touchdown 3L+AMS	4 pt+8.5 lb/100 gal	1	95	95	31
Roundup Ultramax+AMS	.8 pt+8.5 lb/100 gal	0	93	95	30
Roundup Ultramax+AMS	1.6 pt+8.5 lb/100 gal	0	97	98	34
Roundup Ultramax+AMS	3.2 pt+8.5 lb/100 gal	0	98	96	32
LSD (.05)		1	4	3	7

Table 10. Weed Control Programs in Soybeans

RCB; 4 reps
Planting Date: 5/26/01
Variety: NK S14-M7
PPI/PRE: 5/26/01
EPOST: 6/28/01
POST: 7/2/01
Soil: Clay loam; 3.9% OM; 6.2 pH

Precipitation:

PPI/PRE:	1st week	0.53 inches
	2nd week	1.42 inches
EPOST:	1st week	0.03 inches
2nd week	0.00 inches	
POST:	1st week	0.02 inches
	2nd week	0.00 inches

VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Colq=Common lambquarter

COMMENTS: Significant foxtail competition. Control was generally satisfactory considering weed size. Maturity delay compared to check; appears the check may have matured early due to weed competition; herbicide effect on maturity may not be significant.

Treatment	Rate/A	Soybean % VCRR Stunt 7/31/01	% Yeft 7/31/01	% Colq 7/31/01	Soybean % VCRR Delay 9/5/01	Soybean Yield bu/A
Check	----	0	0	0	0.0	18
PREPLANT INCORPORATED & POSTEMERGENCE						
Prowl&Pursuit DG+ Ultra Blazer+MSO+AMS	3.6 pt&1.44 oz+ 12 oz+1%+2 lb	0	96	98	3.8	33
PREPLANT INCORPORATED						
Prowl+Raptor+ Ultra Blazer+MSO+AMS	3.6 pt+4 oz+ 12 oz+1%+2 lb	0	96	99	3.5	33
EARLY POSTEMERGENCE						
Raptor+Ultra Blazer+ MSO+AMS	5 oz+12 oz+ 1%+2 lb	9	76	98	3.3	26
Outlook+Raptor+ Ultra Blazer+NIS+AMS	8 oz+5 oz+ 8 oz+.25%+2 lb	6	72	97	3.3	26
Outlook+Raptor+ Ultra Blazer+NIS+AMS	12 oz+5 oz+ 8 oz+.25%+2 lb	10	73	99	2.3	25
PREEMERGENCE & POSTEMERGENCE						
Authority&Pursuit DG+ Outlook+NIS+AMS	3 oz&1.44 oz+ 12 oz+.25%+2 lb	9	80	98	3.0	26
PREPLANT INCORPORATED & POSTEMERGENCE						
Prowl&Extreme+ NIS+AMS	3.6 pt&3 pt+ .25%+2 lb	0	95	97	3.0	30
Pursuit Plus& Roundup Ultramax+AMS	2.5 pt& .8 qt+2 lb	0	99	99	2.0	35
EARLY POSTEMERGENCE						
Extreme+NIS+AMS	3 pt+.25%+2 lb	0	98	99	3.0	33
Outlook+Extreme+ NIS+AMS	8 oz+3 pt+ .25%+2 lb	0	99	99	3.0	31
Outlook+Extreme+ NIS+AMS	12 oz+3 pt+ .25%+2 lb	0	98	99	3.0	31
LSD (.05)		3	5	2	0.69	5

Table 11. Raptor plus Adjuvants

RCB; 4 reps
Planting Date: 5/26/01
Variety: NK S14-M7
POST: 7/9/01
Soil: Clay loam; 3.9% OM; 6.2 pH

Precipitation:
POST: 1st week 0.33 inches
2nd week 1.33 inches

Yeft=Yellow foxtail
Rrpw=Redroot pigweed

COMMENTS: Evaluation of adjuvants with low rate of Raptor. Large yellow foxtail and redroot pigweed used as the screen weeds. Most effective additive treatments provided 10 to 15% greater control.

Treatment	Rate/A	% Yeft 7/31/01	% Rrpw 7/31/01
Check	----	0	0
POSTEMERGENCE			
Raptor+Destiny+AMS	5 oz+1%+1 lb	68	87
Raptor+Destiny+AMS	4 oz+1%+1 lb	62	83
Raptor+Advance ESO+AMS	4 oz+1%+1 lb	57	82
Raptor+Prime Oil+AMS	4 oz+1%+1 lb	60	83
Raptor+Hi-Per-Oil+AMS	4 oz+.5%+1 lb	45	73
Raptor+Class Act Next Gen.	4 oz+2.5%	51	77
Raptor+AG01023+AMS	4 oz+.5%+1 lb	61	85
Raptor+AG01017+AMS	4 oz+.5%+1 lb	56	78
Raptor+AG01023+AMS	4 oz+1%+1 lb	53	80
Raptor+AG01019+AMS	4 oz+.5%+1 lb	50	73
Raptor+AG01015+AMS	4 oz+1%+1 lb	51	69
LSD (.05)		10	5

Table 12. Glyphosate Additives

RCB; 4 reps
Planting Date: 5/26/01
Variety: NK S14-M7
POST: 7/5/01
Soil: Clay loam; 3.9% OM; 6.2 pH

Precipitation:
POST: 1st week 0.00 inches
2nd week 0.03 inches

Yeft=Yellow foxtail
Bygr=Barnyardgrass
Rrpw=Redroot pigweed
Wibw=Wild buckwheat

COMMENTS: Good weed pressure. Evaluation of additives with two rates of glyphosate products. Weed control was greater with high herbicide rate. Additive differences were less apparent than rate effect.

Treatment	Rate/A	% Yeft 8/17/01	% Bygr 8/17/01	% Rrpw 8/17/01	% Wibw 8/17/01	Soybean Yield bu/A
Check	----	0	0	0	0	11
POSTEMERGENCE						
Roundup Ultramax+AMS	6.5 oz+2.5%	87	74	84	82	23
Roundup Ultramax+ AG0007	6.5 oz+ 2.5%	86	68	82	85	25
Cornerstone+ Preference+AMS	8 oz+ .5%+2.5%	87	70	85	79	25
Cornerstone+ Class Act Next Gen.	8 oz+ 2.5%	90	79	85	85	26
Cornerstone+AG01021	8 oz+1.5%	90	81	85	83	24
Cornerstone+AG01015	8 oz+1%	86	74	80	83	24
Roundup Ultramax+AMS	13 oz+2.5%	97	95	98	96	25
Cornerstone+ Preference+AMS	16 oz+ .5%+2.5%	98	93	95	92	27
Cornerstone+ Class Act Next Gen.	16 oz+ 2.5%	98	97	96	97	27
LSD (.05)		6	7	5	4	3

Table 13. Soybean Spraying

RCB; 4 reps
Variety: NK S14-M7
POST: 6/28/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
POST: 1st week 0.03 inches
2nd week 0.00 inches

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

COMMENTS: Evaluation of glyphosate products and additives. Yields for all treatments were similar. There were no visual differences associated with treatments; measured differences randomly associated with natural site varieties.

