2010 ANNUAL PROGRESS REPORT

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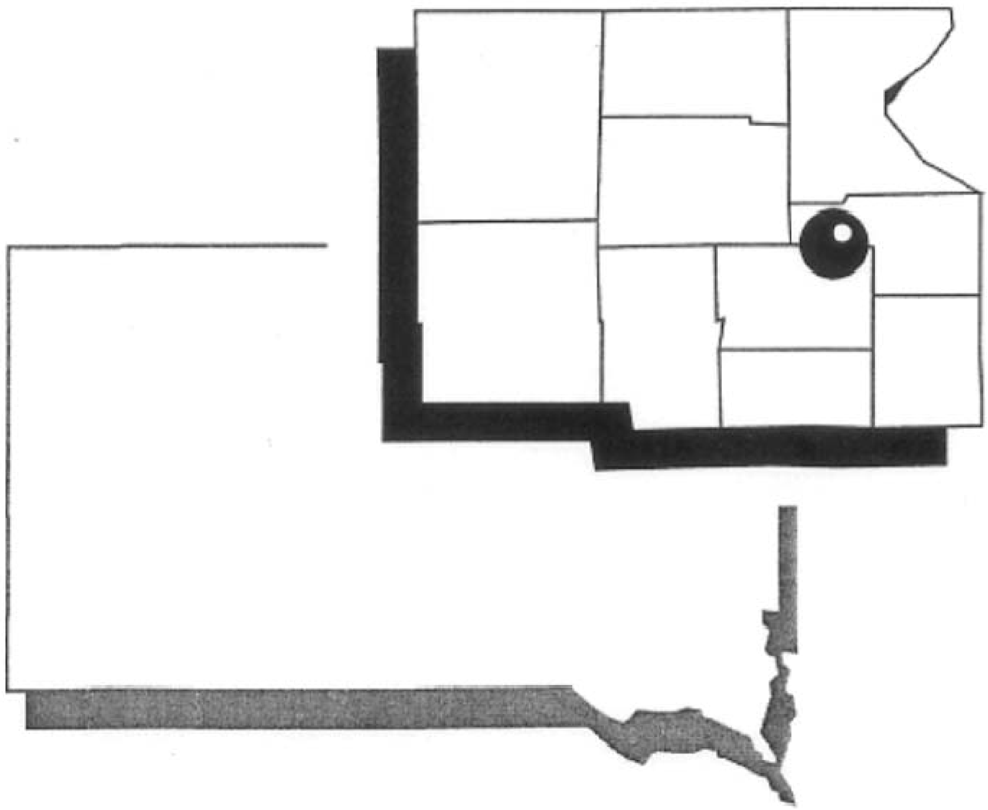
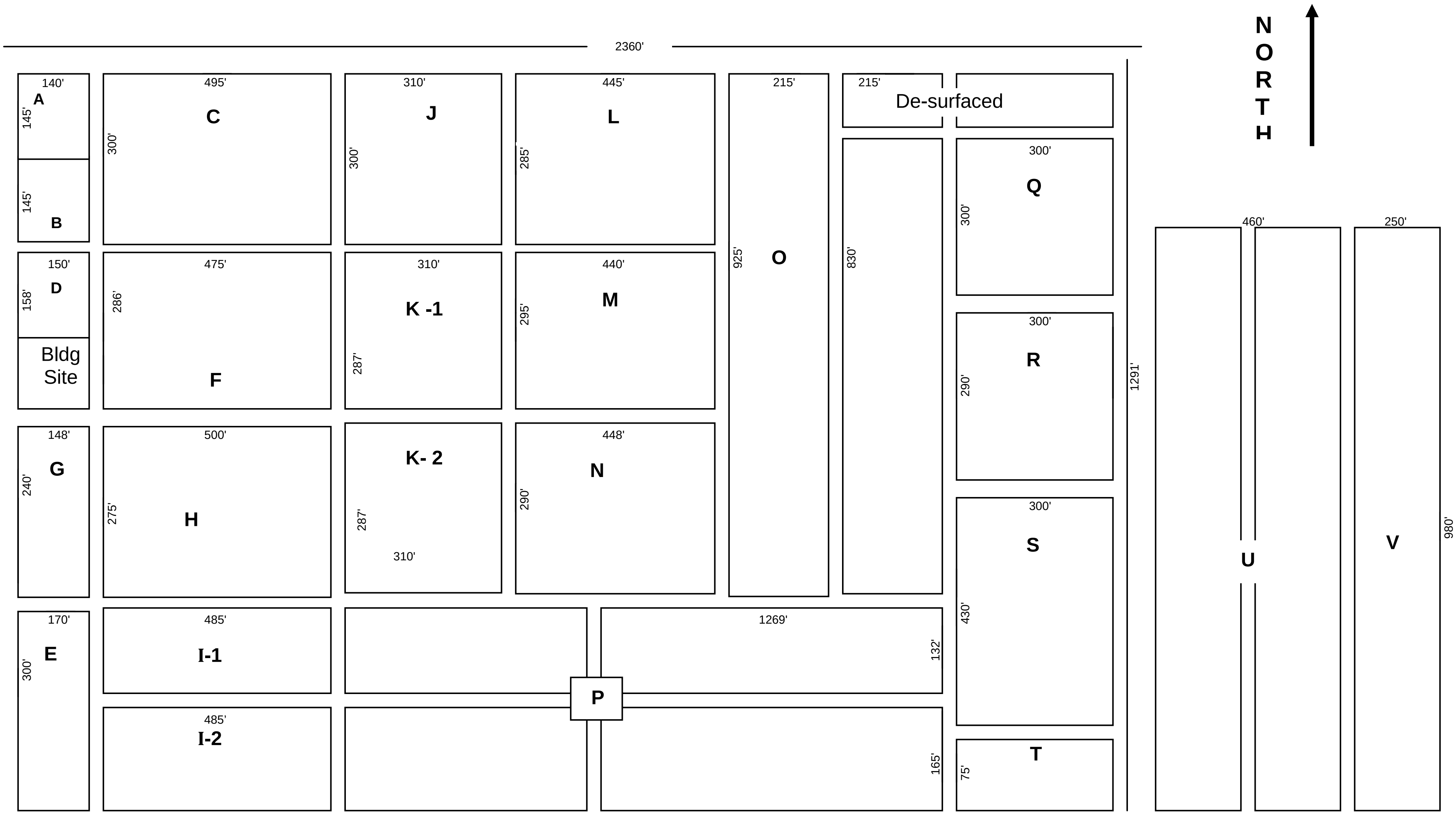


Northeast Research Station

Watertown, South Dakota

Plant Science Department • South Dakota State University • Brookings SD 57007

Northeast Research Station (Watertown)
2010 Land Use



Plot Acreage:

A	0.49	H	3.15	M	3.00	T	0.51
B	0.49	I1	1.2	N	2.98	U	9.72
C	3.40	I2	1.2	O	9.57	V	5.5
D	0.54	J	2.13	P	8.65		
E	1.20	K1	2.00	Q	2.06		
F	3.12	K2	2.00	R	2.00		
G	0.86	L	3.00	S	3.00		

Roadways: 25 feet wide
Acreage in farm: 86
Experimental Acreage: 74

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2010
NORTHEAST RESEARCH STATION ADVISORY BOARD
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Inel Rychman		Brown	
Ronald Dodds*	1019 1st Ave SE Box 13 Aberdeen, SD 57401	Brown	626-7120
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* County Extension Educator
**SDSU Representatives

SDSU – AES-
NORTHEAST RESEARCH STATION
2010 REPORT

Lon Hall Supervisor
Allen Heuer Farm Manager
Lucinda Olson Secretary

MISSION:

The Northeast Research Station is a regional representative site for conducting cultural research, breeding, and testing crops whose traits are adapted for this areas environment.

INFORMATION DISSEMINATION:

- Summer Agronomy Field Tour
- Annual Northeast Research Station Research Report (Plant Science Website)
- Extension Publications
- Research project personal communications, publications, and journal articles

HISTORY:

This year marked the 54th Anniversary of the Northeast Station. The Station has grown considerably from the original 30 acre mobile concept to the current 86 acres. The station has also benefited from a number of improvements over the years. Among the most notable was the construction of an office/storage building in 1991. This was a joint effort by the SD Crop Improvement Association and the Agricultural Experiment Station. A 20 year lease will be up for renewal in 2011.

LOCATION:

The Northeast Research Station is located 15 miles north of Watertown at the intersection of old highway 81 and highway 20. This site was chosen to represent the northeast region of South Dakota. This regions size is approximately 12 counties located within a 70-mile radius with the outside of the circle intersecting research stations located near SDSU. This specific site was chosen for its uniform soil type. The research blocks are made up of 97.5 percent Kranzburg-Brookings and/or 2.5 percent Mckranz-Badger silty clay loam soil types with a 0-2 percent slope. The sites latitude and/or longitude affects several variables including crop and variety selection, photoperiods, growing degree units, precipitation, diseases, and insects. In a continental climate, regional environments are similar from year to year; however, environments always deviate from the mean on a yearly basis, occasionally to the extreme. It is these environmental variations that are useful when assessing genetic by environmental interactions for that region. For example, breeding programs test at several locations in order to evaluate yield stability. The locations may not be optimum environments for a given maturity; however, within maturity, comparisons may be made on a relative basis to assess trait stability.

SCIENTIFIC RESEARCH ADVISORY COMMITTEE:

Research Represented:	Representatives:
• Soils Research	Dr. Ron Gelderman
• Forage Research	Dr. Vance Owens
• Extension Educator	Paul Johnson
• Plant Breeding	Lon Hall

FIELD RESEARCH RESOURCES:

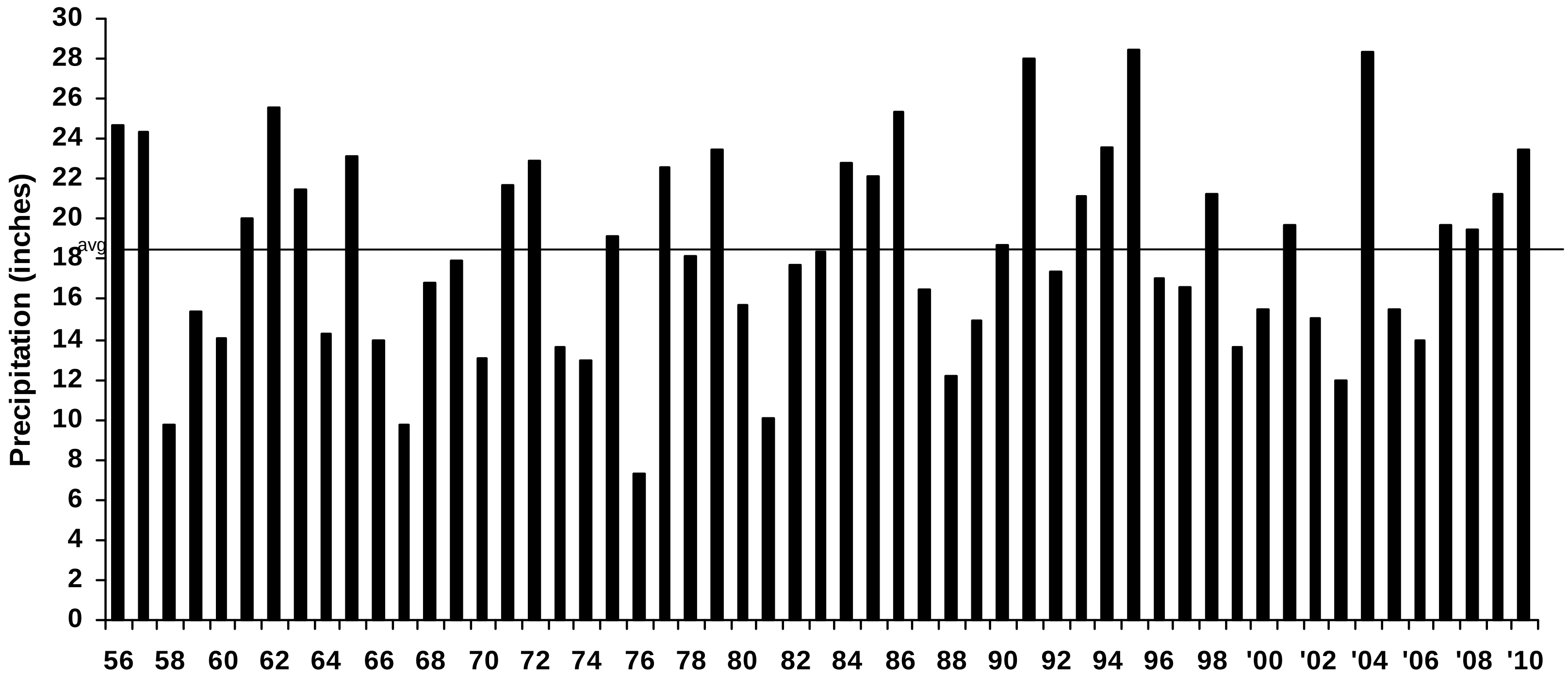
- There are 74 tillable acres comprised of 22 research blocks.
- The building is 50’ x 100’ with 7500 ft^2 of storage and 2500 ft^2 of utility workspace.
- Major Equipment:
    - Tractor- Heston- Model 666
    - Tractor- NH- Model- 7635
    - Loader- 7310- Fits 7635 tractor
    - Tractor- NH TC35 Delux-
    - Tractor- NH T6050 MFWD
    - Planter- JD 7100 4 row 30”
    - Disc Chisel Plow- Wilrich 12 ft.
    - Combine- JD 4420- 4 row corn head mod. 443 13ft. bean platform mod. 213
    - 2 Demco 35ft. sprayers
    - Field cult. With harrow 13ft. Wilrich
    - Gravity boxes 250 bu. each
    - Kawaski 610 Mule
    - Cub Cadet lawn mower Z-force 60”
    - Farm King 7ft. finishing mower
    - Ford 15ft. batwing mower

Table 1. Growing Season Precipitation* (inches) 1956 - 2009

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
2002	1.75	1.67	2.57	2.48	4.44	0.75	1.45	15.11	135
2003	1.78	3.26	1.18	1.94	1.40	1.75	0.67	11.98	160
2004	1.83	5.70	3.34	5.88	1.20	4.77	5.64	28.36	153
2005	1.10	3.43	4.39	1.18	1.67	2.41	1.37	15.55	157
2006	2.53	1.99	0.95	0.92	1.93	5.36	0.24	13.92	168
2007	5.6	3.7	2.07	.85	1.55	3.97	1.91	19.65	192
2008	0.57	2.67	4.48	4.04	1.74	2.25	3.73	19.48	155
2009	1.09	1.73	2.7	3.97	3.6	1.62	6.53	21.24	137
2010	1.55	2.08	6.68	3.23	4.87	3.44	1.6	23.45	158
Avg:	1.98	3.00	3.57	3.14	2.75	2.10	1.83	18.39	148

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

Figure 1. Growing Season Precipitation, 1956 - 2010



2010 SMALL GRAIN VARIETY PERFORMANCE TRIALS

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

This is a report of the 2010 NE Research Farm performance trials for spring wheat and oat conducted by the South Dakota State University Crop Performance Testing (CPT) program. Plots were seeded by the SDSU Oat Breeding Project and harvested by the CPT program.

Plots measuring 5 X 20 feet for each entry were seeded April 20 using a cone-drill with 7-inch row spacing. Seeding rates per acre were: Spring wheat 1.8 million and oat 1.2 million in a loam previously cropped to soybean. ***Research funding & support sources:*** The SDAES and testing fees obtained from the SD Crop Performance Testing Program.

Measurements of Performance

Yield (bu./a) and bushel weight (lbs.) values are an average of four replicates and are adjusted to 13.5% grain moisture (dry matter basis) and bushel weights of 60 (wheat) and 32 lbs. (oats). Grain protein values were obtained using 4 replicates and a FOSS TECATOR Model Infratec 1229 grain analyzer. Yield values are reported for year 2010 and for 3-years (2008-10), while bushel weight, grain protein, and lodging score values are reported for 2010.

Table A. Explanation of performance table footnotes.

No.	Explanation of footnotes
[1]	Heading (small grains) – The number of days from the emergence stage to the head stage or complete head emergence. This value is determined by comparing an entry with a known maturity check variety listed in footnote 1 at the bottom of each table. The heading value is Listed after each variety name. In oat, Hls indicates the variety is a hull-less type variety.
[2]	Lodging score: 0= all plants erect, 3= 50% of plants lodged at 45°-angle, 5= all plants flat.
[3]	Least Significant Difference (LSD 0.05) – the difference two values within a column must equal or exceed to be significantly different from one another at the 0.05 level of probability. If the difference < the LSD value the difference between the values is nonsignificant (NS).
[4]	Top performance group-value (TPG) – the minimum column value that yield, bushel weight, tall height, and high protein must equal or exceed; or the maximum column value that short height, lodging score and low protein must be ≤ to qualify for the TPG indicated by shaded cells.
[5]	Coefficient of variation (C.V.) - the percent of experimental error associated with a test trial. Ideally, the value for yield < 15%. Values < 5% are less common while values of 6 to 15% are more common. Occasionally, values exceed 15%, this means the trial had too much experimental error to be valid; therefore, no data is reported for that trial.

<u>Performance Results for the Eastern South Dakota trials</u>

HRS Wheat:

Yields (Tables 1a) – The entries Faller and Albany at 100%; and Traverse at 80% were the top-yield frequency entries for the past 3-years (2008-10). These entries exhibited very good yield stability or the ability to adapt to a wide range of production environments by being in the top-performance group for yield at more than 50% of the test locations. The entries Faller at 83% and Albany at 67% were the top-yield frequency entries for 2010. When evaluating the yield stability or top-yield frequency of a variety look for shaded values within the yield column for each location, the more shaded values the better. If none of the location yield averages for a variety are shaded– the variety was not in the top-yield group at any location.

Grain protein content (Table 1b) – The entries Vantage averaged 16.6%, Glenn averaged 16.2%, Briggs and Brogan averaged 15.9%, and Steele-ND averaged 15.8% protein for 2010. Vantage was in the top protein group at all six locations, Glenn at three locations, Briggs and Brogan at two locations, and Steele-ND at one location. When evaluating the grain protein content of a variety look for shaded values within the protein column for each location, the more shaded values the better.

Bushel weight (Table 1c) - The top bushel weight entries were the varieties Breaker and Hat Trick at 58.1 lbs. for 2010. Nine varieties ranged from 57.9 to 57.1 lb (Glenn, Brick, Faller, Howard, Tom, Steele-ND, Albany, Select, and Sabin). When evaluating the bushel weight of a variety look for shaded values within the bushel weight column for each location, the more shaded values the better.

Lodging (Table 1d) – The entries Vantage at 1.4; Breaker at 1.7; Brogan, Albany, and Mott at 1.8; Sampson, Barlow, and Reeder at 1.9; and Traverse, Brennan, and RB07 at 2.0 had better than average lodging scores (less than 2.1) for 2010. When evaluating the lodging resistance of a variety look for shaded values within the lodging column for each location, the more shaded values the better.

Height (Table 1e) - The entries Brennan, Sampson, Sabin, and Albany were the shortest varieties at 31 inches, Brogan and RB07 at 32 inches, and Vantage, Hat Trick, and Tom averaged 33 inches or an inch shorter than average (34 inches) for 2010. The entries Breaker, Digger and Select at 34 inches were average in height, while Faller, Briggs, Reeder, Steele-ND, and Brick were an inch taller. The entries Howard, Barlow, Traverse and Granger were two inches and Mott and Glenn were three inches taller than average.

Spring oat:

Yields (Tables 2a) – The entries Souris and Hi Fi at 75%; and Shelby427 and Beach at 50% were the top-yield frequency entries for the past 3-years (2008-10). These entries exhibited very good yield stability or the ability to adapt to a wide range of production environments by being in the top-performance group for yield at more than 50% of the test locations. The experimental lines SD 081949 and SD 081936 at 100% were the top-yield frequency entries for 2010. At Brookings, South Shore, and Warner none of the released varieties yielded as high as the two experimental lines. When evaluating the yield of a variety look for shaded values within the yield column for each location, the more shaded values the better.

Grain protein content (Table 2b) – The entries Streaker and Buff averaged 16.5% and 15.9% protein, respectively, for 2010. These two hulless varieties were consistently higher in grain protein across locations compared to the standard-type hulled varieties. When evaluating the grain protein content of a variety look for shaded values within the protein column for each location, the more shaded values the better.

Bushel weight (Table 2c) - The top bushel weight entries across all locations were the hulless varieties Buff and Streaker at 44.0 and 43.8 lb, respectively, for 2010. Among the standard-hulled entries, the heaviest entries were Shelby427, Colt, and Rockford at 37.7, 37.6, and 37.3 lb, respectively. When evaluating the bushel weight of a variety look for shaded values within the bushel weight column for each location, the more shaded values the better.

Lodging (Table 2d) – The entries with the best lodging resistance or lowest lodging scores were Shelby427, Rockford, SD 081949, and Souris at 2.9, followed closely by SD 091936 and HI Fi at 3.0 for 2010. When evaluating the lodging resistance of a variety look for shaded values within the lodging column for each location, the more shaded values the better.

Height (Table 2e) - The entries Don and SD 081936 were the shortest varieties at 35 and 36 inches, respectively, for 2010. The tallest entries were Shelby427 at 41, Hi Fi and Jerry at 42, Stallion and Rockford at 43, and Beach at 44 inches.

Table 1a. Spring wheat 2008-2010 yield averages (13% H_2O) from six eastern South Dakota locations, sorted by 3-yr and 2010 all yield averages.