Treatment	Rate/A	Soybean % VCRR Stunting 9/5/01	Soybean Yield bu/A
POSTEMERGENCE			
Roundup Ultramax	1.6 qt	1	35
Roundup Ultramax+AMS	1.6 qt+3 lb	0	36
Roundup Ultramax+AMS	1.6 qt+6 lb	0	34
Roundup Ultramax+28% N	1.6 qt+2 qt	0	38
Roundup Ultramax+COC	1.6 qt+1 qt	0	35
Touchdown 3L+AMS	2 qt+3 lb	1	37
Glyphomax Plus+AMS	2 qt+3 lb	0	36
Glyfos X-tra+AMS	2 qt+3 lb	1	36
LSD (.05)		1	7

Table 14. Weed Control in Sunflower

RCB; 4 reps
Planting Date: 5/26/01
Variety: Pioneer 63M80
PPI/PRE: 5/26/01
POST: 6/28/01

Precipitation:

PPI/PRE:	1st week	0.53 inches
	2nd week	1.42 inches
POST:	1st week	0.03 inches
	2nd week	0.00 inches

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

Yeft=Yellow foxtail
Bdlf=Wild mustard, redroot pigweed, wild buckwheat

COMMENTS: Light weed pressure. No visual crop response to treatments. Experimental Harmony GT, Buctril, or 2,4-D used for burndown did not result in visual crop injury in this test.

Treatment	Rate/A	Sunflower % VCRR Stunt 7/12/01	% Yeft 7/12/01	% BDLF 7/12/01	Sunflower % VCRR Stunt 9/13/01	% Yeft 9/13/01
Check	----	0	0	0	0	0
PREPLANT INCORPORATED						
Treflan	1.5 pt	0	86	90	0	90
Sonalan	2.67 pt	0	86	93	0	89
Prowl	3.6 pt	0	86	94	0	88
Treflan+Spartan	1.5 pt+4 oz	0	79	97	0	86
PREEMERGENCE						
Prowl+Spartan	3.6 pt+4 oz	0	75	97	0	82
Prowl	3.6 pt	0	65	92	0	75
Spartan	5.33 oz	0	40	98	0	33
PREEMERGENCE & POSTEMERGENCE						
Spartan&Poast+COC	3.5 oz&1 pt+1%	0	92	98	0	97
Spartan&Select+CCO	3.5 oz&6 oz+1%	0	93	98	0	97
Spartan+2,4-D ester& Poast+COC	3.5 oz+1 qt& 1 pt+1%	0	93	98	0	96
Spartan+Buctril& Poast+COC	3.5 oz+1.5 pt& 1 pt+1%	0	91	98	0	96
Spartan+Harmony GT& Poast+COC	3.5 oz+.6 oz& 1 pt+1%	4	93	98	3	95
LSD (.05)		1	4	2	1	3

Table 15. Weed Control in Canola

RCB; 4 reps
Planting Date: 4/30/01
Variety: See comments
PPI/PRE: 4/30/01
EPOST: 5/26/01
POST: 6/7/01
POST1: 6/28/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

PPI/PRE:	1st week	1.49 inches
	2nd week	0.00 inches
EPOST:	1st week	0.53 inches
	2nd week	1.42 inches
POST:	1st week	2.41 inches
	2nd week	0.67 inches
POST1:	1st week	0.03 inches
	2nd week	0.00 inches

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

Yeft=Yellow foxtail
BDLF=Wild mustard, redroot pigweed, wild buckwheat

COMMENTS: Varieties planted: DK27-20RR, Invigor 2663-LL, and Hylite 243CL. Double rates (2X) did not appear to reduce yield. Weed pressure was light; checks yielded equal to treatments. Late timing for Roundup reduced yield. Yield differences between varieties was apparent.

Treatment	Rate/A	Canola % VCRR Stunt 6/19/01	% Yeft 6/19/01	% BDLF 6/19/01	% Yeft 8/17/01	Canola Yield bu/A
PREPLANT INCORPORATED						
Sonalan	2.5 pt	0	98	98	96	1464
Sonalan (2X)	5 pt	9	98	98	97	1344
Treflan	2 pt	0	98	98	96	1651
Treflan (2X)	4 pt	0	97	98	94	1461
PREPLANT INCORPORATED & POSTEMERGENCE						
Treflan&Stinger	1.5 pt&.33 pt	0	96	98	93	1611
Treflan&Muster+COC	1.5 pt&.38 oz+1%	0	93	98	97	1661
SHALLOW PREPLANT INCORPORATED						
Dual II Magnum	1.6 pt	0	80	95	86	1503
Dual II Magnum (2X)	3.2 pt	1	90	97	91	1439
Outlook	21 oz	0	79	92	83	1414
Outlook (2X)	42 oz	1	92	96	87	1456
PREEMERGENCE						
Surpass	3 pt	3	84	92	79	1374
Authority	5.33 oz	9	13	98	25	1320
POSTEMERGENCE						
Assure II+COC	8 oz+1%	0	94	40	97	1564

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Treatment	Rate/A	Canola % VCRR Stunt 6/19/01	% Yeft 6/19/01	% BDLF 6/19/01	% Yeft 8/17/01	Canola Yield bu/A
Roundup Ready Check	----	0	0	0	0	1501
EARLY POSTEMERGENCE						
Roundup Ultra+AMS	1 pt+2 lb	0	99	99	98	1559
POSTEMERGENCE						
Roundup Ultra+AMS	1 pt+2 lb	0	21	67	24	1533
Roundup Ultra+AMS	2 pt+2 lb	0	97	99	99	1375
POSTEMERGENCE1						
Roundup Ultra+AMS	1 pt+2 lb	0	83	91	95	1212
Check	----	0	0	0	0	1583
EARLY POSTEMERGENCE & POSTEMERGENCE						
Roundup Ultra+AMS& Roundup Ultra+AMS	8 oz+2 lb& 8 oz+2 lb	0	99	99	99	1601
Liberty Link Check	----	0	0	0	0	1617
POSTEMERGENCE						
Liberty+AMS	34 oz+3 lb	0	90	96	92	1714
Liberty (2X)+AMS	68 oz+3 lb	0	91	96	91	1562
IMI Check	----	0	0	0	0	755
POSTEMERGENCE						
Raptor+MSO+28% N	2 oz+1.25%+1.25%	0	74	86	68	811
Raptor+MSO+28% N	4 oz+1.25%+1.25%	1	78	87	83	978
Select+Harmony GT+NIS	5 oz+.12 oz+.25%	0	77	84	75	947
Accent+MSO+AMS	.67 oz+1%+2 lb	0	78	91	68	941
LSD (.05)		4	9	9	7	185