Variety, Heading [1]	Brookings 2010	Brookings 3-Yr	South Shore 2010	South Shore 3-Yr	Frankfort 2010	Frankfort 3-Yr	Warner 2010	Warner 3-Yr	Miller 2010	Miller 3-Yr	Selby 2010	Selby 3-Yr	All Yield Avg. Bu/a 2010	All Yield Avg. Bu/a 3-Yr
Faller, 6	63	62	68	76	52	67	71	78	59	.	74	59	65	68
Albany, 6	56	58	66	73	54	69	70	79	62	.	80	63	65	68
Traverse, 2	53	55	68	76	43	61	65	76	50	.	74	58	59	65
Howard, 6	56	55	66	76	44	59	59	72	54	.	73	56	59	64
Barlow, 3	53	55	71	74	39	56	57	69	46	.	72	54	56	62
Steele-ND, 5	55	54	66	74	45	58	55	69	53	.	72	57	58	62
RB07, 4	47	51	55	67	38	57	62	75	49	.	73	61	54	62
Sabin, 3	53	53	60	67	42	57	59	65	53	.	67	58	56	60
Tom, 4	53	50	61	69	36	55	61	71	49	.	72	53	55	60
Samson, 4	51	49	66	72	35	56	53	67	50	.	71	55	54	60
Granger, 2	56	55	64	70	37	52	57	67	47	.	67	52	55	59
Briggs-Ck, 2	48	51	60	70	34	55	59	68	46	.	69	53	53	59
Brick, 0	43	50	59	68	41	58	57	66	49	.	71	52	53	59
Select, 1	44	49	54	68	31	54	60	69	43	.	73	53	51	59
Reeder, 5	51	47	70	66	35	55	52	68	50	.	71	52	55	58
Glenn, 5	56	52	62	68	43	56	58	66	47	.	65	50	55	58
Brennan, 4	48	48	63	68	32	54	56	68	46	.	71	52	53	58
Mott, 6	45	45	61	65	41	55	53	65	47	.	66	54	52	57
Chris, 5	34	39	40	47	31	39	41	53	38	.	48	40	39	44
Breaker, 5	53	.	66	.	43	.	65	.	48	.	75	.	58	.
Brogan, 5	45	.	48	.	36	.	52	.	40	.	67	.	48	.
Vantage, 9	40	.	57	.	38	.	54	.	42	.	54	.	48	.
Digger, 6	48	.	67	.	36	.	57	.	58	.	75	.	57	.
Hat Trick, 3	53	.	64	.	38	.	57	.	52	.	64	.	55	.
Test avg. :	50	52	63	69	39	57	58	69	48	.	69	54	54	60
High avg. :	63	62	72	76	54	69	71	79	62	.	80	63	65	68
Low avg. :	34	39	40	47	28	39	41	53	36	.	48	40	39	44
[3] LSD (0.05):	5	6	5	8	6	8	4	6	3		5	6		
[4] TPG-value :	58	56	67	68	48	61	67	73	59		75	57		
[5] C.V. :	7	7	6	6	12	7	5	5	5		5	7		

[1] Heading- days later than Brick, the check variety for maturity.
Note- shaded values within a location-year column are in the top yield group.
Note that additional table footnotes are explained in Table A.

Table 1b. Hard red spring wheat 2010 grain protein averages at six South Dakota easterm locations, sorted high to low by all protein average.

Variety, Heading [1]	Brookings (%)	S. Shore (%)	Frankfort (%)	Miller (%)	Warner (%)	Selby (%)	All Protein Avg. (%)
	2010 Protein Averages by Location						
Vantage, 9	16.1	15.7	17.0	17.3	16.5	17.1	16.6
Glenn, 5	15.8	15.3	16.6	16.4	16.3	16.8	16.2
Chris, 5	15.6	15.6	16.5	17.0	16.0	15.5	16.0
Briggs-Ck, 2	15.7	15.0	16.5	15.9	15.8	16.6	15.9
Brogan, 5	16.0	15.8	16.3	16.4	15.2	15.5	15.9
Steele-ND, 5	15.9	15.1	16.2	16.4	15.9	15.4	15.8
Barlow, 3	15.5	15.2	16.4	16.1	15.7	15.9	15.8
Granger, 2	15.5	15.1	16.3	16.4	15.4	15.7	15.7
Brennan, 4	15.3	15.3	16.2	16.3	15.8	15.5	15.7
Sabin, 3	15.2	15.3	15.8	16.4	15.4	16.1	15.7
SD 3997, -	15.2	15.0	16.3	16.5	15.3	16.0	15.7
RB07, 4	15.4	15.3	16.6	15.7	15.4	15.4	15.6
Select, 1	15.5	15.2	16.1	16.0	14.8	15.8	15.6
Brick, 0	15.6	15.2	15.9	15.8	15.3	15.5	15.5
Howard, 6	15.2	14.9	15.9	16.1	15.5	15.3	15.5
Reeder, 5	14.9	14.9	15.7	16.3	15.2	15.7	15.5
Breaker, 5	15.4	14.4	16.2	16.2	14.8	15.3	15.4
Tom, 4	15.2	14.9	15.4	15.9	15.1	15.5	15.3
Hat Trick, 3	14.8	14.5	16.3	16.3	14.5	15.1	15.2
Samson, 4	14.6	14.7	16.0	15.9	15.1	15.1	15.2
Digger, 6	15.0	14.7	15.7	15.7	14.7	14.9	15.1
Faller, 6	14.8	14.5	15.9	15.4	14.7	15.4	15.1
SD 4023, -	15.3	14.3	15.7	15.5	14.6	15.0	15.0
Mott, 6	14.6	14.6	15.1	16.0	14.5	15.5	15.0
Traverse, 2	14.8	15.1	15.5	15.1	14.6	14.4	14.9
Albany, 6	15.2	14.6	15.1	14.7	13.6	14.7	14.6
Test avg. :	15.3	15	16.1	16	15.2	15.6	15.5
High avg. :	16.1	15.8	17.2	17.3	16.5	17.1	16.6
Low avg. :	14.6	14.3	15.1	14.7	13.6	14.4	14.6
[3] Lsd(.05) :	0.5	0.4	0.5	0.6	0.5	0.8	
[4] TPG-value :	15.7	15.5	16.8	16.8	16.1	16.4	
[5] C.V. :	2	2	2	3	2	4	

[1] Heading- days later than Brick, the check variety for maturity.

Note- shaded values within a location-year column are in the top protein group.

Note that additional table footnotes are explained in Table A.

Table 1c. Hard red spring wheat 2010 bushel weight averages at six eastern South Dakota locations, sorted high to low by all bushel weight average.

Variety, Heading [1]	Bushel Weight Averages by Location						All Bu. Wt. Avg.
	Brookings	S.Shore	Frankfort	Miller	Warner	Selby	
	lb	*lb*	*lb*	*lb*	*lb*	*lb*	*lb*
Breaker, 5	55.3	53.1	60.3	56.7	61.4	62.1	58.1
Hat Trick, 3	53.8	56.3	58.7	59.3	59.9	60.8	58.1
SD 4023, -	56.1	56.8	57.7	56.9	59.5	60.7	57.9
Glenn, 5	53.3	55.1	58.6	57.2	60.1	63.3	57.9
SD 3997, -	54.7	55.1	58.1	57.0	59.9	62.3	57.9
Brick, 0	52.9	55.3	58.9	57.1	60.8	62.0	57.8
Faller, 6	54.0	55.1	57.9	57.4	60.9	61.5	57.8
Howard, 6	54.9	55.5	58.8	57.5	59.6	60.5	57.8
Tom, 4	55.7	54.0	58.2	56.0	60.0	62.0	57.7
Steele-ND, 5	53.2	55.7	58.5	56.8	59.1	62.0	57.5
Albany, 6	53.1	56.1	57.8	57.0	59.9	60.1	57.3
Select, 1	53.4	55.3	55.4	55.2	59.8	63.7	57.1
Sabin, 3	55.5	52.9	58.1	56.3	58.7	61.0	57.1
Briggs-Ck, 2	55.7	54.8	55.0	55.7	59.5	61.6	57.0
Brennan, 4	54.0	56.3	55.9	55.2	57.9	61.3	56.8
Granger, 2	54.8	55.3	55.7	54.8	57.8	62.0	56.7
Barlow, 3	53.5	55.9	56.9	54.5	57.7	61.7	56.7
Mott, 6	52.1	52.7	58.1	56.7	59.0	61.0	56.6
Vantage, 9	51.4	52.7	58.5	55.7	60.1	61.1	56.6
RB07, 4	52.5	53.3	55.9	55.8	59.6	61.7	56.5
Reeder, 5	52.7	54.2	55.8	56.0	56.3	61.5	56.1
Digger, 6	52.5	54.9	55.4	55.8	57.2	60.3	56.0
Brogan, 5	53.8	50.8	56.0	55.1	56.8	61.9	55.7
Samson, 4	51.6	53.1	54.1	54.8	55.4	60.9	55.0
Traverse, 2	52.5	51.0	54.2	54.6	58.2	59.1	54.9
Chris, 5	51.0	52.3	54.7	51.3	56.9	57.9	54.0
Test avg. :	53.4	54.4	56.8	55.7	58.9	61.3	56.7
High avg. :	56.1	56.8	60.3	59.3	61.4	63.7	58.1
Low avg. :	51.0	50.8	53.5	51.3	55.4	57.9	54.0
[3] Lsd(.05) :	1.6	1.6	1.5	1.2	1.6	1.4	
[4] TPG-value :	54.6	55.3	58.9	58.2	59.9	62.3	
[5] C.V. :	2	2	2	2	2	2	

[1] Heading- days later than Brick, the check variety for maturity

Note- shaded values within a location-year column are in the top bushel weight group.

Note that additional table footnotes are explained in Table A.

Table 1d. Hard red spring wheat 2010 lodging score averages at five eastern South Dakota locations, sorted low to high by all lodging score average.

Variety, Heading [1]	Lodging Score Averages by Location - 1= good to 5= poor [2]					All lodging score avg.
	Brookings	S.Shore	Miller	Warner	Selby	
	1 to 5	*1 to 5*	*1 to 5*	*1 to 5*	*1 to 5*	*1 to 5*
Vantage, 9	2.0	1.0	1.3	1.8	1.0	1.4
Breaker, 5	1.7	1.0	2.0	2.5	1.0	1.7
Brogan, 5	1.7	1.0	2.3	2.8	1.0	1.8
Albany, 6	1.7	1.0	2.5	2.8	1.0	1.8
Mott, 6	1.3	1.5	2.3	3.0	1.0	1.8
Samson, 4	2.0	1.0	2.8	2.5	1.0	1.9
Barlow, 3	2.3	1.0	2.5	2.5	1.3	1.9
Reeder, 5	2.3	1.0	2.8	2.5	1.0	1.9
Traverse, 2	2.0	1.0	3.0	2.5	1.3	2.0
Brennan, 4	2.3	1.0	3.0	2.5	1.3	2.0
RB07, 4	2.0	1.0	3.0	3.0	1.0	2.0
Hat Trick, 3	2.0	1.5	3.0	2.8	1.0	2.1
Glenn, 5	2.0	1.5	3.0	2.8	1.0	2.1
Select, 1	2.0	1.5	3.0	2.8	1.0	2.1
Faller, 6	2.0	1.8	2.8	3.0	1.0	2.1
Briggs-Ck, 2	2.0	1.5	3.0	3.0	1.0	2.1
Digger, 6	2.3	1.3	3.0	2.8	1.3	2.1
SD 3997, -	2.0	1.8	3.0	3.0	1.0	2.2
SD 4023, -	2.3	2.0	2.8	3.0	1.0	2.2
Brick, 0	2.0	1.8	3.0	3.0	1.3	2.2
Sabin, 3	2.8	1.8	3.0	3.0	1.0	2.3
Howard, 6	2.8	1.8	3.0	3.0	1.3	2.4
Steele-ND, 5	3.0	2.5	3.0	3.3	1.5	2.7
Granger, 2	2.3	2.5	3.0	3.0	2.5	2.7
Tom, 4	3.0	2.8	3.0	3.5	1.8	2.8
Chris, 5	2.8	3.0	4.0	4.0	2.8	3.3
Test avg. :	2.2	1.5	2.8	2.9	1.2	2.1
High avg. :	3.0	3.0	4.0	4.0	2.8	3.3
Low avg. :	1.3	1.0	1.3	1.8	1.0	1.4
[3] Lsd(.05) :	0.5	0.6	0.4	0.6	0.5	
[4] TPG-value :	1.7	1.5	1.6	2.3	1.4	
[5] C.V. :	15	27	11	14	28	

[1] Heading- days later than Brick, the check variety for maturity.
Note- shaded values within a location-year column are in the top lodging score group.
Note that additional table footnotes are explained in Table A.

Table 1e. Hard red spring wheat 2010 plant height averages at five eastern South Dakota locations, sorted low to high by all plant height average.

Variety, Heading [1]	Plant Height Averages by Location - inch					All
	Brookings	S.Shore	Miller	Warner	Selby	Pl. Ht. Avg.
	inch	*inch*	*inch*	*inch*	*inch*	*inch*
Brennan, 4	28	30	32	32	32	31
Samson, 4	29	32	30	33	31	31
Sabin, 3	29	32	32	31	33	31
Albany, 6	30	33	32	32	31	31
SD 4023, -	30	32	32	34	34	32
Brogan, 5	29	31	35	32	35	32
RB07, 4	31	34	31	33	33	32
Vantage, 9	31	33	34	35	31	33
Hat Trick, 3	30	32	33	34	34	33
Tom, 4	30	35	34	34	35	33
Breaker, 5	32	34	33	35	36	34
Digger, 6	33	34	34	35	36	34
Select, 1	32	33	37	35	36	34
Faller, 6	33	36	34	36	35	35
Briggs-Ck, 2	31	34	36	36	37	35
Reeder, 5	32	36	35	36	37	35
Steele-ND, 5	33	35	35	35	37	35
Brick, 0	32	35	35	36	37	35
Howard, 6	33	36	35	37	38	36
Barlow, 3	33	36	35	36	38	36
Traverse, 2	33	34	36	38	39	36
Granger, 2	33	35	38	36	38	36
Mott, 6	34	38	38	37	39	37
Glenn, 5	34	35	39	37	40	37
SD 3997, -	36	37	37	40	41	38
Chris, 5	34	39	38	39	41	38
Test avg. :	32	34	34	35	36	34
High avg. :	37	39	39	40	41	38
Low avg. :	28	30	30	31	31	31
[3] Lsd(.05) :	2	2	2	3	2	
[4] TPG-value :	30	32	32	34	33	
[5] C.V. :	4	4	5	5	4	

[1] Heading- days later than Brick, the check variety for maturity.
Note- shaded values within a location-year column are in the short plant height group.
Note that additional table footnotes are explained in Table A.

Table 2a. Spring oat 2008-2010 yield averages (13% H_2O) from five eastern South Dakota locations, sorted by 3-yr, 2-yr, and 2010 all yield average.

Variety, Heading [1]	Brookings 2010	Brookings 3-Yr	South Shore 2010	South Shore 3-Yr	Miller 2010	Miller 3-Yr	Warner 2010	Warner 3-Yr	Selby 2010	Selby 3-Yr	All Yield Avg. Bu/a 2010	All Yield Avg. Bu/a 3-Yr
Souris, 7	135	145	183	182	150	.	134	145	167	.	154	157
HiFi, 8	138	146	176	174	137	.	141	148	164	.	151	156
Shelby427, 2	119	144	162	162	117	.	125	132	162	.	137	146
Beach, 7	105	133	110	145	129	.	117	128	180	.	128	135
Stallion, 9	102	125	125	135	109	.	125	132	165	.	125	131
Colt, 0	104	113	131	133	136	.	112	122	149	.	126	123
Don, 1	84	105	100	117	133	.	106	120	150	.	115	114
Jerry, 5	90	100	99	124	108	.	105	113	130	.	106	112
Reeves, 2	85	104	108	117	127	.	96	113	154	.	114	111
Buff Hls, 3	80	91	101	117	106	.	101	106	134	.	104	105
Streaker Hls, 3	76	94	94	105	81	.	74	96	117	.	88	98
Rockford, 8	147	.	174	.	135	.	137	.	183	.	155	.
SD 081949, -	163	.	197	.	153	.	162	.	189	.	173	.
SD 081936, -	153	.	191	.	147	.	163	.	178	.	166	.
Test avg. :	120	118	150	137	131	.	129	123	162	.	138	126
High avg. :	163	146	197	182	153	.	163	148	189	.	173	157
Low avg. :	76	91	94	105	81	.	74	96	117	.	88	98
[3] LSD (0.05):	12	20	12	25	10		14	12	11			
[4] TPG-value :	152	127	186	158	144		150	137	179			
[5] C.V. :	7	7	6	6	5		8	9	5			

[1] Heading- days later than Colt, the check variety for maturity.

Note- shaded values within a location-year column are in the top yield

Note that additional table footnotes are explained in Table A..

Table 2b. Spring oat 2010 grain protein averages at five South Dakota eastern sorted high to low by all protein average.

Variety, Heading	2010 Protein Average by Location					All Protein Avg.
	Brookings	S.Shore	Miller	Warner	Selby	
[1]	(%)	(%)	(%)	(%)	(%)	(%)
Streaker Hls, 3	15.1	15.4	16.0	17.0	18.9	16.5
Buff Hls, 3	15.8	14.9	15.4	16.1	17.3	15.9
Reeves, 2	14.6	13.4	14.4	15.3	17.5	15.0
Stallion, 9	14.1	14.1	14.0	15.0	16.2	14.7
Colt, 0	13.5	13.5	14.2	14.7	17.2	14.6
Shelby427, 2	14.0	12.5	13.8	14.8	16.6	14.3
Jerry, 5	13.3	13.7	14.3	13.5	16.7	14.3
Rockford, 8	13.2	12.2	13.5	14.9	16.2	14.0
HiFi, 8	13.6	13.2	13.1	14.7	15.4	14.0
Souris, 7	13.7	13.0	13.8	14.3	15.2	14.0
Don, 1	13.3	12.8	13.8	14.5	15.4	14.0
SD 081949, -	13.6	13.5	13.1	14.3	15.1	13.9
SD 081936, -	13.2	13.3	13.1	14.0	15.0	13.7
Beach, 7	12.8	13.6	13.6	13.6	14.6	13.6
Test avg. :	13.8	13.4	13.8	14.7	16.1	14.4
High avg. :	15.8	15.4	16.0	17.0	18.9	16.5
Low avg. :	12.8	12.0	13.1	13.5	14.6	13.6
[3] Lsd(.05) :	0.8	1.4	0.7	0.7	0.8	
[4] TPG-value :	15.1	14.1	15.4	16.4	18.2	
[5] C.V. :	4	7	3	4	3	

[1] Heading- days later than Colt, the check variety for maturity.
Note- shaded values within a location column are in the top protein group.
Note that additional table footnotes are explained in Table A.

Table 2c. Spring oat 2010 bushel weight averages at five South Dakota eastern
sorted high to low by all bushel weight average.

Variety, Heading [1]	Brookings	S.Shore	Miller	Warner	Selby	All Bu. Wt. Avg.
	Bushel Weight Average by Location					
	lb	*lb*	*lb*	*lb*	*lb*	*lb*
Buff Hls, 3	42.1	41.9	44.9	44.1	47.0	44.0
Streaker Hls, 3	40.2	42.2	44.2	44.3	47.8	43.8
Shelby427, 2	35.4	38.9	37.0	37.3	40.0	37.7
Colt, 0	34.6	38.3	38.1	37.2	39.9	37.6
Rockford, 8	34.9	36.7	37.6	38.3	38.8	37.3
SD 081936, -	33.8	36.4	37.0	37.4	38.0	36.5
SD 081949, -	34.4	36.9	35.6	36.9	37.9	36.3
Souris, 7	33.6	36.4	36.8	36.4	37.6	36.1
Reeves, 2	32.6	35.0	36.7	36.4	40.0	36.1
HiFi, 8	34.1	36.6	35.1	37.7	37.1	36.1
Jerry, 5	33.9	32.9	36.8	36.2	39.4	35.8
Stallion, 9	31.7	35.4	35.4	36.3	39.0	35.6
Beach, 7	33.0	33.1	36.5	36.0	39.1	35.5
Don, 1	29.8	32.4	36.6	35.2	38.0	34.4
Test avg. :	34.4	36.9	37.4	37.6	39.5	37.1
High avg. :	42.1	42.2	44.9	44.3	47.8	44.0
Low avg. :	29.8	32.4	35.1	35.2	36.2	34.4
[3] Lsd(.05) :	1.3	1.2	1.0	1.0	1.0	
[4] TPG-value :	40.9	41.1	44.0	43.4	46.9	
[5] C.V. :	3	2	2	2	2	

[1] Heading- days later than Colt, the check variety for maturity.

Note- light shaded values within a location column are in the top bushel weight group for all varieties including the hulless varieties.

Note- dark shaded values within a location column are in the top bushel weight group for standard hulled varieties only.

Note that additional table footnotes are explained in Table A.

Table 2d. Spring oat 2010 lodging score averages at five eastern South Dakota locations, sorted low to high by all lodging score average.

Variety, Heading [1]	Lodging Score Averages by Location 1= best to 5= poor					All Lodging Score Avg.
	Brookings	S.Shore	Miller	Warner	Selby	
	1 to 5	*1 to 5*	*1 to 5*	*1 to 5*	*1 to 5*	*1 to 5*
Shelby427, 2	3.0	3.0	3.0	3.0	2.3	2.9
Rockford, 8	3.0	3.0	3.0	3.0	2.3	2.9
SD 081949, -	3.0	3.3	2.8	3.0	2.5	2.9
Souris, 7	2.8	2.8	3.0	3.0	3.0	2.9
SD 081936, -	3.3	3.0	3.0	3.0	2.5	3.0
HiFi, 8	3.0	3.0	3.0	3.3	2.8	3.0
Buff Hls, 3	4.5	4.5	3.0	3.8	2.8	3.7
Beach, 7	4.8	4.3	3.3	4.8	2.5	3.9
Colt, 0	5.0	5.0	3.0	4.3	3.3	4.1
Streaker Hls, 3	4.8	4.3	4.0	4.3	3.5	4.2
Don, 1	5.0	5.0	3.0	4.8	3.0	4.2
Jerry, 5	5.0	5.0	3.0	4.8	3.3	4.2
Reeves, 2	5.0	5.0	3.3	4.8	3.3	4.3
Stallion, 9	4.5	5.0	4.5	4.8	3.8	4.5
Test avg. :	3.8	3.8	3.1	3.7	2.8	3.5
High avg. :	5.0	5.0	4.5	4.8	4.0	4.5
Low avg. :	2.5	2.5	2.8	3.0	2.0	2.7
[3] Lsd(.05) :	0.6	0.5	0.4	0.7	0.7	
[4] TPG-value :	3.0	2.9	3.1	3.6	2.6	
[5] C.V. :	11	10	9	13	18	

[1] Heading- days later than Colt, the check variety for maturity.
Note- shaded values within a location column are in the top lodging score group.
Note that additional table footnotes are explained in Table A.

Table 2e. Spring oat 2010 plant height averages at five eastern South Dakota locations, sorted low to high by all plant height average.

Variety, Heading [1]	Plant Height Averages by Location - inch					All Plant Height Avg.
	Brookings	S.Shore	Miller	Warner	Selby	
	inch	*inch*	*inch*	*inch*	*inch*	*inch*
Don, 1	37	31	36	36	36	35
SD 081936, -	36	34	38	36	35	36
Colt, 0	40	36	39	38	39	38
Buff Hls, 3	41	37	39	39	38	39
Souris, 7	44	37	39	42	36	40
SD 081949, -	41	37	42	40	39	40
Reeves, 2	42	39	40	41	40	40
Streaker, 3	42	39	40	40	40	40
Shelby427, 2	44	39	42	41	39	41
HiFi, 8	44	39	44	43	39	42
Jerry, 5	47	41	43	44	38	42
Stallion, 9	48	41	43	44	40	43
Rockford, 8	47	40	44	44	41	43
Beach, 7	49	44	43	46	41	44
Test avg. :	42	38	40	40	38	40
High avg. :	49	44	45	46	41	44
Low avg. :	36	31	35	34	32	35
[3] Lsd(.05) :	3	2	2	3	3	
[4] TPG-value :	38	32	36	36	34	
[5] C.V. :	5	4	4	5	6	

[1] Heading- days later than Colt, the check variety for maturity.
Note- light shaded values within a location-year column are in the short plant height group.
Note- dark shaded values within a location-year column are in the tall plant height group.
Note that additional table footnotes are explained in Table A.