Table 16. Weed Control in Flax Demonstration

RCB; 2 reps
Planting Date: 4/30/01
Variety: Webster
PPI/PRE: 4/30/01
POST: 6/7/01

Precipitation:

PPI/PRE:	1st week	1.49 inches
	2nd week	0.00 inches
POST:	1st week	2.41 inches
	2nd week	0.67 inches

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

Yeft=Yellow foxtail
Wimu=Wild mustard
KOCZ=Kochia

COMMENTS: Moderate weed pressure. Yield response for weed control.

Treatment	Rate/A	Flax % VCRR 7/12/01	% Yeft 7/12/01	% Wimu 7/12/01	% KOCZ 7/12/01	Flax Yield bu/A
Check	----	0	0	0	0	24
PREPLANT INCORPORATED						
Treflan	1.5 pt	0	92	0	25	25
PREEMERGENCE						
Authority	4 oz	0	15	0	82	31
POSTEMERGENCE						
MCPA ester	1 pt	0	0	98	43	27
Buctril	1 pt	0	5	93	99	29
Select+COC	6 oz+1 qt	0	96	0	0	26
Poast+COC	1 pt+1 qt	0	98	0	0	25
Poast+Buctril+COC	1 pt+1 pt+1 qt	0	96	98	92	34
Poast+Buctril	1 pt+1 pt	0	93	98	98	33
Poast+Stinger+COC	1 pt+.33 pt+1 qt	0	98	0	33	30
LSD (.05)		0	4	5	23	6

Table 17. Weed Control in Clearfield Wheat

RCB; 3 reps
Planting Date: 4/26/01
Variety: Clearfield
POST: 5/31/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
POST: 1st week 0.35 inches
2nd week 2.23 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Wibw=Wild buckwheat

COMMENTS: Excellent wheat stand, competitive crop. All treatments controlled mustard, higher rates with MSO + 28% improved yellow foxtail control but appears to have reduced crop tolerance. Wild buckwheat control was partial. Weed control tended to improve in late season; suggested to be the result of excellent late season crop growth.

Treatment	Rate/A	S. Wheat % VCRR 7/6/01	% Yeft 7/6/01	% Wibw 7/6/01	Yield bu/A
Check	----	0	0	0	52
POSTEMERGENCE					
Raptor+NIS+28% N	3 oz+.25%+2.5%	0	88	75	62
Raptor+NIS	3 oz+.25%	0	89	72	62
Raptor+MSO	3 oz+1%	0	89	74	63
Raptor+MSO+28% N	3 oz+1%+2.5%	2	96	83	56
Raptor+NIS+28% N	4 oz+.25%+2.5%	0	95	82	60
Raptor+NIS	4 oz+.25%	0	97	80	59
Raptor+MSO	4 oz+1%	0	95	83	62
Raptor+MSO+28% N	4 oz+1%+2.5%	12	97	87	51
LSD (.05)		2	5	4	6

Table 18. Foxtail Control in Clearfield Wheat

RCB; 3 reps
Planting Date: 4/26/01
Variety: Clearfield
POST: 5/31/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
POST: 1st week 0.35 inches
2nd week 2.23 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Wibw=Wild buckwheat

COMMENTS: Excellent wheat stand. Early-season treatment differences for yellow foxtail control were not apparent in late evaluations. Some combinations appeared to improve wild buckwheat control. Additive combinations with MSO tended to reduce crop tolerance.

Treatment	Rate/A	S. Wheat % VCRR 7/6/01	% Yeft 7/6/01	% Wibw 7/6/01	Yield bu/A
Check	----	0	0	0	52
POSTEMERGENCE					
Raptor+NIS+28% N	3 oz+.25%+2.5%	0	96	58	60
Raptor+NIS	3 oz+.25%	0	96	60	66
Raptor+MSO	3 oz+1%	0	97	52	62
Raptor+MSO+28% N	3 oz+1%+2.5%	3	96	53	55
Raptor+NIS	4 oz+.25%	0	96	67	58
Raptor+NIS+28% N	4 oz+.25%+2.5%	2	98	72	59
Raptor+MSO	4 oz+1%	10	96	65	51
Raptor+MSO+28% N	4 oz+1%+2.5%	10	97	77	46
Assert+NIS+28% N	1 pt+.25%+2.5%	0	93	80	58
Raptor+Assert+NIS	3 oz+1 pt+.25%	0	97	89	53
Raptor+Assert+NIS+28% N	3 oz+1 pt+.25%+2.5%	0	96	80	63
Raptor+Everest+NIS	3 oz+.5 oz+.25%	0	97	92	55
Raptor+Everest+NIS	3 oz+.6 oz+.25%	0	98	89	58
Raptor+Everest+NIS+28% N	3 oz+.5 oz+.25%+2.5%	0	95	92	60
Raptor+BAS 51435H+NIS+28% N	3 oz+2.67 oz+.25%+2.5%	0	96	55	61
Raptor+BAS 51435H+NIS+28% N	3 oz+4 oz+.25%+2.5%	0	93	58	59
Raptor+BAS 51435H+NIS+28% N	4 oz+2.67 oz+.25%+2.5%	0	97	53	58
Raptor+BAS 51435H+NIS+28% N	4 oz+4 oz+.25%+2.5%	0	98	78	51
LSD (.05)		7	3	10	12

Table 19. Crop Safety in RR Spring Wheat

RCB: 3 reps
Planting Date: 4/26/01
Variety: RR
POST: 6/7/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
POST: 1st week 2.41 inches
2nd week 0.67 inches

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

COMMENTS: Roundup Ultra applied to entire area on 5/29/01. Crop tolerance was acceptable for most treatments. Favorable crop growth may have reduced herbicide effects. Treatments with 2,4-D ester tended to be lower in yield.