SOYBEAN VARIETY PERFORMANCE TRIALS AT SOUTH SHORE AND WARNER[1]

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This reports the 2010 soybean performance trials for both glyphosate-resistant and non-glyphosate-resistant soybean entries at the Northeast Research Farm and the Allen and Inel Ryckman farm at Warner, SD conducted by the South Dakota State University Crop Performance Testing program.

Experimental Procedures

Entries were placed in either a maturity group-0 or group-I test trial according to maturity ratings reported by the seed company. Each company selects the appropriate maturity group trial (0 or I) for their entries at a location. However, there are no standard regional or national check entries for maturity. Consequently, in some trials, borderline entries with maturity group ratings at or near the assigned break between the late group-0's and early-group-I's may crossover.

Entries were seeded in three replications (plots) with each replicate randomly located in a block where each plot consisted of four 30-inch rows, 20 feet long. Plots were seeded on May 21 and May 28, 2010 at South Shore and Warner, respectively, with a Monosem precision planter calibrated to deliver 165,000 seeds per acre. Granular Nitragin brand Soybean Soil Implant metered down a tube was used for soil inoculation. The seedbed at South Shore was a Kranzburg silty clay loam with a 3-6% slope previously cropped to spring wheat; and at Warner it was a Harmony-Aberdeen silt clay loam with a 0-2% slope, previously cropped to corn. The plant and harvesting procedures apply to both the glyphosate- and the non-glyphosate-resistant trials.

Chemical weed control in the glyphosate-resistant trials consisted of a pre-emergence application of 2 pt/acre of Dual II Magnum at South Shore and one post-emergence application of glyphosate at South Shore and glyphosate/Fusilade at Warner at label rates. Weed control in the non-glyphosate trials at South Shore consisted of a pre-emergence application of Dual II Magnum at 2 pt. /acre and a post-emergence application of Harmony/Basagran at label rates. At South Shore, Warrior™ insecticide was aerial applied at the label rate to control soybean insects.

Yields (bu/a) are an average of three replications, adjusted to 13% moisture (dry-matter basis) and a bushel weight of 60 pounds. Yield least significant difference (LSD) and minimum top-yield values are rounded off to the nearest whole bushel per acre.

[1]Research supported by the South Dakota Agricultural Experiment Station.

Plant Height was measured from the ground to the top-most node on the main stem. Lodging scores at maturity are a plot average where plants were: All erect = 1, slightly lodged = 2, stem lodged at 45^{o} angle = 3, severely lodged = 4 or all flat = 5.

Measurements of Performance

Check for the "least significant difference" (LSD) value at the bottom of each data column. An LSD value can be used a couple of ways. First, it can indicate how much a variable like yield must differ between two entries before there is a significant difference. For example, if this years test LSD value equals of 4 bu/a, it can be used to compare the yields of any two entries. If entry A yields 50 and entry B yields 48 their yield difference is 2 bu/a (50-48=2). This means the two entries do not differ in yield because the difference of 2 bu/a is not greater than the LSD value of 4 bu/a. In contrast, if variety C yields 45, the yield difference between entry A and C is 5 bu/a (50-45=5). This means entries A and C differ in yield because their difference of 5 bu/a is more than the LSD value of 4 bu/a, thus, entry A has a significantly higher yield than entry C.

A second use for LSD values is to identify the varieties in the top performance group (TPG) for yield. The LSD value at the bottom of each yield column is used to calculate a minimum top yield value. For example, if the highest column yield value is 50 bu. and yield LSD value is 5 bu., subtract the LSD value of 5 bu. to obtain an intermediate value of 45 bu. (50–5=45). The minimum top yield value has to be greater than this intermediate value of 45 bu. and since the yield values are rounded to the nearest bushel it must be at least 46 bu. Thus, varieties with an average of 46 bu. or higher are included in the top-yield group. **Note: Entries tested for two years may also have a top yield group value in the 2010 yield column.** In addition, the TPG for lodging score (Table 1a) can also be determined (remember averages and LSD value are rounded-off). In this case, however, the LSD value is used to calculate a maximum top lodging score value. For example, if the best or lowest column lodging score value is 1 and the lodging score LSD value is 1, add the LSD value of 1 to obtain an intermediate value of 2 (1+1=2). The maximum top lodging score value has to be less than this intermediate value of 2; and because the lodging score value is rounded-off, the maximum lodging score value can only be 1.

Table Footnotes

Explanations for performance table footnotes are outlined in table A.

Table A. Explanation of performance table footnotes.

No.	Explanation of footnotes
[1]	Days to maturity (DTM) – the number of days to maturity from seeding to 95% brown pod.
[2]	Lodging scores: 0= all plants erect, 3= 50% of plants lodged at 45°-angle, 5= all plants flat.
[3]	Least Significant Difference (LSD 0.05) – the difference two values within a column must ≥ to be significantly different from one another at the 0.05 level of probability. If the difference Is < the LSD value the difference between the values is nonsignificant (NS).
[4]	TPG-avg. – the minimum value within a column that entry yield values must ≤ to qualify for the for the top-performance group (TPG).
[5]	TPG-avg. – the maximum value within a column that lodging score values must ≥ to qualify for the TPG.
[6]	Coefficient of variation (C.V.) - the percent of experimental error associated with a test trial. Ideally, the CV value for yield should be < 15%. Values less than 5% are less common, while values of 6 to15% are more common. Occasionally, values exceed 15%; this means the trial had too much experimental error to be valid; therefore, no data is reported.

Performance Trial Results For 2008-10

Glyphosate-Resistant Entries:

South Shore, Group-0 (Tables 1a & 1b): The two-year and 2010 test-yield averages were both 53 bushels per acre, respectively, and the lodging score average was 2 (Table 1a). Varieties had to average 51 and 52 bushels or higher to be in the top yield group for two years and for 2010, respectively. Variety yield differences among the two-year averages were not significant (NS), while the 2010 variety yield differences had to differ by 5 bushels to be significantly different. Variety lodging score values had to equal 1 to be in the top performance group for lodging resistance and had to differ by 1 to be significantly different. The 2010 protein and oil test averages were 39.2% and 19.0%, respectively (table 1b). Variety protein and oil values had to average 39.5% and 20.3% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 0.9% and 0.6%, respectively, to be significantly different.

Warner, Group-0 (Tables 1a & 1b): The two-year and 2010 test-yield averages were 52 and 41 bushels per acre, respectively, and the lodging score average was 1 (table 1a). Varieties had to average 49 and 40 bushels or higher to be in the top yield group for two years and for 2010, respectively. Variety yield differences among the two-year averages were not significant (NS), while the 2010 variety yield differences had to differ by 9 bushels to be significantly different. Variety lodging score value differences were not significant, so all entries were in the top performance group for lodging resistance. The 2010 protein and oil test averages were 31.8% and 21.9%, respectively (table 1b). Variety protein and oil values had to average 32.9% and 23.0% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 1.2% and 0.6%, respectively, to be significantly different.

Northern test zone, Group-0 (Tables 1a & 1b): The two-year and 2010 test-yield averages were 53 and 48 bushels per acre, respectively, and the lodging score average was 2 (table 1a). In 2010, the protein and oil averages were 35.5% and 20.4%, respectively (table 1b). In 2010, however, there was significant year-by-location interactions for both the two-year and 2010 yield averages and the 2010 protein and oil averages at both locations. This means variety performance differed by location and year for the two-year yield and differed by location for the 2010 yield, protein, and oil averages in the Northern zone. Therefore, soybean producers are encouraged to evaluate variety performance differences by using the yield, protein, and oil columns listed under each location and not use the yield, protein and oil columns listed for the Northern zone.

South Shore, Group-I (Tables 2a & 2b): The two-year and 2010 test-yield averages were 54 and 50 bushels per acre, respectively, and the lodging score average was 2 (table 2a). Varieties had to average 50 bushels and 54 bushels or higher to be in the top yield group for two years and for 2010, respectively. Variety yield differences among the two-year averages were not significant (NS), while the 2010 variety yield differences had to differ by 4 bushels to be significantly different. Variety lodging score values had to equal 1 to be in the top performance group for lodging resistance and had to differ by 1 to be significantly different. The 2010 protein and oil test averages were 39.6% and 18.3%, respectively (table 2b). Variety protein and oil values had to average 40.0% and 19.1% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 1.2% and 0.7%, respectively, to be significantly different.

Warner, Group-I (Tables 2a &2b): The two-year and 2010 test-yield averages were 54 and 45 bushels per acre, respectively, and the lodging score average was 1 (table 2a). Varieties had to average 51 and 46 bushels or higher to be in the top yield group for two years and for 2010, respectively. Variety yield differences among the two-year averages were not significant (NS), while the 2010 variety yield differences had to differ by 7 bushels to be significantly different. Variety lodging score value differences were not significant so all entries were in the top performance group for lodging resistance. The 2010 protein and oil test averages were 31.2% and 21.3%, respectively (table 2b). Variety protein and oil values had to average 32.2% and 22.3% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 1.6% and 0.5%, respectively, to be significantly different.

Northern test zone, Group-I (Tables 2a & 2b): The two-year and 2010 test-yield averages were 54 and 48 bushels per acre, respectively, and the lodging score average was 2 (table 2a). In 2010, the protein and oil averages were 35.3% and 19.8%, respectively (table 2b). In 2010, however, there were significant year-by-location interactions for both the two-year and 2010 yield averages and the 2010 protein and oil averages at both locations. This means variety performance differed by location and year for the two-year yield and differed by location for the 2010 yield, protein, and oil averages in the Northern zone. Therefore, soybean producers are encouraged to evaluate variety performance differences by using the yield, protein, and oil columns listed under each location and not use the yield, protein and oil columns listed for the Northern zone.

Non-Glyphosate-Resistant Soybean Variety Trial Results:

South Shore, Group-0 (Tables 3a & 3b): The 2010 and two-year test-yield averages were 46 and 50 bushels per acre, respectively, and the lodging score average was 2 (table 8a). Varieties had to average 42 bushels or higher for two years and 50 bushels or higher for 2010 to be in the top yield group. Variety yield differences among the two-year averages were not significant (NS), while the 2010 variety yield differences had to differ by 5 bushels to be significantly different. Variety lodging score values had to equal 1 to be in the top performance group for resisting lodging, and lodging values had to differ by 1 to be significantly different. The 2010 protein and oil test averages were 39.5% and 19.3%, respectively (table 8b). Variety protein and oil values had to average 44.5% and 20.2% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 1.1% and 0.6%, respectively, to be significantly different.

South Shore, Group-I (Tables 3a & 3b): The two-year and 2010 and test-yield averages were 45 and 47 bushels per acre, respectively, and the lodging score average was 1 (table 8a). Varieties had to average 40 bushels or higher for two years and 49 bushels or higher for 2010 to be in the top yield group. Variety yield averages had to differ by 9 bushels for two years and 5 bushels for 2010 to be significantly different. Variety lodging score values had to equal 1 to be in the top performance group for resisting lodging, and lodging values had to differ by 1 to be significantly different. The 2010 protein and oil test averages were 39.6% and 19.9%, respectively (table 8b). Variety protein and oil values had to average 41.1% and 23.2% or higher, respectively, to be in the top groups for protein and oil in 2010. Variety protein and oil averages had to differ by 1.3% and 1.1%, respectively, to be significantly different.

Table 1a. Glyphosate-resistant maturity group-0 soybean variety yield and lodging averages- northern South Dakota locations, 2009-2010. Entries are sorted by 2-Yr then by 2010 zone yield.

		Northern Averages by Location*						Northern Zone Averages		
		South Shore			Warner					
		Yield-bu/a			Yield-bu/a			Yield-bu/a		
Brand/Variety	DTM [1]	2-Yr	2010	2010 (1-5) [2]	2-Yr	2010	2010 (1-5) [2]	2-Yr	2010	2010 (1-5) [2]
G-2/ GENETICS 6088	112	.	57	2	55	44	1	55	51	1
DAIRYLAND/ DSR-0747/R2Y	112	55	55	2	54	45	1	55	50	2
NUTECH/ 0886RR	111	53	55	1	55	41	1	54	48	1
SD 1093RR	111	53	56	3	53	45	1	53	51	2
PRAIRIE BR./ PB-0999RR	113	53	53	2	53	42	1	53	48	2
PRAIRIE BR./ PB-0954RR	114	53	54	3	50	41	1	52	48	2
PIONEER/ 90Y80	108	54	55	2	50	37	1	52	46	2
NUTECH/ 0990RR	113	52	50	2	52	41	1	52	46	2
NUTECH/ 0889RR	114	54	54	3	49	37	1	52	46	2
G-2/ GENETICS 6098	110	51	49	2	49	37	1	50	43	2
PRAIRIE BR./ EXP 0801	112	.	52	1	.	47	1	.	50	1
SEEDS 2000/ EXP2091RR2Y	112	.	51	2	.	48	1	.	50	2
ASGROW/ AG0730	109	.	54	2	.	43	1	.	49	1
HEFTY/ 09Y11	110	.	54	2	.	44	1	.	49	2
PRAIRIE BR./ PB0879NRR2	115	.	54	3	.	43	1	.	49	2
PRAIRIE BR./ EXP 1001	112	.	53	2	.	41	1	.	47	2
NUTECH/ 6082	115	.	52	4	.	40	1	.	46	2
G-2/ GENETICS 6090	109	.	50	1	.	41	1	.	46	1
HEFTY/ H09Y10	111	.	51	2	.	37	1	.	44	2
PRAIRIE BR./ PB-1120R2	116	.	50	3	.	36	1	.	43	2
SEEDS 2000/ EXP2061RR2Y	112	.	47	3	.	37	1	.	42	2
MUSTANG/ 06441	114	.	57	2	.	.	.	.	.	.
MUSTANG/ 08331	113	.	51	2	.	.	.	.	.	.
MUSTANG/ 09920	116	55	50	2	.	.	.	.	.	.
STINE/ 06RA00	114	.	50	3	.	.	.	.	.	.
Test avg. :	112	53	53	2	52	41	1	53	48	2
High avg. :	116	55	57	4	55	48	1	55	57	3
Low avg. :	108	51	47	1	49	36	1	50	42	1
[3] Test LSD (.05):		NS**	5	1	NS	9	0	***	***	***
[4] Min.TPG-avg. :		51	52	.	49	40				
[5] Max.TPG-avg. :		.	.	1	.	.	1			
[6] Test Coef. Var.:		7	5	18	10	13				
No. Entries:	46	10	25	25	10	21	21	21	46	46

[1] DTM= days to maturity from seeding dates of May 21 at South Shore and May 28 at Warner.
Note that additional table footnotes are explained in Table F.
* Shaded values within a column are included in the top-performance group.
** Indicates differences between values within a column are non-significant (NS).
*** There were significant variety by location interactions for yield zone averages.
Therefore, evaluate yield by using the yield columns for each location.

Table 1b. Glyphosate-resistant maturity group-O soybean variety protein and oil averages-South Dakota locations, 2010. Entries are sorted by 2010 zone protein.

Brand/Variety	DTM [1]	Northern Averages by Location*				Northern Zone Averages	
		South Shore		Warner			
		Protein %	Oil %	Protein %	Oil %	Protein %	Oil %
G-2/ GENETICS 6090	109	40.2	19.7	34.1	22.4	37.2	21.0
PRAIRIE BR./ PB-0954RR	114	39.5	19.2	34.0	21.3	36.8	20.3
PRAIRIE BR./ PB-1120R2	116	39.7	18.2	33.3	20.6	36.5	19.4
NUTECH/ 0886RR	111	40.4	18.7	32.5	22.1	36.5	20.4
NUTECH/ 0889RR	114	39.5	19.1	33.0	21.6	36.2	20.3
G-2/ GENETICS 6088	112	39.9	19.0	32.6	22.2	36.2	20.6
ASGROW/ AG0730	109	38.8	18.6	33.4	20.9	36.1	19.8
PRAIRIE BR./ EXP 1001	112	39.8	18.5	31.9	21.5	35.8	20.0
HEFTY/ H09Y10	111	39.0	19.1	32.2	21.6	35.6	20.3
DAIRYLAND/ DSR-0747/R2Y	112	39.1	18.7	31.8	21.2	35.4	20.0
SEEDS 2000/ EXP2091RR2Y	112	39.4	19.3	31.4	21.9	35.4	20.6
SD/ 1093RR	111	39.7	19.8	31.0	22.5	35.4	21.2
PRAIRIE BR./ PB0879NRR2	115	38.3	19.7	32.3	21.8	35.3	20.7
HEFTY/ 09Y11	110	39.2	18.4	31.3	22.1	35.2	20.3
PRAIRIE BR./ EXP 0801	112	39.3	17.8	31.1	21.6	35.2	19.7
PRAIRIE BR./ PB-0999RR	113	40.0	18.4	30.3	22.3	35.2	20.4
NUTECH/ 0990RR	113	39.8	18.3	30.4	22.8	35.1	20.6
SEEDS 2000/ EXP2061RR2Y	112	38.1	19.6	30.4	22.0	34.2	20.8
PIONEER/ 90Y80	108	37.2	20.9	30.9	23.6	34.1	22.2
G-2/ GENETICS 6098	110	38.3	18.9	29.7	22.1	34.0	20.5
NUTECH/ 6082	115	37.4	19.0	30.2	21.6	33.8	20.3
MUSTANG/ 09920	116	38.8	19.3	.	.	.	.
MUSTANG/ 06441	114	40.0	19.3	.	.	.	.
MUSTANG/ 08331	113	39.2	18.3	.	.	.	.
STINE/ 06RA00	114	39.4	19.0	.	.	.	.
Test avg. :	112	39.2	19.0	31.8	21.9	35.5	20.4
High avg. :	116	40.4	20.9	34.1	23.6	37.2	22.2
Low avg. :	108	37.2	17.8	29.7	20.6	33.8	19.4
[3] LSD(.05) :		0.9	0.6	1.2	0.6	***	***
[4] Min.TPG-avg. :		39.5	20.3	32.9	23.0		
[6] Coef. Var. :		1.4	1.9	2.3	1.8	1.8	1.9
No. Entries :	46	25	25	21	21	42	42

[1] DTM= days to maturity from seeding dates of May 21 at South Shore and May 28 at Warner.
Note that additional table footnotes are explained in Table F.
* Shaded values within a column are included in the top-performance group. Look for hybrids with more shaded values, the more the better.
** Indicates differences between values within a column are non-significant (NS).
*** There were significant variety by location interactions for protein and oil zone averages. Therefore, evaluate protein and oil by using the protein and oil columns for each location.

Table 2a. Glyphosate-resistant maturity group-I soybean variety yield and lodging averages- northern South Dakota locations, 2009-2010. Entries are sorted by 2-Yr then by 2010 zone yield.

		Northern Averages by Location*						Northern Zone Averages		
		South Shore			Warner					
		Yield-bu/a			Yield-bu/a			Yield-bu/a		
Brand/Variety	DTM [1]	2-Yr	2010	2010 (1-5) [2]	2-Yr	2010	2010 (1-5) [2]	2-Yr	2010	2010 (1-5) [2]
DAIRYLAND/ DSR-1370/R2Y	117	55	52	2	59	51	1	57	52	2
PRAIRIE BR./ PB-1597RR	114	57	55	2	56	45	1	57	50	1
PRAIRIE BR./ PB1499NRR2	116	54	47	2	58	46	1	56	47	2
NUTECH/ 6145	117	55	51	1	55	45	1	55	48	1
DAIRYLAND/ DSR-1100/RR	114	55	53	3	54	43	1	55	48	2
HEFTY/ H117	111	55	53	2	54	40	1	55	47	2
G-2/ GENETICS 6159	114	53	51	2	52	42	1	53	47	1
NUTECH/ 6205+RR	121	53	50	2	52	39	1	53	45	2
PRAIRIE BR./ PB-1337RR	114	54	50	2	51	37	1	53	44	2
SD 1161RR/SCN	119	51	50	3	52	43	1	52	47	2
HEFTY/ H139	115	50	48	1	51	40	1	51	44	1
SEEDS 2000/ 2120RR	114	50	48	1	52	40	1	51	44	1
ASGROW/ AG1631	117	.	51	3	.	53	1	.	52	2
DAIRYLAND/ DSR-1710/R2Y	122	.	52	3	.	52	1	.	52	2
PRAIRIE BR./ PB-1722R2	124	.	51	2	.	52	1	.	52	2
MUSTANG/ 13320	117	.	51	2	.	51	1	.	51	1
MUSTANG/ 14441	116	.	52	3	.	49	1	.	51	2
ASGROW/ AG1230	114	.	50	1	.	49	1	.	50	1
ASGROW/ AG1431	115	.	54	2	.	45	1	.	50	2
DAIRYLAND/ DSR1215/RY2	115	.	54	2	.	45	1	.	50	2
PRAIRIE BR./ PB-1920R2	127	.	49	3	.	51	1	.	50	2
SD 2171RR	122	.	52	3	.	47	1	.	50	2
ASGROW/ AG1031	113	.	53	2	.	44	1	.	49	1
MUSTANG/ 11030	116	.	49	2	.	48	1	.	49	2
REA/ 76G10	118	.	55	2	54	42	1	.	49	2
REA/ 71G20	112	.	58	3	.	40	1	.	49	2
REA/ EXP 72G21	120	.	53	3	.	44	1	.	49	2
REA/ EXP 76G11	120	.	51	3	.	47	1	.	49	2
PRAIRIE BR./ PB-1410R2	118	.	49	3	.	49	1	.	49	2
HEFTY/ H11Y10	113	.	49	2	.	46	1	.	48	2
HEFTY/ H16Y11	121	.	51	3	.	45	1	.	48	2
G-2/ GENETICS 6160	115	.	54	3	.	42	1	.	48	2
G-2/ GENETICS 7180	121	.	46	3	.	49	1	.	48	2
REA/ 75G10	115	.	51	2	56	45	1	.	48	2
PRAIRIE BR./ PB-1552R2	114	.	51	2	.	44	1	.	48	2
PRAIRIE BR./ EXP 1701	121	.	48	2	.	48	1	.	48	2
PRAIRIE BR./ EXP 1301	112	.	48	2	.	43	1	.	46	2
ASGROW/ AG1530	116	.	47	2	.	43	1	.	45	2
NUTECH/ 7199	125	.	46	3	.	44	1	.	45	2
NUTECH/ 6195	127	.	43	3	.	47	1	.	45	2

Table 2a. Glyphosate-resistant maturity group-I soybean variety yield and lodging averages- northern South Dakota locations, 2009-2010 (continued).

		Northern Averages by Location*						Northern Zone Averages		
		South Shore			Warner					
		Yield-bu/a			Yield-bu/a			Yield-bu/a		
Brand/Variety	DTM [1]	2-Yr	2010	Lodg. (1-5) [2]	2-Yr	2010	Lodg. (1-5) [2]	2-Yr	2010	Lodg. (1-5) [2]
REA/ EXP 75G91	117	.	45	2	.	44	1	.	45	2
PIONEER/ 91Y22	113	.	48	2	.	40	1	.	44	2
HEFTY/ H12Y11	112	.	47	2	.	41	1	.	44	2
G-2/ GENETICS 7186	115	.	49	2	.	39	1	.	44	2
PIONEER/ 91Y60	113	.	.	.	.	40	1	.	.	.
STINE/ 10RA60	117	.	49	2	.	.	.	.	.	.
STINE/ 13R08	114	.	.	.	.	48	1	.	.	.
STINE/ 14RA02	113	.	.	.	.	41	1	.	.	.
CHANNEL/ 1201R2	113	.	.	.	.	48	1	.	.	.
CHANNEL/ 1400R2	111	.	.	.	.	40	1	.	.	.
CHANNEL/ 1502R2	111	.	.	.	.	47	1	.	.	.
NORTHSTAR/ NS1726NR2	122	.	46	3	.	.	.	.	.	.
Test avg. :	117	54	50	2	54	45	1	54	48	2
High avg. :	127	57	58	3	59	53	1	57	52	2
Low avg. :	111	50	43	1	51	37	1	51	44	1
[3] Test LSD (.05):		NS**	4	1	NS	7	0	***	***	***
[4] Min.TPG-avg. :		50	54	.	51	46	.			
[5] Max.TPG-avg. :		.	.	1	.	.	1			
[6] Test Coef. Var.:		5	5	21	7	10				
No. Entries:	96	12	46	46	14	50	50	24	88	88

[1] DTM= days to maturity from seeding dates of May 21 at South Shore and May 28 at Warner.
Note that additional table footnotes are explained in Table F.
* Shaded values within a column are included in the top-performance group.
** Indicates differences between values within a column are non-significant (NS).
*** There were significant variety by location interactions for yield zone averages.
Therefore, evaluate yield by using the yield columns for each location.

Table 2b. Glyphosate-resistant maturity group-I soybean variety protein and oil averages- South Dakota locations, 2010. Entries are sorted by 2010 zone protein.

		Northern Averages by Location*				Northern Zone Averages	
	DTM	South Shore		Warner			
Brand/Variety	[1]	Protein	Oil %	Protein	Oil %	Protein	Oil %
HEFTY/ H16Y11	121	41.2	18.4	32.8	20.7	37.0	19.6
ASGROW/ AG1530	116	40.7	18.4	33.3	20.8	37.0	19.6
REA/ EXP 76G11	120	40.8	17.4	33.1	20.4	37.0	18.9
ASGROW/ AG1031	113	40.2	18.2	33.2	20.7	36.7	19.5
PRAIRIE BR./ PB-1920R2	127	40.8	17.6	32.5	20.5	36.7	19.1
PIONEER/ 91Y22	113	39.4	19.0	33.8	21.2	36.6	20.1
PRAIRIE BR./ PB-1337RR	114	40.4	17.6	32.4	20.7	36.4	19.1
ASGROW/ AG1230	114	40.0	18.5	32.7	21.4	36.3	20.0
PRAIRIE BR./ EXP 1701	121	40.1	17.1	32.3	20.6	36.2	18.8
REA/ EXP 72G21	120	39.3	18.5	33.0	20.4	36.1	19.4
G-2/ GENETICS 7180	121	40.0	17.5	32.2	21.1	36.1	19.3
REA/ 76G10	118	40.1	18.3	32.0	21.7	36.1	20.0
ASGROW/ AG1431	115	39.5	19.2	32.1	21.8	35.8	20.5
DAIRYLAND/ DSR-1710/R2Y	122	39.7	17.6	31.9	20.8	35.8	19.2
HEFTY/ H12Y11	112	39.5	18.6	31.8	21.8	35.7	20.2
HEFTY/ H139	115	40.1	18.5	31.1	21.5	35.6	20.0
ASGROW/ AG1631	117	40.7	17.4	30.4	22.0	35.6	19.7
REA/ EXP 75G91	117	38.9	18.9	32.1	21.1	35.5	20.0
MUSTANG/ 13320	117	39.6	18.2	31.3	21.1	35.4	19.7
HEFTY/ H117	111	40.2	18.6	30.4	22.5	35.3	20.5
PRAIRIE BR./ EXP 1301	112	39.5	18.6	31.1	22.1	35.3	20.3
SEEDS 2000/ 2120RR	114	40.6	16.3	30.0	20.7	35.3	18.5
NUTECH/ 7199	125	39.5	18.7	31.0	22.1	35.3	20.4
PRAIRIE BR./ PB1499NRR2	116	39.6	18.1	30.9	20.7	35.3	19.4
PRAIRIE BR./ PB-1410R2	118	39.9	17.6	30.5	21.0	35.2	19.3
MUSTANG/ 14441	116	39.7	18.0	30.7	21.0	35.2	19.5
DAIRYLAND/ DSR-1100/RR	114	40.0	18.6	29.6	22.3	34.8	20.4
PRAIRIE BR./ PB-1597RR	114	38.5	18.8	31.0	22.0	34.8	20.4
NUTECH/ 6195	127	40.2	17.4	29.3	20.7	34.7	19.0
REA/ 71G20	112	38.5	19.0	30.9	21.5	34.7	20.3
G-2/ GENETICS 6160	115	38.1	19.3	31.3	21.7	34.7	20.5
REA/ 75G10	115	39.1	18.4	30.2	20.9	34.7	19.7
MUSTANG/ 11030	116	39.4	18.6	29.9	21.6	34.7	20.1
DAIRYLAND/ DSR-1370/R2Y	117	38.6	18.3	30.6	20.8	34.6	19.6
NUTECH/ 6145	117	39.6	18.7	29.5	22.2	34.6	20.5
SD/ 2171RR	122	38.7	18.2	30.4	21.2	34.6	19.7
G-2/ GENETICS 7186	115	38.8	19.1	30.3	22.3	34.5	20.7
DAIRYLAND/ DSR1215/RY2	115	38.8	18.3	30.0	20.4	34.4	19.4
SD/ 1161RR/SCN	119	37.5	19.2	31.3	21.2	34.4	20.2
NUTECH/ 6205+RR	121	38.2	18.5	30.4	21.9	34.3	20.2

Table 2b. Glyphosate-resistant maturity group-I soybean variety protein and oil averages-
South Dakota locations, 2010 (continued).

		Northern Averages by Location*				Northern Zone Averages	
	DTM	South Shore		Warner			
Brand/Variety	[1]	Protein	Oil %	Protein	Oil %	Protein	Oil %
G-2/ GENETICS 6159	114	38.0	19.8	30.4	22.8	34.2	21.3
PRAIRIE BR./ PB-1722R2	124	39.6	18.1	28.7	21.5	34.2	19.8
HEFTY/ H11Y10	113	38.9	19.1	29.4	21.7	34.2	20.4
PRAIRIE BR./ PB-1552R2	114	37.3	19.0	28.4	22.5	32.9	20.8
PIONEER/ 91Y60	113	.	.	30.1	22.2	.	.
STINE/ 10RA60	117	40.6	18.3	.	.	.	.
STINE/ 13R08	114	.	.	30.3	21.8	.	.
STINE/ 14RA02	113	.	.	32.1	21.4	.	.
CHANNEL/ 1201R2	113	.	.	33.2	20.4	.	.
CHANNEL/ 1400R2	111	.	.	32.1	20.4	.	.
CHANNEL/ 1502R2	111	.	.	30.1	21.4	.	.
NORTHSTAR/ NS1726NR2	122	41.2	16.5	.	.	.	.
Test avg. :	117	39.6	18.3	31.2	21.3	35.3	19.8
High avg. :	127	41.2	19.8	33.8	22.8	37.0	21.3
Low avg. :	111	37.3	16.3	28.4	20.4	32.9	18.5
[3] LSD(.05) :		1.2	0.7	1.6	0.5	***	***
[4] Min.TPG-avg. :		40.0	19.1	32.2	22.3		
[6] Coef. Var. :		1.8	2.4	3.2	1.4	2.4	1.9
No. Entries :	96	46	46	50	50	88	88

[1] DTM= days to maturity from seeding dates of May 21 at South Shore and May 28 at Warner.
Note that additional table footnotes are explained in Table F.
* Shaded values within a column are included in the top-performance group. Look for hybrids with more shaded values, the more the better.
** Indicates differences between values within a column are non-significant (NS).
*** There were significant variety by location interactions for protein and oil zone averages.
Therefore, evaluate protein and oil by using the protein and oil columns for each location.

Table 3a. Non-glyphosate-resistant maturity group-0 and -I soybean variety yield and lodging South Shore, 2010-2010.

BRAND/VARIETY	DTM [1]	MG-0 Yield-bu/a 2-yr	MG-0 Yield-bu/a 2010	MG-0 2010 (1-5) [2]	MG-I Yield-bu/a 2-yr	MG-I Yield-bu/a 2010	MG-I 2010 (1-5) [2]
SD03-2154	.	.	55	3	.	.	.
SD07CV-539	.	.	54	2	.	.	.
SHEYENNE	.	.	54	2	.	.	.
SURGE	.	50	53	2	.	.	.
SEEDS 2000 EXP 2083L	.	.	52	2	.	.	.
EXP MN0907	.	.	52	3	.	.	.
SD04CV-613	.	.	52	1	.	.	.
RICHLAND ORG. MK0508	.	48	51	4	.	.	.
SEEDS 2000 EXP 2082L	.	.	51	1	.	.	.
SEEDS 2000 EXP 2092L	.	.	51	1	.	.	.
SD04CV-611	.	.	51	2	.	.	.
MN0606CN	.	.	51	3	.	.	.
SD07CV-528	.	.	50	2	.	.	.
SD06-430	.	.	50	2	.	.	.
SD06-487	.	.	50	3	.	.	.
SD07CV-935	.	.	48	3	.	.	.
EXP MN0908CN	.	48	48	2	.	.	.
SD06-525	.	.	48	3	.	.	.
SD06-322	.	.	47	2	.	.	.
SD06-428	.	.	47	3	.	.	.
SD05-767	.	44	44	3	.	.	.
SD00-1501	.	42	42	2	.	.	.
MN1410	.	.	.	.	48	54	3
MN1701CN	.	.	.	.	49	53	3
SD05-240	.	.	.	.	.	52	3
SEEDS 2000 EXP 2102LN	.	.	.	.	.	50	1
MN1413CN	.	.	.	.	.	49	2
SK FOOD INTL SK9801	.	.	.	.	.	48	2
DEUEL	.	.	.	.	46	47	3
RICHLAND ORG. MK9101	.	.	.	.	.	46	3
RICHLAND ORG. MK1401T	.	.	.	.	.	45	2
RICHLAND ORG. MK1016	.	.	.	.	38	39	3
RICHLAND ORG. MK9120	.	.	.	.	.	32	3
Test avg.:	.	46	50	2	45	47	3
High avg.:	.	50	55	4	49	54	3
Low avg. :	.	42	42	1	38	32	1
[3] LSD (.05):		NS**	5	1	9	5	1
[4] Min. TPG avg.:		42	50	.	40	49	.
[5] Max. TPG avg.:		.	.	1	.	.	1
[6] Coef. Var.:		6	6	19	7	6	13

[1] DTM= days to maturity from seeding dates of May 24 at South Shore.

Note that additional table footnotes are explained in Table F.

* Shaded values within a column are included in the top-performance group.

** Indicates differences between values within a column are non-significant (NS).

Table 3b. Non-glyphosate resistant maturity group-0 and -I soybean variety averages- South Shore, 2010. Sorted by maturity group and

BRAND/VARIETY	DTM [1]	Protein & oil percentages by maturity group			
		MG-0		MG-I	
		Protein %	Oil %	Protein %	Oil %
SD00-1501	118	45.6	16.0	.	.
SD05-767	123	42.2	18.1	.	.
SURGE	118	41.1	19.5	.	.
SD07CV-935	124	40.6	18.6	.	.
SEEDS 2000/EXP 2092L	118	40.4	19.8	.	.
SD06-428	119	40.0	20.2	.	.
SD04CV-613	120	39.8	19.5	.	.
SD04CV-611	120	39.8	19.6	.	.
EXP MN0908CN	119	39.6	18.3	.	.
SEEDS 2000/EXP 2082L	118	39.6	18.7	.	.
SD07CV-528	119	39.4	19.9	.	.
MN0606CN	121	39.3	19.1	.	.
SD06-525	125	39.2	19.1	.	.
SD06-487	119	39.2	19.1	.	.
RICHLAND/ORG./MK0508	120	38.8	17.3	.	.
SEEDS 2000/EXP 2083L	123	38.7	19.3	.	.
SD06-322	118	38.4	20.8	.	.
SD03-2154	118	38.4	20.2	.	.
SD06-430	117	37.8	20.8	.	.
EXP MN0907	119	37.7	20.8	.	.
SHEYENNE	117	37.0	20.0	.	.
SD07CV-539	120	36.1	20.5	.	.
RICHLAND ORG./MK1401T	121	.	.	42.4	18.3
RICHLAND/ORG./MK1016	119	.	.	41.0	16.9
RICHLAND ORG./MK9120	124	.	.	40.9	23.5
SD05-240	128	.	.	40.4	17.9
DEUEL	121	.	.	39.7	18.8
MN1410	123	.	.	39.2	19.2
RICHLAND ORG./MK9101	120	.	.	39.2	22.3
MN1413CN	125	.	.	38.7	18.8
MN1701CN	130	.	.	38.5	19.2
SEEDS 2000/EXP 2102LN	124	.	.	38.3	19.4
SK FOOD INTL/SK9801	119	.	.	37.3	24.3
Test avg. :	121	39.5	19.3	39.6	19.9
High avg. :	130	45.6	20.8	42.4	24.3
Low avg. :	117	36.1	16.0	37.3	16.9
[3] LSD(.05) :		1.1	0.6	1.3	1.1
[4] Min. TPG avg.:		44.5	20.2	41.1	23.2
[6] Coef. Var. :		1.6	1.8	1.9	3.2

[1] DTM= days to maturity from seeding dates of May 21 at South Shore.
Note that additional table footnotes are explained in Table F.
* Shaded values within a column are included in the top-performance group. Look for hybrids with more shaded values, the more the better.

Precision-Planted Glyphosate-Resistant Corn Hybrid Performance Trials

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This reports the 2010 Northeast Research Farm performance trial for the glyphosate-resistant corn hybrids conducted by the South Dakota State University Crop Performance Testing (CPT) program.

Experimental Procedures

Entries were placed into either an early or late maturity trial according to ratings reported by a given seed company. The break between the early and late test was 95-day for both hybrid trials. Entries were seeded in three replications with each hybrid randomly located within a replication block. Plots consisted of four 30-inch rows, 20 feet long. Plots were seeded on May 5, 2010 into a conventionally tilled Kranzburg silty clay loam with a 3-6% slope and previously cropped to spring wheat. A Monosem precision row crop planter was used to seed plots. During seeding, a starter fertilizer of 100 pounds/acre of 30-10-10 was applied 2" below and 2" to the side (2x2) of the seed furrow and later fertilized for a yield goal of 180 bushels/acre. The precision planter was calibrated to deliver 28,750 seeds per acre, regardless, of seed quality and germination percentage. Thus, the harvest population is an indication of initial seed quality and the ability of the seed to cope with the production environment. Weed control procedures consisted of a pre-Dual II Magnum application plus one post-Roundup application, both at label rates.

Measurements of Performance

Yield values are an average of three replicates (plots), and are expressed as bushels per acre (bu/a), adjusted to 15.5% moisture on a dry-matter basis and a bushel weight of 56 pounds. Moisture content is expressed as the percentage of moisture in the shelled grain at harvest.

Check for the "least significant difference" (LSD) value at the bottom of each data column. The reported LSD values can be used in two ways. First, the LSD value can indicate how much a variable such as yield must differ between two hybrids before there is a real yield difference. For example, if the 2-year LSD value equals 12 bu/a acre it can be used to compare the yields of any two hybrids. If hybrid A averages 190 bu/a and hybrid B averages 189 bu/a the yield difference is 11 bu/a (190 - 189 = 11). In this case the two hybrids do not differ in yield because their yield difference of 11 bu/a is less than the reported LSD value of 12 bu/a. In contrast, if hybrid C yields 185 bu/a the difference between hybrids A and C is 15 bu/a (190-185 = 15). In this case, the yield difference of 15 bu/a is more than the reported LSD value of 12 bu/a; therefore, hybrid A is significantly higher in yield than hybrid C.

The second use for the LSD value is to identify the top performance group (TPG) for current year and two-year yields, bushel weight, grain moisture at harvest, and lodging (below the ear) percentage for each test trial. In order to determine which hybrids are in the TPG for yield use the LSD value indicated at the bottom of each yield column in any yield table. For example, let's say the column LSD value equals 15 (bu/a) and the highest yield for that column equals 155 bu/a. If you subtract the column LSD value from the highest yield you obtain an intermediate value of 140 bu/a (155–15 = 140). The minimum top yield value has to be greater than this intermediate value of 140 bu. and since the yield values are rounded to the nearest bushel it must be at least 141 bu. Thus, varieties with an average of 141 bu. or higher are included in the top-yield group. Top yield hybrids are those hybrids that are equal or more than the minimum TPG for yield. Likewise, a minimum TPG value is listed for the 2 yr. (2009-10) average. The minimum yield value needed for a hybrid to qualify for **the TPG for yield for 2010 or for 2009-10 is listed at the bottom of each yield column**. If hybrid yield differences are not significant (NS), then by definition - **all hybrids in the test are in the TPG for yield** for the stated one- or two-year yield average.

Similarly, the TPG for bushel weight, grain moisture at harvest, and stalk lodging below the ear percentage can be determined. Note that yield and bushel weight TPG values must exceed a minimum value; while grain moisture and lodging below ear percentage values must be equal to or less than maximum value to qualify for the TPG depending on a given variable.

Table A. Explanation of performance table footnotes.

No	Explanation of footnotes
[1]	Entries listed by Brand/Hybrid- Sorted by 2-yr then 2010 yield average.
[2]	Brand Relative Maturity (Rel. Mat.)– The relative maturity rating as reported by the seed company.
[3]	Lodging Percentage– percentage of stalks broken below the ear at harvest.
[4]	Final Stand Percentage – number of standing stalks at harvest as a percent of seeded population.
[5]	Least Significant Difference (LSD $_{0.05}$) – the difference two values within a column exceed to be significantly different (0.05 level of probability). If their difference is less than the LSD value the difference is nonsignificant (NS).
[6]	Min. TPG-avg.– the minimum column value for yield, bushel weight, and final stand percentage that a given hybrid must equal or exceed to be in the TPG.
[7]	Max. TPG-avg.– the maximum column value for grain moisture at harvest, lodging percentage that a given hybrid must equal or be less than to be in the TPG.
[8]	Coefficient of variation (C.V.) - the percent of experimental error associated with a trial. Ideally, the CV value for yield is less than 15%. Values less than 5% are less common, values of 6-15% are more common, and if values exceed 15%; the trial contained too much experimental error to be valid; so the trial is not reported.

Seasonal Precipitation and Temperatures

The seasonal precipitation total from April 1 to September 30 was 13.99 inches or 5.65" below average. The April moisture total was 1" below average, the May through June moisture total 3.42" above average, and the September and October averages were each about 2" below average. The average monthly daily temperature from April through September was below average at slightly more than -3°F. The monthly average daily temperatures were near average for May, June, July and September; but were nearly 5^{o}*F* warmer in August. These temperatures lead to growing degree day (GDD) totals that were near normal for May (272 GDDs), June (478 GDDs), and July (673 GDDs): above normal for August (697 GDDs), and below normal for September (221 GDDs). This resulted in a total of 2,424 GDDs or 122 GDDs below average for the April through September period.

Performance Trial Results – 2010

Early – Glyphosate-resistant trial, Table 1. The test trial yield averages were 203 bu/a for two-years and 198 bu/a in 2010. The yield differences among those hybrids tested for two years were nonsignificant (NS). Hybrids that yielded 196 bu/a or more for 2010 qualified for the TPG for yield. Hybrids had to differ in yield by 17 bu/a in 2010 to be significantly different. In 2010, bushel weights averaged 56 lbs, grain moisture averaged 16%, lodging averaged 1%, and final stand percentage averaged 92%. In order for hybrids to be in the TPG for these factors, they had to average 57 lbs. or more in bushel weight, 15% or less in grain moisture, 2% in lodging percentage, and 95% or higher in final stand percentage.

Late – Glyphosate-resistant trial, Table 2. The test trial yield averages were 210 bu/a for two-years and 214 bu/a in 2010. The yield differences among those hybrids tested for two years were nonsignificant (NS). Hybrids that yielded 222 bu/a or more for 2010 qualified for the TPG for yield. Hybrids had to differ in yield by 17 bu/a in 2010 to be significantly different. In 2010, bushel weights averaged 59 lbs, grain moisture averaged 19%, lodging averaged 1%, and final stand percentage averaged 91%. In order for hybrids to be in the TPG for these factors, they had to average 59 lbs. or more in bushel weight, 18% or less in grain moisture, and 3% or more in lodging percentage, and 95% or more in final stand percentage.

Table 1. South Shore early maturity Roundup Ready corn hybrid test results, 2009-10, Northeast Research Seeded May 5, 2010 at 28,750 seeds per acre.