Treatment	Rate/A	S. Wheat % VCRR Stunting 6/19/01	S. Wheat % VCRR Stunting 7/12/01	S. Wheat Yield bu/A
Check	----	0	0	72
POSTEMERGENCE				
Roundup Ultramax+AMS	.8 qt+2 lb	0	0	70
Roundup Ultramax+2,4-D ester+AMS	.8 qt+.5 pt+2 lb	0	0	68
Roundup Ultramax+Harmony GT+AMS	.8 qt+.5 oz+2 lb	0	0	72
Roundup Ultramax+Bronate+AMS	.8 qt+1 pt+2 lb	0	0	68
Roundup Ultramax+Clarity+AMS	.8 qt+2 oz+2 lb	10	8	68
Roundup Ultramax+Starane+AMS	.8 qt+1 pt+2 lb	0	0	72
Discover+Bronate+DSV	3.2 oz+1 pt+1%	0	0	77
Puma+Bronate	.5 pt+1 pt	0	0	73
Achieve+Bronate+Supercharge	7.2 oz+1 pt+.5%	0	0	70
Everest+Bronate+NIS	.6 oz+1 pt+.25%	8	3	72
Starane+2,4-D ester	1 pt+.5 pt	0	0	68
Bronate	1 pt	0	0	70
Harmony GT+2,4-D ester	.5 oz+.5 pt	0	0	68
2,4-D ester	.5 pt	0	0	66
Clarity	2 oz	10	5	72
LSD (.05)		1	2	5

Table 20. Weed Control in RR Spring Wheat

RCB; 3 reps
Planting Date: 4/26/01
Variety: RR
EPOST: 5/29/01
POST: 6/7/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

EPOST:	1st week	0.64 inches
	2nd week	1.49 inches
POST:	1st week	2.41 inches
	2nd week	0.67 inches

VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)
Yeft=Yellow foxtail
Wibw=Wild buckwheat

COMMENTS: Excellent crop growth. Uniform weed pressure. Dense, competitive crop growth improved late season weed evaluations.

Treatment	Rate/A	S. Wheat % VCRR 7/12/01	% Yeft 7/12/01	% Wibw 7/12/01	S. Wheat Yield bu/A
Check	----	0	0	0	58
EARLY POSTEMERGENCE					
Roundup Ultramax+AMS	.4 qt+2 lb	0	99	99	71
Roundup Ultramax+AMS	.6 qt+2 lb	0	99	99	75
Roundup Ultramax+AMS	.8 qt+2 lb	0	99	99	75
POSTEMERGENCE					
Roundup Ultramax+AMS	.4 qt+2 lb	0	98	98	73
Roundup Ultramax+AMS	.6 qt+2 lb	0	99	99	69
Roundup Ultramax+AMS	.8 qt+2 lb	0	99	99	66
EARLY POSTEMERGENCE & POSTEMERGENCE					
Roundup Ultramax+AMS& Roundup Ultramax+AMS	.4 qt+2 lb& .4 qt+2 lb	0	99	99	74
POSTEMERGENCE					
Discover+Bronate+DSV	4 oz+1 pt+1%	0	95	92	63
Puma+Bronate	.67 pt+1 pt	0	97	96	66
Achieve+Bronate+Supercharge	7.2 oz+1 pt+.5%	0	95	93	64
Everest+Bronate+NIS	.6 oz+1 pt+.25%	8	88	92	63
Roundup Ultramax+2,4-D ester+AMS	.4 qt+.5 pt+2 lb	0	99	99	65
Roundup Ultramax+Bronate+AMS	.4 qt+1 pt+2 lb	0	99	99	62
Roundup Ultramax+ Harmony GT+AMS	.4 qt+ .5 oz+2 lb	0	99	99	68
EARLY POSTEMERGENCE					
Roundup Ultramax+Clarity+AMS	.4 qt+2 oz+2 lb	0	99	99	69
Roundup Ultramax+Curtail+AMS	.4 qt+3.5 pt+2 lb	3	98	99	61
LSD (.05)		3	2	3	10

Table 21. Weed Removal in RR Spring Wheat

RCB; 3 reps
Planting Date: 4/26/01
Variety: RR
EPOST: 5/29/01
POST: 5/31/01
POST1: 6/7/01 POST1:
POST2: 6/16/01
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

EPOST:	1st week	0.64 inches
	2nd week	1.49 inches
POST:	1st week	0.35 inches
2nd week	2.41 inches	
1st week	2.41 inches	
2nd week	0.67 inches	
POST2:	1st week	0.41 inches
	2nd week	0.01 inches

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

Grft=Green foxtail
Wibw=Wild buckwheat

COMMENTS: Excellent wheat stand, very competitive. Uniform weed pressure. Late timing reduced weed control and reduced yield 10 bu/A.

Treatment	Rate/A	Timing	S. Wheat % VCRR Stunting 7/12/01	% Grft 7/12/01	% Wibw 7/12/01	Yield bu/A
Check	----	----	0	0	0	63
Roundup Ultramax+AMS	.6 qt+2 lb	EPOST POST POST1 POST2	0	99	99	72
Roundup Ultramax+AMS	.6 qt+2 lb	POST POST1 POST2	0	99	99	72
Roundup Ultramax+AMS	.6 qt+2 lb	POST1 POST2	2	99	99	70
Roundup Ultramax+AMS	.6 qt+2 lb	POST2	5	99	67	60
LSD (.05)			4	0	6	10

Fertilizer Influences on Soil Test and Soybean Yield, Watertown, SD 2001

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

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 objective is to demonstrate soil testings' ability to predict crop response to fertilizer and fertilizer influence on soil tests. The intent is to continue the experiment on the same location at the NE Experiment Station for a number of years.

Materials and Methods

The site selected at the 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. 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 by discing prior to planting. Soybean (roundup ready) was planted on May 30.

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

Results and Discussion

Soil test results from samples taken May 15, 2001, are listed in Table 2. The nitrate soil test was 23 lb/a 2 feet where no nitrogen had been applied since 1995. The residual nitrate level was 41 lb/a 2 feet where 115 lb/a N was applied in the spring of 2000. The 40 pounds of phosphorus and 50 pounds of potassium applied each year since 1996 raised the phosphorous soil test from 4 ppm in the check to 12 ppm and the potassium test from 141 ppm in the check to 180 ppm. Five pounds of zinc applied four times raised the zinc soil test from 0.68 to 3.80 ppm.