Brand/Hybrid + Seed Treatment [1]	Rel. Mat. [2]	Yield 2-Yr bu/a	Yield 2010 bu/a	Other 2010 Averages* Bu.Wt. lb	Grain Moisture Pctg	Lodging Pctg [3]	Final Stand Pctg [4]
DAIRYLAND/ ST-9594 + Cruiser Extreme	94	213	212	59	17	0	98
DAIRYLAND/ ST-9789 + Cruiser Extreme	89	209	208	58	17	0	97
AGSOURCE/ 3T-294 VT3 + Poncho 250	94	207	207	58	17	0	100
DAIRYLAND/ ST-9395 + Cruiser Extreme	95	206	200	57	17	1	85
DEKALB/ DKC42-72(VT3) + Poncho 250	92	206	199	57	17	0	91
DEKALB/ DKC43-27(VT3) + Poncho 250	93	204	196	57	16	1	91
SEEDS 2000/ 9502VT3 + Poncho 250	95	199	195	57	18	0	87
SEEDS 2000/ 9501VT3 + Poncho 250	95	197	190	56	15	1	100
PIONEER/ PIONEER BR.38H08 + Poncho	92	196	196	55	15	1	90
AGSOURCE/ 3P-494+RR/YGPL + Cruiser	94	195	197	55	15	1	94
CHANNEL/ 190-21VT3P + Acceleron	90	.	213	59	16	0	99
DAIRYLAND/ ST-9992 + Cruiser Extreme	92	.	212	56	17	1	99
NUTECH/ 3P-494+ RR/YGPL +	94	.	211	55	16	2	95
NUTECH/ 5B-290 GT/CB/LL + Poncho 250	90	.	211	56	15	1	99
DEKALB/ DKC45-52(GENVT3P) + Acceleron	95	.	210	57	17	0	100
G2 GEN./ 5H-696 RR/HX + Cruiser 250	95	.	205	57	18	0	96
AGSOURCE/ 5N-593GTCBLLRW + Poncho	93	.	203	56	15	0	98
G2 GEN./ 5H-597A RR/HX + Cruiser 250	95	.	202	57	18	0	92
CHANNEL/ 189-59VT3 + Acceleron	89	.	202	57	16	0	94
NUTECH/ 3C-889 RR/YGCB + Poncho 250	89	.	199	57	16	0	97
G2 GEN./ 5H-891 RR/HX + Cruiser 250	91	.	198	56	14	0	94
AGSOURCE/ 3A-889 RR + Poncho 250	89	.	198	56	15	0	94
PIONEER/ PIONEER BR.P9176XR +	91	.	197	58	16	1	97
CHANNEL/ 193-46VT3 + Acceleron	93	.	195	57	16	1	95
NUTECH/ 5N-695 GTCBLLRW + Cruiser 250	95	.	189	55	16	7	86
NUTECH/ 5N-197AGTCBLLRW + Poncho	95	.	184	56	16	5	89
PIONEER/ PIONEER BR.P8917XR +	89	.	178	58	16	1	89
NUTECH/ 3T-393 VT3 + Cruiser 250	93	.	178	55	17	0	80
G2 GEN./ 5H-992 RR/HX + Cruiser 250	92	.	178	54	16	0	64
G2 GEN./ 5X-895 RR/HXT + Cruiser 250	95	.	176	54	17	0	77
Trial avg.:	93	203	198	56	16	1	92
High avg.:	95	213	213	59	18	7	100
Low avg.:	89	195	176	54	14	0	64
[5] LSD(.05):		NS**	17	2	1	2	5
[6] Min.TPG value:		195	196	57	.	.	95
[7] Max.TPG value:		.	.	.	15	2	.
[8] Coef. of var.:		4	5	2	6	145	4
No. entries:	30	10	30	30	30	30	30

[1] Entries are listed by Brand/Hybrid and sorted by 2-yr then by 2010 yield average.

* Shaded values within a column are included in the top-performance group - look for hybrids with one or shaded values; the more the better.

** Indicates differences between values within a column are non-significant (NS).
Note that additional table footnotes are explained in table A.

Table 2. South Shore late maturity Roundup Ready corn hybrid test results, 2009-10, Northeast Research Seeded May 5, 2010 at 28,750 seeds per acre.

Brand/Hybrid + Seed Treatment [1]	Rel. Mat. [2]	Yield 2-Yr bu/a	Yield 2010 bu/a	Other 2010 Averages* Bu.Wt. lb	Grain Moisture Pctg	Lodging Pctg [3]	Final Stand Pctg [4]
G2 GEN./ 5H-999 RR/HX + Cruiser 250	99	220	224	59	19	1	96
DEKALB/ DKC50-66(VT3) + Poncho 250	100	218	222	60	17	0	99
NUTECH/ 3T-401 VT3 + Cruiser 250	100	214	235	58	22	0	100
NUTECH/ 3T-098 VT3 + Cruiser 250	98	208	228	59	20	0	94
DEKALB/ DKC48-37(VT3) + Poncho 250	98	208	207	60	17	0	91
G2 GEN./ 5H-797 RR/HX + Cruiser 250	97	204	212	59	18	0	92
SEEDS 2000/ 9901VT3 + Poncho 250	99	201	207	59	20	0	83
DEKALB/ DKC50-35(VT3) + Poncho 250	100	.	239	59	21	0	98
DEKALB/ DKC51-86(GENVT3P) + Acceleron	101	.	238	59	20	0	100
DEKALB/ DKC52-59(VT3) + Poncho 250	102	.	228	59	20	0	92
G2 GEN./ 5H-502 RR/HX + Cruiser 250	100	.	226	58	22	1	91
SEEDS 2000/ EXP 9602G3 + Cruiser 250	96	.	226	57	17	0	97
CHANNEL/ 196-06VT3 + Acceleron	96	.	224	59	19	1	98
NUTECH/ 5H-700A RR/HX + Cruiser 250	100	.	219	58	21	0	88
NUTECH/ 5N-197 GTCBLLRW + Poncho	97	.	217	58	21	3	89
NUTECH/ 5N-102 GTCBLLRW + Cruiser 250	100	.	212	56	21	1	92
EPLEY/ E1275RR + Maxim XL,Lorsban	97	.	212	59	17	2	97
SEEDS 2000/ 9701SS + Acceleron	97	.	207	59	17	3	92
EPLEY/ E1125GT + Maxim XL,Lorsban	98	.	206	57	19	9	91
AGSOURCE/ 3T-297 VT3 + Poncho 250	97	.	202	59	19	0	80
G2 GEN./ 5X-500 RR/HXT + Cruiser 250	100	.	201	59	19	0	87
AGSOURCE/ 5X-598A RR/HXT + Cruiser	98	.	199	57	19	1	84
G2 GEN./ 5X-598 RR/HXT + Cruiser 250	98	.	196	57	19	0	80
AGSOURCE/ 5X-500A RR/HXT + Cruiser	101	.	196	58	19	0	90
SEEDS 2000/ EXP X299V + Poncho 250	99	.	178	59	20	0	66
Trial avg.:	99	210	214	59	19	1	91
High avg.:	102	220	239	60	22	9	100
Low avg.:	96	201	178	56	17	0	66
[5] LSD(.05):		NS**	17	1	1	3	5
[6] Min.TPG value:		201	222	59	.	.	95
[7] Max.TPG value:		.	.	.	18	3	.
[8] Coef. of var.:		5	5	1	4	248	4
No. entries:	25	7	25	25	25	25	25

[1] Entries are listed by Brand/Hybrid and sorted by 2-yr then by 2010 yield average.

* Shaded values within a column are included in the top-performance group - look for hybrids with one or shaded values; the more the better.

** Indicates differences between values within a column are non-significant (NS).
Note that additional table footnotes are explained in table A.

OAT PROJECT

Lon Hall
(web site: http://plantsci.sdstate.edu/oats/index.htm)

The oat program's objective is to develop oat varieties for producers in South Dakota and surrounding states. Multipurpose varieties are being developed to satisfy more than one market. These varieties may be used in double cropping, as a companion crop, forage, and/or harvested for grain. The desired agronomic traits are high grain and/or forage yield potential, high-test weight, disease resistance, straw strength, white hulled or hulless, and maturity adaptation for South Dakota's diverse regional environments.

'Shelby427', a white-hulled spring oat, was developed by the South Dakota Agricultural Experiment Station (SDAES) and approved for release in 2010. Shelby427 has a high groat percentage, excellent stem rust, crown rust, and barley yellow dwarf virus resistance. SD081936 and SD081949 are being increased with intent to release in 2012; however, only one will be approved for variety release.

2010 STANDARD VARIETY OAT PEFORMANCE TRIAL SUMMARY:

	SVO 8Loc yield bu/a	SVO 8Loc tw lbs/bu	SVO 2Loc head June	SVO 5Loc ldg* 1-5	SVO NE ldg** %	SVO BK sb*** 1-5	SVO 8Loc ht inch	SVO NE crown rust%	SVO 7Loc protein %
SD 081949	102.4	35.9	19	2.9	20	2.7	36	0	14
SD 081936	102.0	36.0	18	3	11	2.8	33	0	13.7
SD 081577	101.9	35.4	20	2.9	5	2.3	35	0	13.6
SD 081563	101.0	36.4	21	2.7	5	2.2	35	0	14.1
Souris	99.4	35.5	22	2.9	29	2.8	36	0	14
SD 081629	99.3	37.8	18	2.7	29	2.3	35	0	14.6
SD 081644	95.7	36.3	21	3	19	2.7	36	0	14.1
HiFi	95.6	35.5	23	3	29	3.3	39	3	13.7
Rockford	95.4	36.7	24	2.9	29	3.7	39	0	13.6
Shelby427	94.4	37.8	17	2.9	31	2.7	38	0	13.9
MN 07210	90.4	35.2	25	3.2	32	3.7	40	0	14.1
SD 082192	81.1	36.5	14	4.4	44	3.5	32	98	13.9
Colt	80.7	36.7	15	4.1	22	3.2	35	80	14.6
Stallion	76.9	34.8	22	4.5	73	4.7	39	68	14.5
Beach	75.4	35.7	22	3.9	40	4.0	41	75	13.7
Don	74.3	33.9	16	4.2	27	3.0	33	95	13.9
Reeves	67.9	36.2	16	4.3	47	4.3	38	90	14.6
Jerry	66.0	34.6	20	4.2	40	3.2	39	86	14.5
Buff Hls	62.3	41.9	18	3.7	47	3.2	35	73	16.1
Streaker Hls	51.4	42.4	17	4.2	57	4.2	37	50	16.5
Mean	85.7	36.6	19.3	3.5	31.9	3.2	36.7	35.9	14.3

*Reading at harvest

**Reading at dough

***staw snap back, 1 strongest

Program Synopsis:

The objective of the South Dakota State University oat breeding program is to develop white hulled and hulless cultivars with superior agronomic traits, grain, and forage qualities. Although the main focus is cultivar development, other cooperative research includes: forage trials, fungicide, fertility, and herbicide studies. Cultivar development continues by employing various aspects of three plant-breeding methods: bulk, mass selection, and single seed descent.

Diverse germplasm was used to make 345 unique 2 or 3-way hybridizations in an attempt to break unfavorable gene linkages, combine genes, and create positive transgressive segregation. Two hundred and seventy crosses were selected for F1 increase in the fall greenhouse cycle. Twenty two thousand plants consisting of 21 F3 bulk populations and 12 F5 high avenathramide/beta-glucan bulk populations were screened for kernel type and crown rust in the fall greenhouse cycle. Five hundred and eighty eight lines were evaluated for BYDV, crown, and stem rust resistance. Fifteen hundred single seed descent plants and 36 high avenanthramide and beta-glucan F3 bulk populations were harvested from the spring greenhouse. There were a total of 3693 yield plots grown in the field. The numbers of unique bulk populations grown were 240 bulk F2s and 144 bulk F3s. There were 1305 lines derived from F5, F7, F8, and/or F9 generations grown in unreplicated Preliminary Yield Trials at the Northeast Farm or the Brookings location. The number of unique lines grown in replicated Advanced Yield Trials and regional nurseries were 164 and 120 respectively.

SD060130, SD091038, and SD091226 (naked oat) are being increased in New Zealand.
Twenty four derived lines from SD041405 and twelve SD070110 (tall forage) derivatives were yield tested and underwent a simultaneous preliminary increase. A tall forage winter rye, X79-8, is currently undergoing a minor increase. SD081936 and SD081949 were approved for increase with intent to release in 2012; however, only one will by released. SD081949 and SD081936 ranked 1 and 2 respectively for yield in the 2010 South Dakota Standard Variety Oat Yield Trials. Shelby427, a white hulled variety, was released in 2010.

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Spring Wheat Breeding

Karl D. Glover

Our primary objective is to improve the agronomic, milling, and baking characteristics of spring wheat cultivars that are well adapted to South Dakota. Prior to the release of a new cultivar to growers, its advantageous features must be well documented. Characterization of material begins during the second growing season after a cross has been made. Thousands of breeding lines, each representing a potential cultivar, are created yearly and are subject to removal from consideration based on their susceptibility to disease and lack of agronomic promise. Lines chosen for additional testing are more heavily scrutinized with each successive testing year. Therefore, the number of lines included in preliminary and advanced yield tests is relatively few compared to early generation tests. Spring wheat production environments in our state can be dramatically different from year-to-year and even from location-to-location within a year. Unfortunately, this prevents cultivars from being optimally adapted to all production environments. This necessitates that preliminary and advanced yield tests also be conducted in several environments throughout the state. The Northeast Research Station is one of two locations used for testing material in both early- and advanced-selection stages.

Thirty-five experimental lines appearing to hold the most potential for cultivar release were included in the 2010 Advanced Yield Trials (AYT) along with thirteen released cultivars included for comparative purposes. Not all thirty-five entries will be selected for continued testing in 2011. Table 1 presents statewide agronomic and Fusarium head blight resistance observations collected from thirty entries grown in both the 2009 and 2010 AYT, as well as grain yield observations from the Northeast Research Station. Statewide data for each entry are presented as an average over seven locations (Aurora, Brookings, Groton, Miller, Redfield, Selby, and South Shore) from both 2009 and 2010 (14 location-year combinations).

Among the experimental lines presently being considered for release, SD4023 appears most promising as a new cultivar due to its yield potential, test weight, short plant stature, and end-use qualities (data not shown). Breeder seed of SD4023 will be increased in South Dakota during 2011 and may be released to Registered seed producers in 2012.

Efforts carried out, and cultivars released, by this program are made possible primarily with financial support provided by the South Dakota Agricultural Experiment Station, South Dakota Wheat Commission, and South Dakota Crop Improvement Association.

Table 1. Agronomic and disease resistance performance data of sixteen hard red spring wheat experimental lines evaluated in 2009 and 2010 Advanced Yield Trials.

Entry	Northeast Research Station			2009 - 2010 Statewide Averages *					
		Yield (bu/ac)		TW (lb/bu)	Heading (Day)***	Height (in)	Pro (%)	DIS (%)***	Yield (bu/ac)
	2009	2010	2yr.						
FALLER	62.7	58.4	59.6	57.0	25.3	35.6	14.5	26.5	58.1
TRAVERSE	63.1	71.7	67.3	55.1	21.5	36.7	14.4	26.3	56.4
KNUDSON	62.9	71.9	65.4	57.8	23.6	33.9	14.3	27.9	56.4
SD4023	55.1	66.7	59.5	57.8	23.4	33.5	14.4	31.4	55.2
SD4178	65.7	69.0	65.1	58.0	21.7	33.5	14.3	26.8	54.9
SD4189	55.4	65.8	63.3	57.7	22.0	37.1	14.4	28.5	53.7
SELECT	40.3	60.4	56.2	58.3	19.9	35.4	14.7	22.3	52.9
SD4165	45.7	64.5	56.0	56.9	21.6	33.6	15.2	25.9	52.8
STEELE-ND	49.4	64.3	58.1	57.8	23.1	36.0	15.2	30.4	52.3
SD4199	66.4	66.5	61.2	57.5	19.3	33.9	14.3	28.3	52.3
SD4159	59.8	52.6	55.9	57.7	21.1	33.8	14.4	28.0	51.9
SD4205	42.3	65.5	55.9	55.6	28.4	36.3	13.6	36.1	51.9
BRIGGS	52.4	64.6	55.2	56.9	20.2	34.9	15.0	25.5	51.6
BRICK	60.0	64.9	59.9	58.7	19.2	35.4	14.9	18.5	51.6
SD4076	61.5	62.8	59.2	58.1	20.0	33.4	14.9	23.2	51.5
SD4112	56.6	60.0	58.5	57.8	20.6	34.9	14.5	25.5	51.3
OXEN	46.8	65.4	56.3	54.9	21.6	33.4	14.6	31.0	51.1
SD4171	44.6	64.3	56.7	56.5	19.2	33.6	15.4	18.0	51.1
SD4156	39.9	60.7	53.4	56.3	23.2	34.0	14.6	32.2	51.0
SD3997	49.3	66.3	57.7	57.9	21.6	38.2	15.3	25.5	50.7
SD4046	48.3	54.4	54.7	57.4	22.2	36.7	14.4	22.1	50.5
REEDER	41.1	60.4	50.5	55.5	23.1	35.2	15.0	32.5	49.5
SD4011	53.8	58.7	54.6	55.8	21.6	33.6	15.4	25.9	49.2
RUSS	45.8	58.5	50.8	55.3	23.0	36.6	14.6	32.6	49.2
GRANGER	46.7	65.8	54.5	57.0	22.2	36.8	15.0	31.2	49.0
SD4187	49.9	57.0	53.3	55.1	20.8	35.8	14.7	23.6	48.2
SD4105	64.7	50.7	52.3	57.8	21.3	35.4	14.3	25.2	48.0
KELBY	43.5	61.4	53.4	57.4	21.6	30.5	15.4	26.8	48.0
SD4181	67.0	62.3	59.4	58.9	20.1	36.6	15.7	18.9	47.4
ALSEN	47.1	53.8	51.1	57.2	23.1	34.5	15.6	22.2	46.3
MEAN	52.9	62.3	57.2	57.1	21.9	35.0	14.8	26.6	51.5
LSD (0.05)	8.9	4.5	5.2	0.6	0.5	0.7	0.2	7.8	2.5
CV (%)	16.4	8.4	7.5	2.0	8.8	4.6	3.3	16.6	5.5

* Performance based on 14 AYT locations grown in 2009 and 2010.

** Heading date expressed as days after 1 June.

*** DIS (%) calculated as product of average incidence and average severity of entries tested for Fusarium head blight resistance at Brookings nursery in 2009 and 2010.

NE Farm Soybean Breeding Summary for 2010 Growing Season

Project Leader: Dr. Guo-Liang Jiang
Research Associate II: Marci Green
Research Manager: Nick Hall

As in the past, soybean plots were grown in replicated 30-inch rows with either 2 row plots (preliminary trials) or 4 row plots (advanced and regional trials) and 14.5 foot plot lengths. Experiments grown at NE farm included preliminary and advanced yield trials and conventional entries from SDSU's soybean breeding project in Maturity Groups 0 and 1. In addition, regional soybean trials (UNF), and quality traits trials (QT) containing high protein and modified fatty acid entries were grown. Advanced trials contained only SD entries, while regional and quality traits trials contained entries from several universities across the North –Central region. Yields for 2010 were generally very good at NERF. Plants were planted on May 28 for all trials. All material matured prior to hard frost.

There were 9 entries in the maturity group 0 quality traits (QT) test and 20 entries in the maturity group 1. The yields for group 0 ranged from 28.41 to 41.8 bu/acre with mean 33.6. Group 1 QT yields ranged from 29.5 to 45.6 bu/acre with mean 34.6.

Advanced trails included 63 conventional entries in maturity groups 0 and 1. MG 0 test average was 38.1 bu/acre with highest yoelding line 41.8 bu/acre. In MG 1, test average was 34.6 bu/acre with highest yield of 46.6 bu/acre.

There were 506 entries in MG 0 and MG 2 preliminary trials. MG 0 test average was 26.3 bu/acre with highest yield of 43.7 bu/acre.

In the regional trials, there were 18 MG 1 entries in first year regional trials (UP1) and 29 MG 1 entries in 2nd or later year regional trials (UT 1). For UP 1, test average was 36.4 bu/acre with high of 42.8 bu/acre. In UT 1, test average was 37.4 bu/acre and highest line yielding 44.4 bu/acre.

No protein and oil data have been collected at this time and therefore are not being reported.

The Northeast Farm remains a key site in our testing program. Yields usually are more unpredictable at this site than other sites, providing a good contrast of performance of individual lines. This site appears to be a good measure of soybean performance on SD Choteau. Lines that do well at NE Farm should do well elsewhere on the Choteau.

Northeast Research Farm Annual Report

2010 Alfalfa Production

Vance Owens and Chris Lee

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.

Materials and Methods

Six replications of each cultivar were planted 6 May 2008 at a rate of 18 lbs pure live seed/acre. Fifty pounds super phosphate (P_2O_5) was applied and incorporated before planting. Later fertilizer application was made when necessary as recommended by the South Dakota State Soil Testing Laboratory. Forage was harvested with a sickle-type harvester 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 0.10 level of probability when significant F-tests were detected by analysis of variance.

Results

Table 1 provides forage production data for 10 alfalfa cultivars planted in 2008. Three cuttings were taken from the 2008 trial. Cultivars are ranked from highest to lowest based on cumulative production. The least significant difference (LSD) listed at the bottom of each 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.

Acknowledgements

Financial support for this research was provided by marketers of the various alfalfa seed entries and by the South Dakota Agricultural Experiment Station.

Table 1. Forage yield of 10 alfalfa cultivars entered in the South Dakota State University alfalfa testing program. Trial was planted 6 May 2008 at the Northeast Research Farm.

	2010				2009	2-yr
Entry	16-Jun	15-Jul	12-Aug	Total	Total	Total
	---------------------------- Tons dry matter/acre--------------------------					
Rebound 5.0	1.33	1.26	0.80	3.39	4.59	7.98
Producers A4330	1.11	1.15	0.78	3.04	4.84	7.87
LegendDairy 5.0	0.98	1.20	0.67	2.86	4.51	7.37
Pionner 54V09	0.99	1.06	0.63	2.67	4.31	6.99
Ameristand 407TQ	0.99	1.06	0.71	2.76	4.23	6.98
DKA 43-13	1.03	1.08	0.75	2.86	4.03	6.88
WL 343HQ	0.99	1.09	0.65	2.73	3.71	6.44
Pioneer 55V48	1.00	1.03	0.64	2.66	3.68	6.34
Garst 6417	0.91	0.92	0.65	2.48	3.82	6.30
Vernal	0.98	1.05	0.58	2.61	3.49	6.10
Average	1.03	1.09	0.69	2.81	4.12	6.93
Maturity (Kalu & Fick)	4.5	5.5	4.9			
LSD (P=0.10)	NS	NS	0.10	NS	0.67	1.06
CV (%)	22.6	18.6	15.2	17.8	16.8	15.7
P-value	0.173	0.268	0.011	0.150	0.021	0.043

NS = not significant at 0.10 level of probability
50 lbs P2O5/Acre - preplant

Table 2. Forage yield of 10 alfalfa cultivars entered in the South Dakota State University alfalfa testing program. Trial was planted 6 May 2008 at the Northeast Research Farm.

	2009			
Entry	12-Jun	15-Jul	10-Aug	Total
	------------------------- Tons Dry Matter/Acre ---------------------------			
Producers A4330	1.76	1.68	1.39	4.84
Rebound 5.0	1.67	1.67	1.25	4.59
LegendDairy 5.0	1.55	1.67	1.30	4.51
54V09	1.64	1.62	1.06	4.31
Ameristand 407TQ	1.54	1.48	1.21	4.23
DKA 43-13	1.28	1.55	1.20	4.03
Garst 6417	1.34	1.42	1.06	3.82
WL 343HQ	1.23	1.41	1.08	3.71
55V48	1.29	1.36	1.03	3.68
Vernal	1.33	1.44	0.72	3.49
Average	1.46	1.53	1.13	4.12
Maturity (Kalu & Fick)	4.6	4.8	4.4	
LSD (P=0.10)	0.31	NS	0.20	0.67
CV (%)	22.2	16.7	18.1	16.8
P-value	0.050	0.224	< 0.001	0.021

NS = not significant at 0.10 level of probability

50 lbs P2O5/Acre - preplant

Weed Control – W.E.E.D. Project

M. Moechnig, D. Deneke, D. Vos, and J. Alms

Introduction

The Northeast Station provides a strategic location to collect weed control data for northeastern South Dakota. Field plots provide side-by-side comparisons and comparative performance data. Plots are evaluated for weed control and crop tolerance. Yields were harvested from selected studies.