The unfertilized phosphorus soil test level of 4 ppm was in the low soil test range and 40 pounds of phosphorus would have been recommended for a 40 bushel yield goal. The phosphorus treatment, however, did not increase yields (Table 1). The zinc soil test (0.68) was in the medium range and no zinc would have been recommended since soybean does not normally respond to zinc fertilizer applications. Zinc application since 1996 raised the soil test to the very high range but did not significantly (Pr>.05) increase yield. The potassium soil test in the unfertilized plot was high and no

potassium would have been recommended. Adding potassium fertilizer in this study did not increase yield of beans (Table 1). Soybean yield in the nitrogen fertilized treatment was 27 bu per acre compared to the unfertilized treatment of 24 bu per acre. This trend of soybean yield response to nitrogen fertilizer happens occasionally but rarely results in profitable yield increases.

This site will be rotated to wheat in 2002. Similar fertilizer treatments (N rate will change) will be applied to the same plots. Yield and soil tests from the last five years of this study can be found in the 1996 to 2000 NE Farm Progress Reports or in the 1996 to 2000 SDSU Plant Science Department Soil/Water Science Research Annual Report, TB No. 99.

Table 1. Fertilizer Treatments and Soybean Yield, North East Research Farm, Watertown, 2001.

Fertilizer[1]				Soybean
N	P_2O_5	K_20	Zn	Yield .
- - - - - - - - - - - - - lb/a - - - - - - - - - - - - -				bu/a
50	40	50	5	27
0	40	50	5	24
50	0	50	5	26
50	40	0	5	26
50	40	50	0	25
Pr > F				0.09
CV%				6.3
LSD .05				NS

[1] P, K, Zn applied each year 1996-2001, N rate was 50, 95, 50, 75 and 115 lb/a for years 1996-2000.

Table 2. Soil Tests for Fertilizer Experiment at Watertown Experiment Station, 2001.

Soil Test[1]	Fertilized[2]	Unfertilized
Nitrate-N, lb/a 2 feet	41	23
Phosphorus, ppm Olson	12	4
Potassium, ppm	180	141
Zinc, ppm	3.80	0.68
pH	6.5	---
Organic Matter, %	3.4	---
Salt, mmhos/cm	0.4	---

[1] Sampled 5/15/01

[2] each year since 1996

2001 Winter Wheat Scab Fungicide Trial

M. Draper, K. Ruden, A. Ibrahim, S. Kalsbeck, and R. Little

Introduction:

Fusarium head blight (Scab or FHB) has been a recurring problem in wheat grown in South Dakota since the severe epidemic of 1993. In that year, winter wheat grown in the eastern part of the state was severely damaged. In recent years, surveys have shown periodic outbreaks of scab on winter wheat in various parts of the state. The development of FHB resistant varieties is not as advanced in winter wheat as in spring wheat. Problems inherent in the maturation of the crop pose obstacles to quick solutions to this disease through plant breeding. As such, fungicides become a very important element in the multi-faceted management program that must be followed in fields with a history of scab. Seven of the fifteen treatments included in this trial were part of a fifteen state, uniform 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). Fourteen treatments and an untreated check were included in the study and applied to two hard red winter wheat varieties, Arapahoe and Wesley. All fungicide treatments were applied at about anthesis on the main tiller (Feekes 10.51). 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 all locations. Treatments were replicated four times. Plot 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). After harvest (Table 1), treatments were compared with regard to grain yield and test weight; percent protein in the grain; proportion of tombstones or Fusarium damaged kernels (FDK) and

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

Location	Activity	Crop stage		Date
		Descriptive stage	Feekes growth	
NE Farm	Planting			September 21, 2000
	Fungicide applications	Anthesis	Feekes 10.51	June 19, 2001
	Rating	Soft dough	Feekes 11.2	July 6, 2001
	Harvest	Mature	Feekes 11.4	August 7, 2001

for the level of vomitoxin or deoxynivalenol (DON) present in the harvested grain; and percent ergot incidence in the plots. The DON content was measured with gas chromatography at North Dakota State University.

The fungicides in the trial are listed in Table 2 and included tebuconazole (Folicur), propiconazole (Tilt), and metconazole (Caramba) that have been evaluated in previous tests. New fungicides in the test included a strobilurin, BAS 505 (BASF) that has been labeled for FHB in Europe and AMS 21619 (Bayer), a product of new

chemistry that showed promising results in limited tests in North Dakota and Arkansas in 2000.

Table 2: Products, active ingredients, and rates of treatments used in 2001 FHB suppression studies.

Treatment (product)	Treatment (active ingredient)	Rate
Untreated	n/a	
Folicur + Induce	tebuconazole +NIS	4 fl oz/A + 0.125% (V/V)
AMS 21619 + Induce	proprietary + NIS	5.7 fl oz/A + 0.125 % (V/V)
BAS 505 + Induce	proprietary + NIS	2 # ai/A + 0.125 % (V/V)
BAS 505 + Folicur + Induce	proprietary + tebuconazole + NIS	0.1 # ai/A + 2 fl oz/A + 0.125% (V/V
Caramba	metconazole	13.5 fl oz/A
Tilt + Induce	propiconazole + NIS	4 fl oz/A + 0.125% (V/V)
Tilt + Induce	propiconazole + NIS	2 fl oz/A + 0.125% (V/V)
Untreated	n/a	
Folicur	tebuconazole	4 fl oz/A
28-0-0 + Folicur + Induce	N + tebuconazole + NIS	29.4 # actual N/A + 4 fl oz/A + 0.125% (V/V)
28-0-0 + Folicur	N + tebuconazole	29.4 # actual N/A + 4 fl oz/A
28-0-0 + NIS	N + NIS	29.4 # actual N/A + 0.125% (V/V)
28-0-0	N	29.4 # actual N/A

Results and Discussion:

In 2001, scab pressure in South Dakota was fairly light in the northeastern quarter of the state. A survey of spring wheat in grower's fields indicated the scab was present at about 1% field severity (scab index) for all wheat across the state. Under natural conditions, very little scab developed in the plots.

Due to dry conditions at flowering, no significant differences were observed in scab suppression from any treatment and severity of FHB was quite low. Similarly, no other factors measured in the study were found to be significantly less than the untreated check. The only treatment that showed a significant increase in yield was Folicur, tank mixed with 28-0-0, with an increase of 9.05 bu/A. Similarly, only small increases in protein content were observed. The low rate of Tilt and Folicur without surfactant each increased the protein content significantly by 0.43%. This is not a result that would be expected in most years and may be an anomaly.

Acknowledgements:

This research was supported in part by grants from the SD Wheat Commission and the National Wheat and Barley Scab Initiative.