2010 Research and Demonstration Projects

1. Corn Herbicide Demonstration
2. Kochia Control with Cadet in Corn
3. Weed Control with Realm Q
4. Soybean Herbicide Demonstration
5. Ignite with Adjuvants in Soybeans
6. Weed Control in Dicamba Tolerant Soybeans
7. Weed Control with Flexstar GT
8. Glyphosate Antagonism with Contact Herbicides
9. Residual Weed Control with Authority Products in Soybeans
10. Duration of Residual Weed Control in Soybeans
11. Burndown with Aim and Cadet
12. Fallow Weed Control with Sharpen
13. Glyphosate Resistant Kochia Control Options
14. Sharpen in Millet
15. Tank-Mixtures for Established Roundup Ready Alfalfa
16. Canada Thistle in Clearfield Sunflowers
17. Grass and Broadleaf Weed Control with Premixes and Tank-Mixes
18. Broadleaf Weed Control with Pulsar and Orion
19. Wolverine in Spring Wheat
20. Broadleaf Weed Control in Spring Wheat with Huskie
21. Residual Herbicides in Spring Wheat
22. Weed Control in Sunflower with Spartan and Dual
23. Preplant Burndown in No-Till Sunflowers with Spartan Advance

The most common broadleaf weed species included common lambsquarters, pigweed species, kochia, wild buckwheat, and wild mustard. Green foxtail was the most common grass weed species.

Additional experiments were also conducted at the Northeast Research Station to evaluate experimental herbicides. Results from these studies may be released at a later time when those products are registered for use in South Dakota. Results from other research stations are printed in the 2010 Weed Control Field Test Data (EMC 678) or on the internet at http://plantsci.sdstate.edu/weeds/. This internet site also contains research results from previous years at the Northeast Experiment Station and other locations across South Dakota.

ACKNOWLEDGEMENT

Local Extension educators assist with identifying research needs, conducting tours, and incorporating research results into crop production recommendations for growers. Funding for this research is provided by:

1. South Dakota Soybean and Research and Promotion Council
2. South Dakota Wheat Commission
3. Consortium for Alternative Crops
4. Crop protection industries

***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. Refer to the appropriate weed control fact sheets available from county extension offices for herbicide recommendations.

Table 1. Corn Herbicide Demonstration

RCB; 4 reps
Variety: Pio 9494 XR HXX LL RR 2
Planting Date: 5/5/10
PRE: 5/5/10
POST: 6/3/10; Corn 1-2 collar, 3-4 in; Yeft 1-4 lf, 1-5 in; Rrpw 1-2 in; Colq 1-3 in; Pesw 1-3 in.
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

PRE:	1st week	1.12 inches
	2nd week	0.14 inches
POST:	1st week	0.49 inches
	2nd week	1.93 inches

Yeft=Yellow foxtail
Rrpw=Redroot pigweed
Colq=Common lambsquarter
Pesw=Pennsylvania smartweed

Comments: The objective of this study was to evaluate weed control programs that may be used in conventional, Roundup Ready, or Liberty Link corn. Programs may contain a pre followed by a postemergence application, an early postemergence application that includes a residual herbicide, or a postemergence application. Only one RR/LL corn variety was used for all treatments. Ratings on June 3 indicated control associated with the preemergence herbicides. All reemergence herbicides resulted in moderate to good grass and broadleaf weed control. Corn heights were measured on July 19 to demonstrate how the programs without preemergence herbicides reduced corn height by about 10 inches as a result of early-season weed competition. Postemergence treatments were applied when the corn was about the V2 or 2 leaf collar growth stage. Yellow foxtail densities were very high. Roundup (glyphosate) or Ignite (glufosinate) resulted in poor yellow foxtail control due to late emerging flushes. All programs resulted in good to excellent broadleaf weed control. The highest yielding treatment (199 bu/A) was Harness Xtra (acetochlor + atrazine) followed by Roundup. The yield on treatments without preemergence herbicides ranged from 138-180 bu/A which is a loss of about 20-60 bu/A or about $90-$270 per acre (at $4.50/bu corn). Although preemergence herbicides can cost about $10-$15 per acre, they were clearly profitable at this location.

Treatment	Rate/A	% Fxtl 6/3/10	% Bdlf 6/3/10	Corn Height (in) 7/19/10	% Yeft 7/26/10	% Rrpw 7/26/10	% Colq 7/26/10	% Pesw 7/26/10	% Yeft 9/21/10	Corn Yield bu/A
Check	----	0 e	0 c	35 d	0 f	0 c	0 b	0 b	0 g	21 f
PREEMERGENCE & POSTEMERGENCE										
Integrity&Status+	13 oz&2.5 oz+									
Option+MSO	1.5 oz+1.5 pt	91 abc	98 a	79 abc	87 abc	97 a	99a	99 a	89 abc	181 abc
Corvus+Atrazine&	3 oz+1 pt&									
Laudis+Atrazine+	3 oz+1 pt+									
COC+AMS	1%+1.5 lb	86 cd	98 a	84 abc	89 abc	99 a	99 a	99 a	90 abc	193 a
Harness Xtra 6L&	2 qt&									
Stout+Resolve+	0.5 oz+0.5 oz+									
NIS+AMS	0.25%+2 lb	98 a	98 a	84 abc	98 a	99 a	99 a	99 a	99 a	195 a
POSTEMERGENCE										
Steadfast+Atrazine+	0.75 oz+1 qt+									
COC+28% N	1%+2 qt	---	---	73 abc	63 e	99 a	99 a	99 a	75 d	161 b-e
Capreno+	3 oz+									
Atrazine+COC	1 qt+1%	---	---	74 abc	86 abc	99 a	99 a	99 a	78 d	157 cde
PREEMERGENCE & POSTEMERGENCE										
Harness Xtra 6L&	1 qt&									
Roundup WeatherMax+	22 oz+									
AMS	2.5 lb	96 ab	98 a	85 abc	93 ab	99 a	99 a	99 a	94 ab	199 a
Surestart&	1.75 pt&									
Durango+AMS	24 oz+2.5 lb	90 bc	98 a	88 ab	83 bcd	96 a	99 a	99 a	88 bc	194 a

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

Treatment	Rate/A	% Fxtl 6/3/10	% Bdlf 6/3/10	Corn Height (in) 7/19/10	% Yeft 7/26/10	% Rrpw 7/26/10	% Colq 7/26/10	% Pesw 7/26/10	% Yeft 9/21/10	Corn Yield bu/A
POSTEMERGENCE										
Roundup WeatherMax+	22 oz+									
AMS	2.5 lb	---	---	71 bc	61 e	85 b	96 a	99 a	67 e	157 cde
Halex GT+Atrazine+AMS	3.6 pt+1 pt+2.5 lb	---	---	77 abc	87 abc	99 a	99 a	99 a	82 cd	171 a-d
Roundup WeatherMax+	22 oz+									
Atrazine+AMS	1 qt+2.5 lb	---	---	81 abc	83 bcd	99 a	99 a	99 a	82 cd	180 abc
PREEMERGENCE & POSTEMERGENCE										
Surestart&	2 pt&									
Ignite 280+AMS	22 oz+2.5 lb	92 abc	98 a	91 a	90 abc	96 a	99 a	99 a	92 abc	190 ab
Balance Flexx+Atrazine&	3 oz+1 pt&									
Ignite 280+AMS	22 oz+2.5 lb	82 d	98 a	91 ab	78 cd	99 a	99 a	99 a	89 abc	180 abc
Breakfree&	1.5 pt&									
Ignite 280+AMS	22 oz+2.5 lb	91 abc	97 b	90 ab	74 d	98 a	94 a	99 a	91 abc	180 abc
POSTEMERGENCE										
Ignite 280+	22 oz+									
Atrazine+AMS	1 pt+2.5 lb	---	---	67 c	53 e	99 a	99 a	99 a	53 f	138 e
Ignite 280+Laudis+	22 oz+2 oz+									
Atrazine+COC+AMS	1 pt+1%+1.5 lb	---	---	72 bc	63 e	99 a	99 a	99 a	63 e	145 de
LSD (0.10)		5	1	10	7	3	3	0	6	18

Table 2. Kochia Control with Cadet in Corn

RCB; 4 reps	Precipitation:			
Variety: DKC 4327 RR 2 VT3		PRE:	1st week	1.12 inches
Planting Date: 5/5/10			2nd week	0.14 inches
PRE: 5/5/10		POST:	1st week	1.93 inches
POST: 6/9/10; Corn 3 collar, 5-7 in; Pesw 3-4 in; Wimu 5-7 in; Wibw 3-6 lf, 2-5 in; Colq 2-4 in; KOCZ 3-6 in.			2nd week	0.73 inches
Soil: Clay loam; 4.1% OM; 5.8 pH	Pesw=Pennsylvania smartweed Wimu=Wild mustard Wibw=Wild buckwheat Colq=Common lambsquarter KOCZ=Kochia			

Comments: The objective of this study was to evaluate kochia control with Cadet (fluthiacet) in corn. Cadet is a PPO (or contact) herbicide that may be used in corn or soybeans at 0.4-0.9 fl oz/A. The weed populations were high as the untreated check resulted in approximately 95% yield loss. Cadetalone did not provide much broadleaf weed control but did increase weed control when tank-mixed with Glyfos (glyphosate) relative to Glyfos alone. When tank-mixing Cadet with Glyfos, the Cadet rate did not seem to matter when appied at 0.5-0.9 oz/A. The tank-mixes with Cadet provided greater weed control than the tank-mix with Resource (flumiclorac), but it may be best to apply Resource at 4 oz/A rather than the 2 oz/A rate used in this study. Resource at 4 oz/A may cost as much as Cadet at 0.7 oz/A. Adding Cadet + dicamba to glyphosate resulted in similar weed control as adding Status (dicamba + diflufenzopyr) to glyphosate. The greatest overall weed control was achieved with the Halex (glyphosate + s-metolachlor + mesotrione) treatment. In summary, results from this study indicated that adding Cadet to glyphosate may improve control of kochia and other broadleaf weeds relative to glyphosate alone.

Treatment	*Rate/A*	*% Pesw 6/21/10*	*% Wimu 6/21/10*	*% Wibw 6/21/10*	*% Wibw 7/15/10*	*% Colq 7/15/10*	*% KOCZ 7/15/10*	*% Colq 9/22/10*	*% KOCZ 9/22/10*	*Corn Yield bu/A*
PREEMERGENCE & POSTEMERGENCE										
Dual II Magnum&	0.75 pt&									
Cadet+COC	0.6 oz+1%	0 b	97 a	0 d	---	---	---	---	---	119 b
Dual II Magnum &	0.75 pt&									
Cadet+COC	0.9 oz+1%	0 b	98 a	0 d	---	---	---	---	---	123 b
Dual II Magnum &	0.75 pt&									
Cadet+	0.5 oz+									
Glyfos Xtra+AMS	24 oz+1.7 lb	96 a	98 a	95 c	76 bc	83 c	90 a	82 c	89 ab	167 a
Dual II Magnum &	0.75 pt&									
Cadet+	0.7 oz+									
Glyfos Xtra+AMS	24 oz+1.7 lb	97 a	98 a	96 bc	76 bc	84 c	94 a	85 bc	90 ab	171 a
Dual II Magnum &	0.75 pt&									
Cadet+	0.9 oz+									
Glyfos Xtra+AMS	24 oz+1.7 lb	98 a	98 a	96 bc	69 c	85 c	90 a	83 c	89 ab	176 a
Dual II Magnum&	0.75 pt&									
Glyfos Xtra+AMS	24 oz+1.7 lb	98 a	98 a	96 bc	91 a	71 d	80 b	73 d	75 c	175 a
Dual II Magnum&	0.75 pt&									
Cadet+Glyfos Xtra+	0.5 oz+24 oz+									
Clarity+AMS	3 oz+1.7 lb	98 a	98 a	97 ab	83 ab	92 b	94 a	90 b	90 ab	179 a

Table 2. Kochia Control with Cadet in Corn (continued . . .)

Treatment	Rate/A	% Pesw 6/21/10	% Wimu 6/21/10	% Wibw 6/21/10	% Wibw 7/15/10	% Colq 7/15/10	% KOCZ 7/15/10	% Colq 9/22/10	% KOCZ 9/22/10	Corn Yield bu/A
PREEMERGENCE & POSTEMERGENCE (Continued . . .)										
Dual II Magnum&	0.75 pt&									
Status+	2.5 oz+									
Glyfos Xtra+AMS	24 oz+1.7 lb	98 a	98 a	98 a	90a	91 b	93 a	90 b	91 ab	170 a
Dual II Magnum&	0.75 pt&									
Resource+	2 oz+									
Glyfos Xtra+AMS	24 oz+1.7 lb	97 a	98 a	97 ab	75 bc	75 d	81 b	74 d	81 b	175 a
Dual II Magnum&	0.75 pt&									
Halex GT+	3.6 pt+									
NIS+AMS	0.25%+17 lb	98 a	98 a	97 ab	90 a	98 a	96 a	97 a	95 a	180 a
Check	----	0 b	0 b	0 d	0 d	0 3	0 c	0 e	0 d	10 c
LSD (.10)		1	1	1	6	4	5	5	6	14

Table 3. Weed Control with Realm Q

RCB; 4 reps
Variety: Pio 9494XR HXX LL RR2
Planting Date: 5/5/10
PRE: 5/5/10
POST: 6/3/10; Corn 1-2 collar, 3-4 in; Grft 1-4 lf, 1-5 in; Pesw 1-3 in; Wimu 4-6 in; Wibw 2-3 lf; Yeft 1-4 lf, 1-5 in; Corw 1-2 in.
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

PRE:	1st week	1.12 inches
	2nd week	0.14 inches
POST:	1st week	0.49 inches
	2nd week	1.93 inches

Grft=Green foxtail
Yeft=Yellow foxtail
Pesw=Pennsylvania smartweed
Wimu=Wild mustard
Wibw=Wild buckwheat
Corw=Common ragweed

<u>Comments</u>: The objective of this study was to evaluate weed control with Realm Q, a new premix of rimsulfuron (Resolve) and mesotrione (Callisto) plus a safener (isoxadifen). Other new products include Abundit, a loaded IPM glyphosate, and Prequel, a premix of rimsulfuron and isoxaflutole (Balance). Realm Q alone provided marginal to fair control of several grass and broadleaf weed species. Adding Realm Q with Ignite did not result in acceptable grass control. Tank-mixing with Atrazine resulted in good control of all weeds except yellow foxtail. Weed control was very good when Cinch (s-metolachlor + atrazine) was applied preeemergence. Consequently, Cinch followed by Realm Q resulted in the greatest corn yield, which was at least 20 bu/A greater than other treatments. Results from this study demonstrated that Realm Q may be used in existing weed management programs to improve grass and broadleaf weed control.

Treatment	Rate/A	% Grft 6/3/10	% Bdlf 6/3/10	% Grft 6/21/10	% Wibw 6/21/10	% Yeft 7/16/10	% Wibw 7/16/10	% Pesw 7/16/10	% Corw 7/16/10	Corn Yield bu/A
POSTEMERGENCE										
Realm Q+COC+AMS	4 oz wt/A+1%+2 lb	---	---	86 b	89 b	65 c	40 c	58 c	74 b	121 d
Realm Q+Abundit+ AMS	4 oz wt/A+32 oz+ 2 lb	---	---	98 a	99 a	76 b	97 a	98 a	98 a	161 b
Realm Q+Ignite 280+ AMS	4 oz wt/A+22 oz+ 2 lb	---	---	82 b	97 a	25 e	89 a	90 b	97 a	115 d
Realm Q+Atrazine+ COC+AMS	4 oz wt/A+1 pt+ 1%+2 lb	---	---	94 a	99 a	58 d	98 a	99 a	99 a	148 bc
Steadfast+ Callisto+COC+AMS	0.75 oz+ 2.5 oz+1%+2 lb	---	---	85 b	88 b	75 b	30 d	30 d	62 c	141 c
PREEMERGENCE & POSTEMERGENCE										
Cinch ATZ&Realm Q+ COC+AMS	1 qt&4 oz wt/A+ 1%+2 lb	95 a	98 a	98 a	99 a	92 a	99 a	99 a	99 a	182 a
Prequel&Realm Q+ COC+AMS	1.66 oz&4 oz wt/A+ 1%+2 lb	73 b	97 b	95 a	96 a	78 b	77 b	98 a	99 a	163 b
Check	----	0 c	0 c	0 c	0 c	0 f	0 e	0 e	0 d	7 e
LSD (.10)		4	1	4	3	5	9	4	6	12

Table 4. Soybean Herbicide Demonstration

RCB; 4 reps
Variety: Conventional – Surge
Asgrow AG 1230 RR
Croplan 1098 LL
Planting Date: 5/20/10
PRE: 5/20/10
POST: 6/16/10; Soybean 4-6 in, 1 tri; Yeft 4-7 in, 4-5 lf; Wibw 3-5 lf; Colq 2-4 in; Rrpw 2-4 in.
LPOST: 7/6/10; Soybean 12-15 in, early bloom; Yeft 1-3 in.
Soil: Clay loam; 4.1% OM, 5.8 pH

Precipitation:

PRE:	1st week	1.22 inches
	2nd week	0.36 inches
POST:	1st week	0.39 inches
	2nd week	4.59 inches
LPOST:	1st week	1.50 inches
	2nd week	0.12 inches

Yeft=Yellow foxtail
Wibw=Wild buckwheat
Colq=Common lambsquarter
Rrpw=Redroot pigweed

Comments: The objective of this study was to evaluate weed control programs in conventional, Liberty Link, and Roundup Ready soybeans. Broadleaf weed control was generally good among each program. Yellow foxtail densities were very high and it was the dominant weed at this site. In the conventional soybean treatments, grass control with Assure (quizalofop) was greater when applied with Cadet than when applied with Harmony which may be partially due to antagonism or differences in adjuvants. Yellow foxtail control was marginal to fair in the conventional programs, moderate in the Liberty Link soybeans, and good in the Roundup Ready soybeans. Consequently, soybean yield was greatest in the Roundup Ready soybeans, slightly less in the Liberty Link soybeans, and least in the conventional soybeans.

Treatment	Rate/A	% Yeft 7/16/10	% Wibw 7/16/10	% Colq 7/16/10	% Rrpw 7/16/10	% Yeft 9/20/10	% Colq 9/20/10	% Rrpw 9/20/10	Soybean Yield bu/A
PREEMERGENCE & POSTEMERGENCE									
Check ***(Conventional)***	----	0 i	0 e	0 d	0 c	0 k	0 c	0 c	3 f
Prowl H_2O & Raptor+ Resource+MSO+28% N	2.25 pt&4 oz+ 4 oz+1 qt+1 qt	81 d	80 d	99 a	99 a	80 ef	99 b	98 a	38 cd
Boundary&Cadet+Assure II+ COC+28% N	2 pt&0.6 oz+5 oz+ 1%+2 qt/100 gal	84 cd	85 c	99 a	99 a	85 de	99 ab	99 a	38 cd
Fierce&Harmony 50SG+ Assure II+NIS	3 oz&0.125 oz+ 5 oz+0.25%	44 h	98 a	99 a	99 a	55 i	99 ab	99 a	34 e
Authority Assist&Harmony SG+ Poast Plus+NIS	6 oz&0.125 oz+ 0.75 pt+0.5%	78 de	93 b	99 a	99 a	73 g	99 ab	99 a	37 d
Optill&Flexstar+ COC+28% N	2 oz&0.75 pt+ 0.5%+1%	56 g	96 ab	99 a	99 a	45 j	99 ab	99 a	34 e
PREEMERGENCE & POSTEMERGENCE									
Check ***(Liberty Link)***	----	0 i	0 e	0 d	0 c	0 k	0 c	0 c	5 f
Valor&Ignite 280+AMS	2 oz&22 oz+2.5 lb	69 f	97 ab	98 ab	99 a	75 fg	99 ab	99 a	41 bc
Authority Assist& Ignite 280+AMS	5 oz& 22 oz+2.5 lb	72 f	98 a	99 a	99 a	76 fg	99 ab	99 a	41 bc
Fierce& Ignite 280+AMS	2.5 oz& 22 oz+2.5 lb	80 de	95 ab	97 b	99 a	81 ef	99 ab	99 a	44 b
POSTEMERGENCE & LATE POSTEMERGENCE									
Ignite 280+AMS& Ignite 280+AMS	22 oz+2.5 lb& 22 oz+2.5 lb	94 b	99 a	99 a	99 a	88 cd	99 ab	99 a	43 b

Table 4. Soybean Herbicide Demonstration (continued . . .)

Treatment	Rate/A	% Yeft 7/16/10	% Wibw 7/16/10	% Colq 7/16/10	% Rrpw 7/16/10	% Yeft 9/20/10	% Colq 9/20/10	Soybean % Rrpw 9/20/10	Yield bu/A
POSTEMERGENCE									
Ignite 280+Pursuit 2L+ NIS+AMS	22 oz+3 oz+ 1 qt+3.4 lb	73 ef	96 ab	96 c	98 a	61 h	99 ab	99 a	38 cd
PREEMERGENCE & POSTEMERGENCE									
Check ***(Roundup Ready)***	----	0 i	0 e	0 d	0 c	0 k	0 c	0 c	3 f
Valor& Roundup WeatherMax+AMS	2 oz& 22 oz+2.5 lb	80 de	99 a	99 a	98 a	92 bcd	99 ab	99 a	47 a
Sonic& Durango+AMS	3 oz& 24 oz+2.5 lb	79 de	99 a	99 a	96 a	94 abc	99 ab	98 a	47 a
Prowl H_2O& Roundup WeatherMax+AMS	2.25 pt& 22 oz+2.5 lb	89 bc	99 a	99 a	93 b	97 ab	99 ab	95 b	47 a
POSTEMERGENCE & LATE POSTEMERGENCE									
Roundup WeatherMax+AMS& Roundup WeatherMax+AMS	22 oz+2.5 lb& 22 oz+2.5 lb	99 a	99 a	99 a	99 a	99 a	100 a	100 a	47 a
POSTEMERGENCE									
Extreme+NIS+AMS	3 pt+0.25%+2.5 lb	90 bc	99 a	99 a	96 a	88 cd	99 b	97 a	46 a
LSD (0.10)		5	3	1	2	5	0.5	2	2

Table 5. Ignite with Adjuvants in Soybeans

RCB; 3 reps
Variety: Croplan 1098 LL
Planting Date: 5/20/10
POST: 6/16/10; Soybean 1-tri; 4-6 in.; Yeft 4-5 lf, 4-7 in; Wimu 4-8 in; Corw 2-5 in; Colq 2-4 in.
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:

POST:	1st week	0.39 inches
	2nd week	4.54 inches

Yeft=Yellow foxtail
Wimu=Wild mustard
Corw=Common ragweed
Colq=Common lambsquarter

Comments: The objective of this study was to evaluate weed control when different adjuvants are added to Ignite (glufosinate). Weather Gard Complete (Loveland) and Doubledown (United Suppliers) are deposition aids, drift control agents, water conditioners, antifoam, and penetrants. Array (Rosen's) is a deposition aid, foliar retention agent, water conditioner, and penetrant. Interlock (Winfield) is a deposition aid, drift control agent, and penetrant. Gardian Plus (Van Diest) is a deposition aid, drit control agent, and water conditioner. Hel-fire (Helena) is a deposition aid and water conditioner. Border Xtra 9L (Precision Labs) is an AMS plus deposition aid, antifoam, and drift control agent. Bronc Max E.D.T. (Wilbur Ellis) is an AMS plus deposition aid and water conditioner. Request (Helena) is a water conditioner. Grounded (Helena) is a deposition aid. Results from this study indicated that weed control associated with the AMS additive was equal to or greater than weed control associated with the other additives. Yellow foxtail control was slightly less when Array or Bronc Max was added. Broadleaf weed control was similar among the different additives. In summary, results from this study indicated that several deposition aids and drift reduction agents did not reduce weed control efficacy associated with Ignite.

Treatment	Rate/A	% Yeft 6/30/10	% Wimu 6/30/10	% Corw 6/30/10	% Colq 6/30/10
Check	----	0 d	0 b	0 b	0 b
POSTEMERGENCE					
Ignite 280+AMS	22 oz+1.5 lb	92 a	99 a	99 a	99 a
Ignite 280+Weather Gard Complete	22 oz+2 qt/100 gal	90 ab	99 a	99 a	99 a
Ignite 280+Array	22 oz+9 lb ai/100 gal	87 c	99 a	99 a	99 a
Ignite 280+ Class Act NG+Interlock	22 oz+ 5 qt/100 gal+4 oz	92 a	99 a	99 a	99 a
Ignite 280+Gardian Plus	22 oz+2.5 gal/100 gal	93 a	99 a	99 a	99 a
Ignite 280+ Hel-Fire+ Grounded	22 oz+ 2 pt/100 gal+ 1 gal/100 gal	90 ab	99 a	99 a	99 a
Ignite 280+Doubledown	22 oz+2.5 gal/100 gal	91 ab	99 a	99 a	99 a
Ignite 280+Border Xtra 8L	22 oz+2.5 gal/100 gal	92 ab	99 a	99 a	99 a
Ignite 280+Bronc Max E.D.T.	22 oz+2 qt/100 gal	89 b	99 a	99 a	99 a
Ignite 280+Request+ Grounded	22 oz+2 qt/100 gal+ 1 gal/100 gal	92 ab	99 a	99 a	99 a
LSD (.10)		2	0	0	0

Table 6. Weed Control in Dicamba Tolerant Soybeans

RCB; 3 reps
Planting Date: 5/20/10
PRE: 5/20/10
POST: 6/3/10; Soybean – unifoliate; Yeft 1-4 in; Colq 2-4 in; Rrpw 1-3 in.
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:

PRE:	1st week	1.22 inches
	2nd week	0.36 inches
POST:	1st week	0.49 inches
	2nd week	1.93 inches

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

Comments: The objective of this study was to evaluate weed control in dicamba tolerant soybeans. The weed densities at this location were very high. Treatments with Warrant, a new microencapsulated acetochlor product for soybeans, improved residual yellow foxtail control. Lambquarters control was improved when either Clarity (dicamba) was added to Roundup (glyphosate) or Valor (flumioxazin) was applied preemergence. Pigweed control was variable and all treatments were statistically similar to Roundup alone. In summary, results from this study demonstrated that using dicamba in dicamba tolerant soybeans can improve control of difficult weeds such as lambquarters and crop tolerance appears to be excellent.

Treatment	***Rate/A***	***% Yeft 6/30/10***	***% Colq 6/30/10***	***% Colq 7/26/10***	***% Rrpw 7/26/10***
POSTEMERGENCE					
Roundup PowerMax+AMS	22 oz+1.7 lb	57 d	77 d	71 c	88 abc
Roundup PowerMax+Clarity+AMS	22 oz+4 oz+1.7 lb	67 c	87 bc	92 ab	73 c
Roundup PowerMax+Clarity+ Warrant+AMS	22 oz+4 oz+ 1.5 qt+1.7 lb	78 ab	89 abc	94 ab	81 abc
Roundup PowerMax+Warrant+AMS	22 oz+1.5 qt+1.7 lb	83 ab	50 e	40 d	92 ab
Roundup PowerMax+Clarity+AMS	22 oz+8 oz+1.7 lb	70 c	93 ab	97 ab	77 bc
Roundup PowerMax+Clarity+ Warrant+AMS	22 oz+8 oz+ 1.5 qt+1.7 lb	81 ab	91 abc	96 ab	76 bc
PREEMERGENCE & POSTEMERGENCE					
Valor&Roundup PowerMax+AMS	2 oz&22 oz+1.7 lb	81 ab	94 ab	95 ab	98 a
Valor&Roundup PowerMax+ Clarity+AMS	2 oz&22 oz+ 4 oz+1.7 lb	77 b	84 cd	80 bc	97 a
Valor&Roundup PowerMax+ Clarity+Warrant+AMS	2 oz&22 oz+ 4 oz+1.5 qt+1.7 lb	85 ab	96 ab	96 ab	99 a
Valor&Roundup PowerMax+ Warrant+AMS	2 oz&22 oz+ 1.5 qt+1.7 lb	83 ab	78 d	78 bc	98 a
Valor&Roundup PowerMax+ Clarity+AMS	2 oz&22 oz+ 8 oz+1.7 lb	82 ab	96 ab	96 ab	97 a
Valor&Roundup PowerMax+ Clarity+Warrant+AMS	2 oz&22 oz+ 8 oz+1.5 qt+1.7 lb	88 a	98 a	99 a	97 a
Check	----	0 e	0 f	0 e	0 d
LSD (.10)		7	6	12	12

Table 7. Weed Control with Flexstar GT

RCB; 3 reps	Precipitation:
Variety: Asgrow 1230RR	POST: 1st week 0.39 inches
Planting Date: 5/20/10	2nd week 4.54 inches
POST: 6/16/10; Soybean 1 tri, 4-6 in; Corw 2-5 in; Pesw 2-4 in; Colq 2-4 in; Rrpw 2-4 in.	Corw=Common ragweed
Soil: Clay loam; 3.0% OM; 6.1 pH	Pesw=Pennsylvania smartweed
	Colq=Common lambsquarter
	Rrpw=Redroot pigweed

Comments: The objective of this study was to evaluate weed control with Flexstar GT, a new premix of fomesafen (Flexstar) and glyphosate (Touchdown). Weed densities were high as they caused 66% yield loss in the untreated check. Nevertheless, all treatments resulted in excellent weed control. Therefore, results from this study indicated that Flexstar GT is an effective premix herbicide as the mixture of a PPO herbicide such as Flexstar did not antagonize glyphosate activity.

Treatment	***Rate/A***	***% Corw 6/30/10***	***% Pesw 6/30/10***	***% Corw 8/23/10***	***% Colq 8/23/10***	***% Pesw 8/23/10***	***% Rrpw 8/23/10***	***% Corw 9/20/10***	***% Pesw 9/20/10***	***Soybean Yield bu/A***
POSTEMERGENCE										
Flexstar GT+AMS	38 oz+2.5 lb	99 a	99 a	98 a	97 a	97 a	98 a	99 a	99 a	49 a
Resource+	3 oz+									
Touchdown Total+	24 oz+									
AMS	2.5 lb	99 a	99 a	96 a	97 a	95 a	96 a	98 a	98 a	51 a
Cadet+	0.5 oz+									
Touchdown Total+	24 oz+									
AMS	2.5 lb	99 a	99 a	98 a	98 a	95 a	98 a	99 a	99 a	51 a
RU PowerMax+AMS	22 oz+2.5 lb	99 a	99 a	97 a	99 a	98 a	98 a	99 a	98 a	51 a
Cobra+	10 oz+									
Touchdown Total+	24 oz+									
AMS	2.5 lb	99 a	99 a	99 a	96 a	98 a	99 a	99 a	99 a	49 a
Touchdown Total+AMS	24 oz+2.5 lb	99 a	99 a	97 a	97 a	97 a	97 a	97 a	96 b	51 a
Touchdown Total+	24 oz+									
Flexstar+AMS	0.75 pt+2.5 lb	99 a	99 a	97 a	98 a	98 a	99 a	99 a	98 a	49 a
Check	----	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 c	17 b
LSD (.10)		0	0	3	2	3	2	1	2	3

Table 8. Glyphosate Antagonism with Contact Herbicides

RCB; 3 reps
Variety: Asgrow AG 1230
Planting Date: 5/20/10
POST: 7/6/10; Soybean 15 in, early bloom;
Pesw 10-12 in; Rrpw 12-15 in; Colq 12-15 in;
Corw 10-12 in; KOCZ 10-12 in.
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:
POST: 1st week 1.50 inches
2nd week 0.12 inches

Pesw=Pennsyvania smartweed
Rrpw=Redroot pigweed
Colq=Common lambquarter
Corw=Common ragweed
KOCZ=Kochia

Comments: The objective of this study was to see if tank-mixing PPO herbicides (i.e. contact herbicides) with glyphosate would antagonize glyphosate activity. To promote visible antagonistic effects; low rates of Gly Star (3 lb a.e./4 lb a.i. per gallon glyphosate) and PPO herbicides were used. Occasionally, PPO herbicides can cause rapid leaf “burn” on the weeds which can inhibit glyphosate translocation and efficacy. Flexstar (fomesafen) and Cobra (lactofen) were more effective on pigweed and common ragweed whereas Resource (flumiclorac) and Cadet (fluthiacet) were more effective on common lambsquarters. Glyphosate antagonism was apparent with pigweed, but not among the other weed species. Flexstar and Resource seemed to antagonize glyphosate slightly more than Cadet or Cobra. Results from this study demonstrated that PPO herbicides may antagonize glyphosate but some weed species may be more susceptible to antagonism than others. These results may be particularly important for managing glyphosate resistant kochia which may only be controlled with PPO herbicides if postemergence applications are required in conventional or Roundup Ready soybeans.

Treatment	*Rate/A*	*% Pesw 7/26/10*	*% Rrpw 7/26/10*	*% Colq 7/26/10*	*% Corw 7/26/10*	*% Colq 9/22/10*	*% Corw 9/22/10*	*% KOCZ 9/22/10*	*% Rrpw 9/22/10*
Check	----	0 d	0 e	0 e	0 d	0 f	0 c	0 b	0 f
POSTEMERGENCE									
GlyStar+NIS+AMS	6 oz+0.25%+2.5 lb	69 a	90 a	76 a	68 ab	73 bc	77 ab	90 a	98 a
Flexstar+NIS+AMS	2 oz+0.25%+2.5 lb	68 a	70 c	23 d	83 a	27 e	75 ab	80 a	65 cd
Resource+NIS+AMS	2 oz+0.25%+2.5 lb	17 c	53 d	50 b	50 c	65 c	70 ab	63 a	37 e
Cadet+NIS+AMS	0.2 oz+0.25%+2.5 lb	20 c	53 d	53 b	47 c	63 c	60 b	70 a	43 e
Cobra+NIS+AMS	4 oz+0.25%+2.5 lb	43 b	72 c	30 c	78 a	37 d	81 ab	92 a	72 bcd
GlyStar+Flexstar+ NIS+AMS	6 oz+2 oz+ 0.25%+2.5 lb	89 a	81 b	80 a	74 ab	73 bc	86 a	93 a	63 cd
GlyStar+Resource+ NIS+AMS	6 oz+2 oz+ 0.25%+2.5 lb	74 a	78 b	78 a	68 ab	78 b	75 ab	87 a	57 d
GlyStar+Cadet+ NIS+AMS	6 oz+0.2 oz+ 0.25%+2.5 lb	79 a	85 ab	81 a	59 bc	91 a	72 ab	85 a	82 b
GlyStar+Cobra+ NIS+AMS	6 oz+4 oz+ 0.25%+2.5 lb	74 a	83 ab	78 a	65 ab	83 ab	84 ab	93 a	78 bc
LSD (.10)		13	6	6	11	9	14	22	11

Table 9. Residual Weed Control with Authority Products in Soybeans

RCB; 3 reps
Variety: Asgrow AG 1230 RR
Planting Date: 5/20/10
PRE: 5/20/10
POST: 6/16/1-; Soybeans 4-6 in, 1-tri; Yeft 4-5 lf; Corw 2-5 in; Colq 2-4 in; Pesw 2-4 in; KOCZ 2-4 in.
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:

PRE:	1st week	1.22 inches
	2nd week	0.36 inches
POST:	1st week	0.39 inches
	2nd week	4.54 inches

Yeft=Yellow foxtail
Corw=Common ragweed
Colq=Common lambsquarter
Pesw=Pennsylvania smartweed
KOCZ=Kochia

Comments: The objective of this study was to evaluate weed control in soybeans with Authority (sulfentrazone) products. All treatments resulted in good to very good weed control. Spartan (sulfentrazone) alone resulted in similar weed control as sulfentrazone premixes containing cloransulam (Authority First) or imazethapyr (Authority Assist). Using preemergence herbicides resulted in slightly greater late-season control of common ragweed and lambsquarters relative to Roundup (glyphosate) alone. However, yield was similar among all treatments. Results from this study demonstrated that preemergence herbicides followed by Roundup can result in very good weed control in soybeans.

Treatment	Rate/A	% Yeft 6/30/10	% Corw 6/30/10	% Colq 6/30/10	% Corw 8/23/10	% Colq 8/23/10	% Pesw 8/23/10	% KOCZ 8/23/10	% Corw 9/20/10	Soybean Yield bu/A
PREEMERGENCE & POSTEMERGENCE										
Authority First&	3.2 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	97 a	99 a	99 a	99 a	99 a	99 a	99 a	99 a	49 a
Authority Assist&	5 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	95 a	99 a	99 a	99 a	99 a	99 a	99 a	99 a	49 a
Authority Assist&	5 oz&									
RU WeatherMax+	28 oz+									
Cadet+AMS	0.5 oz+2.5 lb	95 a	99 a	99 a	98 a	99 a	99 a	99 a	99 a	50 a
Authority Assist&	6 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	96 a	99 a	99 a	99 a	99 a	99 a	99 a	99 a	50 a
Spartan 4F&	4 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	96 a	99 a	99 a	98 a	99 a	98 a	99 a	99 a	48 a
Spartan 4F&	5 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	96 a	99 a	99 a	99 a	99 a	99 a	99 a	99 a	47 a
Valor&	1.75 oz&									
RU WeatherMax+AMS	22 oz+2.5 lb	97 a	99 a	99 a	98 a	99 a	99 a	99 a	99 a	49 a
POSTEMERGENCE										
RU WeatherMax+AMS	22 oz+2.5 lb	96 a	99 a	99 a	95 b	95 c	96 a	99 a	98 a	48 a
Durango+	24 oz+									
FirstRate+AMS	0.3 oz+2.5 lb	97 a	99 a	99 a	99 a	96 b	99 a	99 a	99 a	48 a
PREEMERGENCE & POSTEMERGENCE										
Sonic&	3 oz&									
Durango+AMS	24 oz+2.5 lb	96 a	99 a	99 a	99 a	99 a	98 a	99 a	99 a	49 a
Check	----	0 b	0 b	0 b	0 c	0 d	0 b	0 b	0 b	20 b
LSD (.10)		1	0	0	2	1	2	0	1	3

Table 10. Duration of Residual Weed Control in Soybeans

RCB; 3 reps
Variety: Asgrow AG 1230RR
Planting Date: 5/20/10
PRE: 5/20/10
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:
PRE: 1st week 1.22 inches
2nd week 0.36 inches

Corw=Common ragweed
Colq=Common lambsquarter

Comments: The objective of this study was to compare the duration of residual weed control associated with several preemergence herbicides in soybeans. In particular, we wanted to evaluate the new herbicide, Fierce (flumioxazin + pyroxasulfone). Pyroxasulfone is a new herbicide that is somewhat similar to Dual (s-metolachlor) which is best on grass weed species but also has some activity on small-seeded broadleaf weed species. The greatest duration of lambsquarters control was achieved with products containing imazethapyr (Authority Assist and Optill). The greatest duration of common ragweed control was achieved with products containing cloransulum (Authority First and Valor + pyroxasulfone + FirstRate) or fomesafen (Prefix). On September 9, it was difficult to distinguish common ragweed control among most treatments. Consequently, some herbicides were better suited for small-seeded broadleaf weeds and some were better suited for large-seeded broadleaf weeds, but no single herbicide was excellent for both. Fierce performed well as a general grass and broadleaf residual herbicide.

Treatment	Rate/A	% Corw 6/30/10	% Colq 6/30/10	% Corw 7/15/10	% Colq 7/15/10	% Corw 7/28/10	% Colq 7/28/10	% Corw 9/20/10	Soybean Yield bu/A
Check	----	0 d	0 e	0 e	0 h	0 h	0 f	0 c	33 bc
PREEMERGENCE									
Valor SX	2 oz	90 a	90 bc	76 b	86 ef	13 g	33 d	30 b	39 ab
Fierce	2.5 oz	93 a	90 bc	92 a	82 f	70 bcd	47 c	67 a	41 ab
Fierce	3 oz	91 a	91 bc	88 a	89 cde	50 e	57 c	55 a	44 a
Fierce	3.75 oz	96 a	94 ab	93 a	91 b-e	67 cd	57 c	70 a	42 ab
Gangster FR+Gangster V	0.4 oz+2 oz	95 a	96 ab	92 a	94 abc	63 d	80 b	82 a	45 a
Authority First	3.2 oz	97 a	98 a	93 a	95 ab	78 ab	81 b	62 a	44 a
Authority Assist	5 oz	77 b	97 a	43 c	98 a	0 h	93 a	0 c	39 ab
Optill	2 oz	94 a	98 a	93 a	98 a	63 d	96 a	62 a	46 a
Prefix	2 pt	94 a	79 d	93 a	75 g	86 a	48 c	77 a	41 ab
Prowl H_2O	2.5 pt	57 c	77 d	33 d	86 def	0 h	17 e	0 c	31 c
LSD (.10)		4	4	8	4	8	9	19	5

Table 11. Burndown with Aim and Cadet

RCB; 4 reps
BURNDOWN: 6/2/10; Grft 2-5 in; Pesw 5-7 in; Wimu 4-7 in; Corw 4-6 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:
BURNDOWN: 1st week 0.49 inches; 2nd week 1.93 inches

Comments: The objective of this study was to evaluate weed control associated with burndown applications of Cadet (fluthiacet), Aim (carfentrazone), or mixtures of these products with Roundup (glyphosate). The “burndown” treatments were applied late (June 2) to ensure plentiful weed growth at the time of application. Dyne-amic is a NIS blend with modified spray oil. Adding both Cadet and Aim to Roundup was better than adding either product alone. The optimal Aim rate was 1.5 fl oz/A whereas Cadet could be applied at 0.5-1.25 fl oz/A. These mixtures resulted in good overall weed control which was similar to Sharpen at 1 fl oz/A with Roundup. Results from this study demonstrated that mixing Cadet and Aim with lower Roundup rates can improve weed control relative to Roundup alone.

Treatment	Rate/A	% Grft 6/10/10	% Pesw 6/10/10	% Wimu 6/10/10	% Corw 6/10/10
BURNDOWN					
Aim EC+Roundup PowerMax+ Dyne-amic+AMS	1.5 oz+16 oz+ 0.5%+3.4 lb	98 a	87 cde	98 ab	92 b
Aim EC+Roundup PowerMax+ Dyne-amic-AMS	0.5 oz+16 oz+ 0.5%+3.4 lb	98 a	84 cde	97 b	84 c
Cadet+Roundup PowerMax+ Dyne-amic+AMS	1.25 oz+16 oz+ 0.5%+3.4 lb	98 a	82 de	98 ab	84 c
Cadet+Roundup PowerMax+ Dyne-amic+AMS	0.75 oz+16 oz+ 0.5%+3.4 lb	96 ab	90 bcd	98 ab	85 c
Cadet+Roundup PowerMax+ Dyne-amic_AMS	0.5 oz+16 oz+ 0.5%+3.4 lb	93 b	81 de	98 ab	83 cd
Aim EC+Cadet+Roundup PowerMax+ Dyne-amic+AMS	1.5 oz+1.25 oz+16 oz+ 0.5%+3.4 lb	98 a	95 ab	99 a	97 a
Aim EC+Cadet+Roundup PowerMax+ Dyne-amic+AMS	1.5 oz+0.75 oz+16 oz+ 0.5%+3.4 lb	97 a	93 abc	99 ab	97 a
Aim EC+Cadet+Roundup PowerMax+ Dyne-amic+AMS	1.5 oz+0.5 oz+16 oz+ 0.5%+3.4 lb	97 a	92 abc	98 ab	94 ab
Aim EC+Cadet+Roundup PowerMax+ Dyne-Amic+AMS	0.51 oz+1.26 oz+16 oz+ 0.5%+3.4 lb	97 a	86 cde	98 ab	91 b
Aim EC+Cadet+Roundup PowerMax+ Dyne-amic+AMS	0.51 oz+0.75 oz+16 oz+ 0.5%+3.4 lb	98 a	84 cde	99 a	90 b
Aim EC+Cadet+Roundup PowerMax+ Dyne-amic+AMS	0.51 oz+0.5 oz+16 oz+ 0.5%+3.4 lb	95 ab	86 cde	98 ab	92 b
Aim EC+Roundup PowerMax+ Dyne-amic+AMS	0.51 oz+16 oz+ 0.5%+3.4 lb	96 ab	85 cde	98 ab	83 cd
Cadet+Roundup PowerMax+ Dyne-amic+AMS	0.5 oz+16 oz+ 0.5%+3.4 lb	90 c	80 e	98 ab	85 c
Roundup PowerMax+Dyne-amic+AMS	16 oz+0.5%+3.4 lb	86 d	58 f	96 c	79 d
Sharpen+Roundup PowerMax+ Dyne-amic+AMS	1 oz+16 oz+ 0.5%+3.4 lb	98 a	98 a	98 ab	98 a
Check	----	0 e	0g	0 d	0e
LSD (0.10)		2	5	1	3

Table 12. Fallow Weed Control with Sharpen

RCB; 4 reps
POST: 6/2/10; Grft 3-5 in; Pesw 4-6 in; Bygr 2-5 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:

POST:	1st week	0.49 inches
	2nd week	1.93 inches

Grft=Green foxtail
Pesw=Pennsylvania smartweed
Bygr=Barnyardgrass

Comments: The objective of this study was to evaluate weed control in a fallow field with Sharpen (saflufenacil). Roundup (glyphosate) alone appeared to only provide marginal smartweed control on June 10 whereas adding Sharpen greatly improved control. However, barnyardgrass control in this treatment was less than several other treatments. It is difficult to speculate why, but there could be some glyphosate antagonism partially due to the addition of an MSO which is required to get adequate broadleaf control with Sharpen. The 2,4-D + atrazine treatment has worked very well in past research on mustards and marestail/horseweed, but this treatment provided poor control of grasses and smartweed. In summary, results from this study indicated that adding Sharpen with Roundup can improve control of difficult weed species such as smartweed.