Table 3: Results of fungicide treatment on several parameters of scab and foliar disease suppression at NE Farm. Columns reflect means of data from Arapahoe and Wesley.

Treatment	FHB Incidence[c] (%)	FHB Head Severity[d] (%)	FHB Field Severity Index[e] (%)	FDK[f] (%)	DON[g] (PPM)	Yield (bu/A)	Test Wt (lb/bu)	Protein (%)
Untreated	1.00	4.25	0.14	1.38	0.08	59.15	57.84	13.47
Folicur + NIS	1.75	5.54	0.16	1.38	0.06	67.13	58.45	13.66
AMS 21619 + NIS	0.25	0.88	0.02	1.50	0.00	66.56	58.73	13.63
BAS 505 + NIS	1.75	9.56	0.33	1.63	0.29	64.33	57.67	13.80
BAS 505 +Folicur + NIS	1.25	2.92	0.16	1.50	0.16	66.28	58.12	13.80
Caramba	1.75	8.81	0.26	1.13	0.09	64.23	57.38	13.71
Tilt + NIS	1.50	4.38	0.12	2.00	0.22	65.96	57.63	13.59
Tilt + NIS	0.75	4.38	0.09	1.63	0.10	55.06	55.80	13.90*
Untreated	1.25	10.31	0.28	1.13	0.13	56.11	55.52	13.60
Folicur	1.50	5.60	0.23	1.38	0.00	63.21	58.22	13.90*
28-0-0 + Folicur + NIS	2.25	10.25	0.29	1.25	0.00	62.22	57.74	13.68
28-0-0 + Folicur	2.75	4.08	0.26	1.63	0.19	68.20*	57.94	13.74
28-0-0 + NIS	2.25	7.27	0.32	1.50	0.09	56.64	56.69	13.29
28-0-0	2.50	9.19	0.26	1.75	0.13	58.81	57.07	13.35
LSD (0.05)	NS[g]	NS	NS	NS	NS	8.91	2.13	0.37

[a] % of infected heads, based on 50 head sample

[b] % infection of blighted heads

[c] % blighted heads X % infection on blighted heads

[d] Level of deoxynivalenol in sample, as detected by gas chromatography

[e] % of Fusarium damaged heads as evaluated by visual examination

* Indicates a significant improvement from the untreated check ($P_{0.05}$)

[f] NS indicates not significant (P=0.05) based on F protected LSD

2001 Spring Wheat Scab Foliar Fungicide Trial

M. Draper, K. Ruden, J. Rudd, R. Devkota, and G. Lammers

Introduction:

Fusarium head blight (Scab) has been a recurring problem in wheat grown in South Dakota since the severe epidemic of 1993. While scab was noted in western SD counties in 1999-2000 and north central counties in 2001, it is most often 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 and the environment in portions of the state where these crops are concentrated, losses are rarely as significant. Scab can be managed through cultural methods, variety selection and fungicides. No one fungicide has proven effective enough to 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. Seven of the fifteen treatments included in this trial were part of a fifteen state, uniform 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), Brookings and in a growers field near Groton, SD. Fourteen treatments and an untreated check were included in the study and applied to two hard red spring wheat varieties, Oxen and Ingot. All fungicide treatments were applied at about anthesis on the main tiller (Feekes 10.51). 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 all locations. Treatments were replicated six times at Groton and Brookings, but only four times at the NE Farm. Plot 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) or a 0-9 whole plot (green leaf) rating; and percent leaf rust present on the flag leaf. After harvest (Table 1), treatments were compared with regard to grain yield and test weight; percent protein in the grain; proportion of tombstones

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

Location	Activity	Crop stage		Date
		Descriptive	Feekes growth stage	
Groton	Planting			May 2, 2001
	Fungicide applications	Anthesis	Feekes 10.51	July 2, 2001
	Rating	Soft dough	Feekes 11.2	July 25, 2001
	Harvest	Mature	Feekes 11.4	August 20, 2001
NE Farm	Planting			May 12, 2001
	Fungicide applications	Anthesis	Feekes 10.51	July 6, 2001
	Rating	Soft dough	Feekes 11.2	July 25, 2001
	Harvest	Mature	Feekes 11.4	September 8, 2001
Brookings	Planting			May 3, 2001
	Fungicide applications	Anthesis	Feekes 10.51	July 2, 2001
	Rating	Soft dough	Feekes 11.2	
	Harvest	Mature	Feekes 11.4	

or Fusarium damaged kernels (FDK) and for the level of vomitoxin or deoxynivalenol (DON) present in the harvested grain; and percent ergot incidence in the plots. The DON content was measured with gas chromatography at North Dakota State University.

The fungicides in the trial are listed in Table 2 and included tebuconazole (Folicur), propiconazole (Tilt), and metconazole (Caramba) that have been evaluated in previous tests. New fungicides in the test included a strobilurin, BAS 505 (BASF) that has been labeled for FHB in Europe and AMS 21619 (Bayer), a product of new chemistry that showed promising results in limited tests in North Dakota and Arkansas in 2000.

Three biological control agents were also tested. OH 182.9 is a wild yeast that has shown anti-fungal activity and TrigoCor 1447 and SDSU-1BA are bacteria that inhibit the growth of *Fusarium graminearum* in culture.

Table 2: Products, active ingredients, and rates of treatments used in 2001 FHB suppression studies.

Treatment (product)	Treatment (active ingredient)	Rate
Untreated	n/a	
Folicur + Induce NIS	tebuconazole +NIS	4 fl oz/A + 0.125% (V/V)
AMS 21619 + Induce NIS	proprietary + NIS	5.7 fl oz/A + 0.125 % (V/V)
BAS 505 + Induce NIS	proprietary + NIS	2 # ai/A + 0.125 % (V/V)
BAS 505 + Folicur + Induce NIS	proprietary + tebuconazole + NIS	0.1 # ai/A + 2 fl oz/A + 0.125% (V/V
OH 182.9	Bio-Control	10^6 CFU/ml
Trigo-Cor 1447	Bio-Control	10^6 CFU/ml
SDSU - 1BA	Bio-Control	10^6 CFU/ml
Tilt + Induce NIS	propiconazole + NIS	4 fl oz/A + 0.125% (v/V)
Caramba	metconazole	13.5 fl oz/A
Folicur + AG01005	tebuconazole + surfactant	4 fl oz/A + 1%(V/V)
28-0-0 + Folicur + Induce NIS	N + tebuconazole + NIS	29.4 # actual N/A + 4 fl oz/A + 0.125 % (V/V)
28-0-0 + Folicur	N + tebuconazole	29.4 # actual N/A + 4 fl oz/A
28-0-0 + Induce NIS	N + NIS	29.4 # actual N/A + 0.125% (V/V)
28-0-0	N	29.4 # actual N/A

Results and Discussion:

In 2001, scab pressure in South Dakota was fairly light in the northeastern quarter of the state. A survey of spring wheat in grower's fields indicated the scab was present at about 1% field severity (scab index) across the state. Under natural conditions, very little scab developed in the plots. Results were similar at the Groton and NE Farm sites, but the Brookings site was lost due to glyphosate herbicide drift and an infestation of bluegrass billbugs, which led to a thinning of the stand and loss of tillers.

Due to dry conditions across the state, no significant differences were observed in scab suppression from any treatment at any location. Further, the very late year led to late development of leaf disease. As such, at Groton and the NE Farm, no significant reduction in leaf disease was attained.

Similarly, no other factors measured in the study were found to be significantly less than the untreated check. However, even though leaf disease did develop, there were no reductions in yield associated with any of the treatments.

Acknowledgements:

This research was supported in part by grants from the SD Wheat Commission and the National Wheat and Barley Scab Initiative.

Table 3: Results of fungicide treatment on several parameters of scab and foliar disease suppression at NE Farm. Columns reflect means of data from Oxen and Ingot.

Treatment	Whole Plot Disease[b]	Leaf Disease (% leaf area)	Leaf rust (% leaf area)	FHB Incidence[c] (%)	FHB Head Severity[d] (%)	FHB Field Severity Index[e] (%)	FDK[f] (%)	DON[g] (PPM)	Yield (bu/A)	Test Wt (lb/bu)	Protein (%)
Untreated	4.25	24.20	4.78	2.25	3.94	0.19	0.38	0.00	55.43	57.76	14.98
Folicur + NIS	3.75	18.63	3.18	1.50	3.06	0.12	0.25	0.00	53.31	58.01	14.98
AMS 21619 + NIS	4.50	32.40	3.85	1.25	4.38	0.11	0.13	0.00	53.79	57.71	14.71
BAS 505 + NIS	3.13	21.13	3.25	0.75	8.00	0.16	0.50	0.00	53.90	57.74	14.89
BAS 505 +Folicur + NIS	4.25	28.67	3.47	0.75	1.75	0.05	0.38	0.00	53.01	58.35	14.76
OH 182.9	5.50	38.13	6.25	0.50	1.75	0.04	0.50	0.00	53.99	57.77	14.40
TrigoCor 1447	5.63	40.50	7.53	0.50	5.00	0.10	0.00	0.00	54.54	57.51	14.80
SDSU - 1BA	4.88	27.63	4.90	1.25	13.00	0.29	0.38	0.00	49.32	56.78	15.03
Tilt + NIS	3.63	23.13	3.70	1.00	3.50	0.07	0.25	0.00	54.98	58.34	14.65
Caramba	4.13	31.75	2.98	2.25	5.30	0.24	0.13	0.00	54.48	56.91	15.13
Folicur + AG01005	5.50	42.75	2.50	2.25	33.56	0.71	0.00	0.00	51.49	57.99	14.85
28-0-0 + Folicur + NIS	5.00	37.88	4.50	1.00	5.13	0.17	0.00	0.00	54.97	56.50	15.36
28-0-0 + Folicur	3.88	31.25	2.10	1.25	4.38	0.11	0.00	0.00	54.14	57.85	15.26
28-0-0 + NIS	5.13	31.13	3.25	1.75	6.13	0.16	0.38	0.00	55.78	57.86	14.95
28-0-0	4.50	22.08	4.28	0.75	2.63	0.05	0.25	0.00	52.46	58.28	14.78
LSD (0.05)	NS[h]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 4: Results of fungicide treatment on several parameters of scab and foliar disease suppression at Groton. Columns reflect means of data from Oxen and Ingot.

Treatment	Whole Plot Disease[b]	Leaf Disease (% leaf area)	Leaf rust (% leaf area)	FHB Incidence[c] (%)	FHB Head Severity[d] (%)	FHB Field Severity Index[e] (%)	FDK[f] (%)	DON[g] (PPM)	Yield (bu/A)	Test Wt (lb/bu)	Protein (%)
Untreated	5.25	46.08	42.98	0.83	4.50	0.10	0.42	0.04	68.33	54.19	15.39
Folicur + NIS	6.00	47.92	26.25	0.33	3.33	0.07	0.42	0.00	72.11	54.48	14.96
AMS 21619 + NIS	7.33	80.17	34.70	1.67	12.13	0.38	0.33	0.00	65.40	54.86	15.26
BAS 505 + NIS	6.50	62.33	17.77	1.17	10.75	0.23	0.25	0.00	64.90	55.34	15.45
BAS 505 +Folicur + NIS	4.92	36.92	42.20	1.33	6.63	0.18	0.67	0.00	72.05	51.63	15.33
OH 182.9	6.17	54.75	50.78	0.67	4.50	0.09	0.33	0.00	67.86	54.76	15.23
TrigoCor 1447	6.58	68.58	59.08	1.33	3.50	0.14	0.58	0.00	70.18	53.36	15.35
SDSU - 1BA	5.42	45.75	26.58	0.50	2.92	0.06	0.50	0.00	69.13	53.67	15.33
Tilt + NIS	5.08	42.42	51.15	1.50	4.83	0.21	0.42	0.00	68.41	54.03	15.20
Caramba	6.00	58.58	50.82	1.00	5.47	0.15	0.58	0.00	67.07	54.72	15.43
Folicur + AG01005	4.67	33.25	42.90	1.00	5.08	0.14	0.33	0.00	68.06	54.75	15.48
28-0-0 + Folicur + NIS	4.17	29.43	18.02	0.83	16.17	0.32	0.58	0.00	69.37	52.46	15.58
28-0-0 + Folicur	5.83	49.33	42.65	1.33	14.53	0.45	0.50	0.04	66.21	53.80	15.62
28-0-0 + NIS	5.92	57.83	58.87	1.00	7.71	0.18	0.92	0.04	65.96	52.56	15.44
28-0-0	5.75	56.58	50.37	0.67	2.33	0.05	0.67	0.00	65.55	54.52	15.69
LSD (0.05)	NS[h]	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.34

[a] % of infected heads, based on 50 head sample
[b] % infection of blighted heads
[c] % blighted heads X % infection on blighted heads
[d] Level of deoxynivalenol in sample, as detected by gas chromatography
[e] % of Fusarium damaged heads as evaluated by visual examination
• Indicates a significant improvement from the untreated check ($P_{0.05}$)
[f] NS indicates not significant (P=0.05) based on F protected LSD

2001 Spring Wheat Foliar Fungicide Trial

M. Draper, K. Ruden, J. Rudd, R. Devkota and G. Lammers

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 and (*S. tritici*, *S. avenae, S. nodorum*). 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). Two varieties, Oxen and Ingot, were entered in the study. Fourteen fungicides or fungicide combinations and an untreated check were included in the study, with fungicide applications at the jointing (Feekes 1-2) or the flag leaf stage (Feekes 8-9), 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 0-9 scale for overall disease; yield and test weight. The products compared in the trial are listed in Table 2 with the active ingredient, rate applied and crop stage treated. Products were applied to either the crop at jointing or flag leaf emergence. Adjuvants used are listed in Table 2.

Results and Discussion:

In 2001 weather conditions were quite dry which limited leaf-spotting diseases and caused the crop to mature rapidly. Data from Brookings was not significant for any factor measured and as such is not included in this report. Data from the NE Farm study site (Tables 3) show a general reduction in whole plot disease rating, total leaf disease and leaf rust; however, no significant increase in yield was realized. Surprisingly, even some of the early treatments applied at about jointing, led to reductions in disease; however, the later applications led to significantly less diseased leaf tissue than what was present following seedling applications. Nonetheless, these results do suggest that early applications can reduce the rate of disease progress in an epidemic and can help reduce disease pressure later in the season. Similarly, protein was increased by several of the treatments, including seedling application with a reduced rate (2 fl oz/A) of Tilt or the low rate (5 fl oz/A) of Stratego. The response to later fungicide timing supports the observation that diseases generally occurred later in crop development. As such, leaf diseases were not as likely to cause significant yield reduction.

Acknowledgements:

This research was supported in part by grants from the SD Crop Improvement Association, SD Wheat Commission, and National Wheat and Barley Scab Initiative.

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

Location	Activity	Crop stage		Date
		Descriptive	Feekes growth stage	
NE Farm	Planting			May 12, 2001
	Fungicide applications	Seedling-Jointing	Feekes 1-2	June 20, 2001

		Flag leaf	Feekes 8-9	June 29, 2001
	Rating	Soft dough	Feekes 11.2	July 25, 2001
	Harvest	Mature	Feekes 11.4	September 8, 2001
Brookings	Planting			April 20, 2001
	Fungicide applications	Seedling-Jointing	Feekes 1-2	
		Flag leaf	Feekes 8-9	June 20, 2001
	Rating	Soft dough	Feekes 11.2	July 20, 2001
	Harvest	Mature	Feekes 11.4	August 7, 2001

Table 2: Product/active ingredient comparisons in study.

Treatment (product)	Treatment (active ingredient)	Rate	Crop stage
Untreated	n/a	n/a	n/a
Folicur 3.6 EC + NIS	tebuconazole	2 fl oz/A + 0.125%	Feekes 1-2
Stratego 250 EC + NIS	trifloxystrobin + propiconizole	10 fl oz/a + 0.125%	Feekes 1-2
Stratego 250 EC + NIS	trifloxystrobin + propiconizole	5 fl oz/A + 0.125%	Feekes 1-2
Tilt 3.6 EC	propiconizole	2 fl oz/A	Feekes 1-2
Folicur 3.6 EC + NIS	tebuconazole	4 fl oz/A + 0.125%	Feekes 9
Stratego 250 EC + NIS	trifloxystrobin + propiconizole	10 fl oz/A + 0.125%	Feekes 9
Stratego 250 EC + NIS	trifloxystrobin + propiconizole	5 fl oz/A + 0.125%	Feekes 9
Tilt 3.6 EC	propiconizole	2 fl oz/A	Feekes 9
Quadris 2.08 SC	azoxystrobin	7 fl oz /A	Feekes 9
Quadris 2.08 SC + Tilt 3.6 EC	azoxystrobin + propiconizole	3.12 fl oz/A + 4 fl oz/A	Feekes 9
Quadris 2.08 SC + Tilt 3.6 EC	azoxystrobin + propiconizole	3.89 fl oz/A + 4 fl oz/A	Feekes 9
Quadris 2.08 SC + Tilt 3.6 EC	azoxystrobin + propiconizole	4.68 fl oz/A + 4 fl oz/A	Feekes 9
Tilt 3.6 EC	propiconizole	4 fl oz/A	Feekes 9

Table 3: Results of fungicide treatment on several parameters of foliar disease suppression at NE Farm. Columns reflect means of data from Oxen and Ingot.

Treatment	Whole Plot Disease Rating (1-9)	Leaf Disease (% leaf area)	Leaf Rust (% leaf area)	Yield (bu/A)	Test Wt. (#/bu)	Protein (% by wt)
Untreated	5.38	43.75	5.90	55.41	58.26	14.21
Folicur + NIS (Feekes 1-2)	4.13*	27.63*	6.35	56.44	59.29	14.65
Stratego + NIS (Feekes 1-2)	4.00*	32.25*	5.25	55.73	58.54	14.81
Stratego + NIS (Feekes 1-2)	3.75*	25.50*	6.03	56.14	58.03	15.21*
Tilt (Feekes 1-2)	4.25*	31.63*	8.18	55.07	59.04	15.04*
Folicur + NIS (Feekes 8-9)	2.38*	14.63*	1.03*	56.51	59.15	15.15*
Stratego + NIS (Feekes 8-9)	2.50*	15.75*	3.90	58.28	58.89	14.61
Stratego + NIS (Feekes 8-9)	2.63*	15.75*	3.63	58.49	57.28	14.96*
Tilt (Feekes 8-9)	2.38*	15.25*	4.63	59.10	57.72	15.01*
Quadris (Feekes 8-9)	1.38*	9.90*	2.28*	56.93	59.06	14.84*
Quadris + Tilt (Feekes 8-9) – Lo	2.50*	13.00*	4.40	57.78	58.60	14.56*
Quadris + Tilt (Feekes 8-9) – Mid	1.63*	8.45*	2.03*	58.45	58.66	14.64*
Quadris + Tilt (Feekes 8-9) – Hi	2.25*	14.32*	1.58*	58.63	58.72	14.26
Tilt (Feekes 8-9)	2.63*	14.27*	4.10	57.63	57.89	15.26*
LSD (0.05)	1.05	10.02	3.46	NS	NS	0.61

* Indicates a significant improvement from the untreated check ($P_{0.05}$)

[a] NS indicates not significant (P=0.05) based on F protected LSD