Treatment	***Rate/A***	***% Grft 6/10/10***	***% Pesw 6/10/10***	***% Bygr 6/30/10***	***% Pesw 6/30/10***
Check	----	0 c	0 e	0 d	0 c
POSTEMERGENCE					
Roundup Original+NIS+AMS	32 oz+0.25%+3.4 lb	96 a	60 c	85 b	96 a
Sharpen+Roundup Original+ MSO+AMS	1 oz+32 oz+ 1%+3.4 lb	98 a	96 a	76 c	99 a
2,4-D ester+Roundup Original+ NIS+AMS	16 oz+32 oz+ 0.25%+4 lb	93 a	83 b	92 a	99 a
Distinct+Roundup Original+ NIS+AMS	2 oz+32 oz+ 0.25%+4 lb	94 a	87 b	87 b	99 a
2,4-D ester+Atrazine	1 pt+1 qt	25 b	38 d	0 d	55 b
LSD (.10)		3	6	3	3

Table 13. Glyphosate Resistant Kochia Control Options

RCB 4 reps
PRE: 4/21/10
POST: 6/9/10; KOCZ 2-5 in; Colq 4 in; Corw 4-6 in;
Grft 3-6 in; Rrpw 2-5 in.
Soil: Silty clay loam; 3.2% OM; 6/3 pH

Precipitation:

PRE:	1st week	0.37 inches
	2nd week	0.91 inches
POST:	1st week	1.93 inches
	2nd week	0.39 inches

KOCZ=Kochia
Colq=Common lambsquarter
Corw=Common ragweed
Grft=Green foxtail
Rrpw=Redroot pigweed

Comments: The objective of this study was to evaluate options for controlling glyphosate resistant kochia in corn, soybeans, fallow, and small grains. No crops were planted in this study. Postemergence herbicides were applied on June 9, so the ratings on June 7 indicated control from the preemergence herbicides. Some kochia was beginning to emerge at the time the preemergence herbicides were pplied. Among the fallow treatments, Clarity (dicamba) at 8 fl oz/A resulted in the greatest kochia control. Among the corn treatments, Integrity (saflufenacil+dimethenamid) resulted in slightly less residual kochia control than Balance Flexx (isoxaflutole) or Degree Xtra (acetochlor+atrazine), but all programs resulted in very good control after the postemergence herbicides were pplied. All the soybean treatments resulted in very good kochia control. Among the wheat treatments, Starane NXT (fluroxypyr+bromoxynil) resulted in the greatest kochia control. Results from this study identified optimal herbicide programs for managing glyphosate resistant kochia populations in a variety of crop environments. This study was part of a regional effort to develop recommendations for managing glyphosate resistant kochia.

Treatment	*Rate/A*	*% KOCZ 6/7/10*	*% Colq 6/7/10*	*% Corw 6/7/10*	*% Grft 6/7/10*	*% KOCZ 7/27/10*	*% Colq 7/27/10*	*% Corw 7/27/10*	*% Rrpw 7/27/10*
Check	----	0 d	0 d	0 d	0 g	0 e	0 e	0 f	0 h
POSTEMERGENCE									
Roundup PowerMax+AMS	22 oz+2%	---	---	---	---	71 bc	77 ab	93 ab	68 b-e
FALLOW									
POSTEMERGENCE									
Clarity+NIS+AMS	8 oz+0.25%+2%	---	---	---	---	95 a	94 a	82 ab	78 abc
Sharpen+MSO+AMS	1 oz+2%+2%	---	---	---	---	68 bc	65 bc	79 abc	74 a-d
Rage D-Tech+COC+AMS	16 oz+2%+2%	---	---	---	---	85 ab	90 a	77 abc	80 abc
CORN									
PREEMERGENCE & POSTEMERGENCE									
Balance Flexx& Laudis+Atrazine+MSO	6 oz& 3 oz+8 oz+1%	95 ab	94 a	95 a	43 f	98 a	97 a	99 a	54 def
Integrity&Status+ MSO+28% N	13 oz&10 oz+ 2 pt+5 qt/100 gal	85 c	94 a	91 a	84 bc	94 a	90 a	97 a	23 g
Degree Xtra&Impact+ MSO+28% N	3 qt&0.75 oz+ 1%+5 qt/100 gal	99 a	99 a	94 a	97 a	99 a	98 a	97 a	79 abc
SOYBEAN									
PREEMERGENCE & POSTEMERGENCE									
Authority Assist&Cadet	10 oz&0.75 oz	99 a	99 a	78 b	87 b	95 a	95 a	49 d	88 ab
Valor&Cobra+COC	2.5 oz&12.5 oz+1%	98 a	98 a	91 a	67 e	98 a	93 a	99 a	63 c-f
Boundary&Cobra+COC	2.3 pt&12.5 oz+1%	99 a	98 a	93 a	94 a	96 a	90 a	99 a	13 gh

Table 13. Glyphosate Resistant Kochia Control Options (continued . . .)

Treatment	***Rate/A***	***% KOCZ 6/7/10***	***% Colq 6/7/10***	***% Corw 6/7/10***	***% Grft 6/7/10***	***% KOCZ 7/27/10***	***% Colq 7/27/10***	***% Corw 7/27/10***	***% Rrpw 7/27/10***
				WHEAT					
POSTEMERGENCE									
Huskie+NIS+28% N	11 oz+0.25%+2 qt	---	---	---	---	70 bc	75 ab	76 abc	61 c-f
Starane NXT+NIS	14 oz+0.25%	---	---	---	---	92 a	85 a	70 bc	86 ab
Agility SG+NIS+28% N	3.2 oz+0.25%+4 qt	---	---	---	---	33 d	92 a	58 cd	94 a
LSD (.10)		6	6	6	6	14	13	15	14

Table 14. Sharpen in Millet

RCB; 4 reps
Variety: Proso – Early Bird – 30 lb/A
Pearl – Elite ll – 20 lb/A
Planting Date: 6/9/10
EPP: 6/2/10
PRE: 6/9/10
Soil: Clay loam; 3.2% OM; 6.3 pH

Precipitation:

EPP:	1st week	0.49 inches
	2nd week	1.93 inches
PRE:	1st week	1.93 inches
	2nd week	0.39 inches

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

Comments: The objective of this study was to evaluate residual weed control and crop tolerance associated with Sharpen (saflufenacil) applications in millet. Sharpen applied at 2 oz/A resulted in noticeably greater pigweed control than Sharpen at 1.5 oz/A. No visible millet growth reduction was observed. Atrazine, which is not registered for use in millet, did not cause noticeable millet injury at a rate up to 1 qt/A. In summary, results from this study indicated that Sharpen may be an effective herbicide for residual broadleaf weed control in millet.

Treatment	***Rate/A***	***% Rrpw 7/15/10***	***% VCRR Proso Millet 8/5/10***	***% VCRR Pearl Millet 8/5/10***
Check	----	0 f	0 a	0 a
EARLY PREPLANT 7-14				
Sharpen	1.44 oz	69 cd	0 a	0 a
Sharpen	2 oz	78 bc	0 a	0 a
PREEMERGENCE				
Sharpen	1.44 oz	68 cd	0 a	0 a
Sharpen	2 oz	85 ab	0 a	0 a
Atrazine	1 pt	63 d	0 a	0 a
Atrazine	1 qt	90 a	0 a	0 a
Sharpen+Everest	1 oz+0.3 oz	68 cd	0 a	0 a
Everest	0.6 oz	25 e	0 a	0 a
LSD (.10)		8	0	0

Table 15. Tank-Mixtures for Established Roundup Ready Alfalfa

RCB; 3 reps
POST: 7/20/10; Alfalfa 2-3 in.; Dali 4-7 in rosette
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
POST: 1st week 0.57 inches
2nd week 0.79 inches

VCRR=Visual Crop Response Rating
(0=no response; 100=complete kill)
Dali=Dandelion

Comments: The objective of this study was to evaluate general weed control associated with Roundup in established Roundup Ready alfalfa. The dominant weed at this location was dandelion. Roundup was the only herbicide that provided good postemergence control of dandelions. 2,4-DB (Butyrac) caused some visible alfalfa injury which reduced alfalfa yield. Otherwise, treatments with Roundup resulted in similar yields as conventional herbicide treatments which indicated very good Roundup tolerance. In summary, results from this study demonstrated that Roundup may be used to control difficult weed species in RR alfalfa with very good crop tolerance.

Treatment	***Rate/A***	***% Dali 8/5/10***	***Alfalfa % VCRR Stunting 8/5/10***	***Alfalfa Yield (tons/A)***	***% Dali 8/23/10***
Check	----	0 c	0 c	1.0 a	0 e
POSTEMERGENCE					
Roundup WeatherMax+AMS	42.7 oz+2%	92 a	0 c	1.1 a	99 a
Roundup PowerMax+AMS	42.7 oz+2%	95 a	0 c	1.2 a	98 a
Roundup WeatherMax+ Raptor+AMS+NIS	42.7 oz+ 6 oz+2%+0.25%	94 a	0 c	1.1 a	99 a
Roundup PowerMax+ Raptor+AMS+NIS	42.7 oz+ 6 oz+2%+0.25%	94 a	0 c	1.1 a	99 a
Roundup WeatherMax+ Pursuit 2L+AMS+NIS	42.7 oz+ 6 oz+2%+0.25%	94 a	0 c	1.2 a	99 a
Roundup PowerMax+ Pursuit 2L+AMS+NIS	42.7 oz+ 6 oz+2%+0.25%	96 a	0 c	1.2 a	98 a
2,4-DB+Roundup PowerMax	3 qt+42.7 oz	94 a	13 a	0.8 b	99 a
Roundup WeatherMax+ Select Max+AMS+NIS	42.7 oz+ 34 oz+2%+0.25%	94 a	0 c	1.1 a	99 a
Roundup PowerMax+ Select Max+AMS NIS	42.7 oz+ 34 oz+2%+0.25%	96 a	0 c	1.1 a	99 a
Raptor+AMS+NIS	6 oz+2%+0.25%	86 b	0 c	1.1 a	91 b
Pursuit 2L+AMS+NIS	6 oz+2%+0.25%	87 b	0 c	1.2 a	84 c
2,4-DB	3 qt	84 b	8 b	1.1 a	75 d
LSD (.10)		3	2	0.12	3

Table 16. Canada Thistle in Clearfield Sunflowers

RCB; 3 reps
Variety: Triumph 660CL
Planting Date: 6/2/10
POST: 7/6/10; Sunflower 6-8 in; Cath 6-12 in.
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:
POST: 1st week 1.50 inches
2nd week 0.12 inches

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

Comments: The objective of this study was to evaluate Canada thistle control in Clearfield (Beyond tolerant) sunflowers. Beyond (imazamox) did not adequately control Canada thistle. However, the high rate of Euro Lightning (imazapyr + imazamox) provided about 70% Canada thistle control. Euro Lightning is currently not registered for use in SD. In summary, results from this study demonstrated that one Beyond application may not adequately control Canada thistle but Euro Lightning may have some potential for Canada thistle control in Clearfield sunflowers.

Treatment	***Rate/A***	***% VCRR Sunflower 7/15/10***	***% Cath 7/26/10***	***% Cath 8/23/10***	***% Cath 9/20/10***
Check	----	0 c	0 d	0 d	0 d
POSTEMERGENCE					
Beyond+MSO+AMS	4 oz+1%+2%	17 a	55 c	30 c	30 c
Beyond+MSO+AMS	6 oz+1%+2%	18 a	86 a	47 b	53 b
Euro Lightning+MSO+AMS	8.3 oz+1%+2%	10 b	73 b	58 ab	62 ab
Euro Lightning+MSO+AMS	10 oz+1%+2%	10 b	78 ab	73 a	72 a
Euro Lightning+MSO+AMS	15 oz+1%+2%	17 a	87 a	69 a	70 a
LSD (.10)		3	7	16	9

Table 17. Grass and Broadleaf Weed Control with Premixes and Tank-Mixes

RCB; 4 reps
Variety: Briggs
Planting Date: 4/14/10
POST: 6/2/10; SpWht 6-8 in, 5 lf tiller; Grft 1-3 in; Wimu 6-8 in; Pesw 2-4 in; Wibw 3-4 in, 3-5 lf; Yeft 1-3 in; Wioa 4-6 in.
Soil: Clay loam; 3.2% OM; 6.3 pH

Precipitation:
POST: 1st week 0.49 inches; 2nd week 1.93 inches

Grft=Green foxtail
Wimu=Wild mustard
Pesw=Pennsylvania smartweed
Wibw=Wild buckwheat
Yeft=Yellow foxtail
Wioa=Wild oat

Comments: The objective of this study was to evaluate grass and broadleaf weed control with Axial (pinoxaden) tank-mix partners and several commercial premix products. Yellow foxtail control was greatest when Axial was tank-mixed with Pulsar (dicamba + fluroxypyr) or WideMatch (clopyralid + fluroxypyr) + MCPA. Affinity TankMix (thifensulfuron + tribenuron) seemed to antagonize Axial. The premix products, which included GoldSky (florasulam + fluroxypyr + pyroxsulam) and Wolverine (fenoxaprop + pyrasulfotole + bromoxynil) resulted in moderate yellow foxtail control. Rimfire Max (propoxycarbazone + mesosulfuron) was poor on the foxtail species as expected. Most treatments provided good to excellent broadleaf weed control. In summary, results from this study indicated that Axial is a very effective foxtail herbicide but some broadleaf herbicide tank-mixes can reduce grass control.

Treatment	Rate/A	% Grft 6/21/10	% Wimu 6/21/10	% Pesw 6/21/10	% Wibw 6/21/10	% Yeft 7/22/10	% Pesw 7/22/10	% Wibw 7/22/10	% Wioa 7/22/10	SpWht Yield bu/A
Check	----	0 f	0 c	0 c	0 d	0 e	0 d	0 c	0 b	35 b
POSTEMERGENCE										
Axial XL+Orion+	16.4 oz+17 oz+									
Buctril 4EC	1 pt	93 b	99 a	99 a	99 a	88 a	98 a	99 a	99 a	43 a
Axial XL+Pulsar	16.4 oz+8.3 oz	97 a	83 b	94 b	95 c	92 a	87 c	98 b	99 a	44 a
Axial XL+	16.4 oz+									
WideMatch+	16 oz+									
Affinity TM	0.6 oz	95 ab	95 a	99 a	99 a	83 b	99 a	99 a	99 a	44 a
Axial XL+	16.4 oz+									
WideMatch+	16 oz+									
MCPA ester	8 oz	98 a	96 a	98 a	98 a	92 a	98 a	99 a	99 a	43 a
GoldSky+NIS	1 pt+0.25%	89 c	96 a	97 a	97 b	83 b	99 a	99 a	99 a	42 a
Wolverine+NIS	27.2 oz+0.25%	98 a	98 a	95 b	98 ab	85 b	93 b	99 a	99 a	40 a
Rimfire Max+	3 oz+									
Huskie+MSO	11 oz+1.5 pt	59 d	99 a	99 a	99 a	43 c	99 a	99 a	99 a	43 a
Rimfire Max+	3 oz+									
Huskie+Quad 7	11 oz+0.8 pt	45 e	99 a	99 a	99 a	35 d	99 a	99 a	99 a	44 a
LSD (.10)		3	2	2	1	3	2	1	0	3

Table 18. Broadleaf Weed Control with Pulsar and Orion

RCB; 4 reps
Variety: Briggs
Planting Date: 4/14/10
POST: 6/2/10; SpWht 6-8 in; 5 lf tiller; Wimu 6-8 in; Pesw 2-4 in; Corw 2-4 in.
Soil: Clay loam; 3.6% OM; 6.3 pH

Precipitation:
POST: 1st week 0.49 inches; 2nd week 1.93 inches

Wimu=Wild mustard
Pesw=Pennsylvania smartweed
Corw=Common ragweed

Comments: The objective of this study was to evaluate weed control associated with Pulsar (dicamba + fluroxypyr) and Orion (florasulam + MCPA). Pulsar alone provided good control of most weeds except Pennsylvania smartweed whereas Orion seemed to be more consistent with the weed species present in this study. However, Orion alone can be slightly less effective than Pulsar on other weed species, such as kochia. Adding tank-mix partners to Pulsar, such as Affinity TankMix (thifensulfuron + tribenuron) or WideMatch (clopyralid + fluroxypyr) improved smartweed control. Other alternative products, such as Huskie (pyrasulfotole + bromoxynil), WideMatch + MCPA, and Affinity TankMix + MCPA also provided good control of each weed species present in this study. In conclusion, results from this study indicated that Pulsar and Orion can be effective broadleaf herbicides but tank-mix partners may be needed to control some weed species.

Treatment	Rate/A	% Wimu 6/21/10	% Pesw 6/21/10	% Corw 6/21/10	% Pesw 7/22/10	% Corw 7/22/10	SpWht Yield bu/A
Check	----	0 c	0 c	0 c	0 e	0 d	30 b
POSTEMERGENCE							
Pulsar+NIS	8.3 oz+0.25%	91 b	78 b	87 b	76 d	97 a	44 a
Pulsar+MCPA ester+NIS	8.3 oz+0.54 pt+0.25%	97 a	83 b	93 ab	81 c	99 a	42 a
Pulsar+Affinite TM+NIS	8.3 oz+0.6 oz+0.25%	98 a	98 a	98 a	99 a	99 a	45 a
Orion+Starane	17 oz+0.33 pt	98 a	97 a	96 a	99 a	98a	45 a
Orion+Buctril	17 oz+1 pt	98 a	98 a	97 a	99 a	99 a	44 a
Orion	17 oz	98 a	98 a	94 ab	94 ab	93 b	44 a
Pulsar+WideMatch+ Affinity TM+NIS	8.3 oz+1 pt+ 0.2 oz+0.25%	97 a	98 a	98 a	99 a	99 a	43 a
Huskie+NIS+AMS	11 oz+0.25%+0.5 lb	98 a	97 a	98 a	93 ab	99 a	41 a
WideMatch+MCPA ester	1 pt+8 oz	96 a	97 a	98 a	93 b	98 a	43 a
Affinity TM+MCPA ester	0.6 oz+8 oz	98 a	98 a	96 a	99 a	83 c	44 a
LSD (.10)		2	5	5	4	3	4

Table 19. Wolverine in Spring Wheat

RCB; 4 reps
Variety: Briggs
Planting Date: 4/14/10
POST: 6/2/10; SpWht 6-8 in, 5 lf tiller; Yeft 1-3 in;
Wimu 6-8 in; Pesw 2-4 in; Wibw 3-5 lf, 3-4 in.
Soil: Clay loam; 3.6% OM; 6.3 pH

Precipitation:
POST: 1st week 0.49 inches
2nd week 1.93 inches

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

Comments: The objective of this study was to evaluate grass and broadleaf weed control associated with Wolverine (fenoxaprop + pyrasulfotole + bromoxynil) applications in spring wheat. All treatments resulted in good wild mustard and wild buckwheat control. Smartweed was best controlled with treatments containing fluroxypyr or florasulam, which includes WideMatch (clopyralid + fluroxypyr), GoldSky (florasulam + fluroxypyr + pyroxsulam), and Orion (florasulam + MCPA). July evaluations indicated the Wolverine resulted in slightly greater yellow foxtail control than GoldSky (florasulam + fluroxypyr + pyroxsulam). In summary, results from this study indicated that Wolverine may provide good grass and broadleaf weed control, but adding 2,4-D or MCPA may improve smartweed control.

Treatment	Rate/A	% Yeft 6/21/10	% Wimu 6/21/10	% Pesw 6/21/10	% Wibw 6/21/01	% Yeft 7/22/10	% Pesw 7/22/10	% Wibw 7/22/10	SpWht Yield bu/A
Check	----	0 c	0 c	0 e	0 d	0 g	0 e	0 c	32 b
POSTEMERGENCE									
Wolverine	27.4 oz	98 a	99 a	88 c	96 ab	88 bc	83 c	98 a	44 a
WideMatch+ MCPA ester+Puma	0.75 pt+ 0.5 pt+0.5 pt	97 a	96 b	97 a	98 a	90 ab	91 b	99 a	41 a
Orion+Puma	17 oz+0.5 pt	90 b	96 b	90 c	92 c	71 f	96 a	99 a	39 a
GoldSky+NIS	16 oz+0.25%	91 b	97 ab	92 bc	93 c	79 e	97 a	98 a	42 a
Pulsar+MCPA ester+ Puma+NIS	8.3 oz+0.5 pt+ 0.25%+0.5 pt	96 a	97 ab	80 d	93 bc	91 a	77 d	99 a	40 a
Axial XL+Huskie	16.4 oz+11 oz	96 a	99 a	94 ab	98 a	85 d	91 b	98 a	40 a
Wolverine+MCPA ester	1.7 pt+0.5 pt	97 a	99 a	92 bc	94 abc	84 d	89 b	94 b	43 a
Wolverine+2,4-D ester	1.7 pt+0.5 pt	97 a	99 a	92 bc	96 ab	86 cd	87 b	98 a	41 a
LSD (.10)		2	1	3	2	2	4	2	3

Table 20. Broadleaf Weed Control in Spring Wheat with Huskie

RCB; 4 reps
Variety: Briggs
Planting Date: 4/14/10
POST: 6/2/10; SpWht 6-8 in, 5 lf tillered; Wimu 6-8 in;
Pesw 2-4 in; Grft 1-3 in; Corw 2-4 in.
Soil: Clay loam; 3.6% OM; 6.3 pH

Precipitation:
POST: 1st week 0.49 inches
2nd week 1.93 inches

Wimu=Wild mustard
Pesw=Pennsylvania smartweed
Grft=Green foxtail
Corw=Common ragweed

Comments: The objective of this study was to evaluate broadleaf weed control with Huskie (pyrasulfotole + bromoxynil) in spring wheat. Puma at 0.5 pt/A was applied with each treatment to control green foxtail. None of the broadleaf herbicides antagonized grass control from Puma. Huskie at 11 fl oz/A resulted in similar weed control as Huskie at 15 fl oz/A. Other alternative herbicide mixes also resulted in good overall weed control. In summary, even the low rate of Huskie resulted in good control of difficult broadleaf weed species such as smartweed and common ragweed.

Treatment	Rate/A	% Wimu 6/21/10	% Pesw 6/21/10	% Grft 6/21/10	% Pesw 7/22/10	% Corw 7/22/10	SpWht Yield bu/A
Check	----	0 b	0 c	0 b	0 d	0 c	30 b
POSTEMERGENCE							
Huskie+Puma+AMS	11 oz+0.5 pt+0.5 lb	98 a	96 a	98 a	95 a	99 a	41 a
Huskie+Puma+AMS	13.5 oz+0.5 pt+0.5 lb	98 a	97 a	98 a	96 a	99 a	42 a
Huskie+Puma+AMS	15 oz+0.5 lb	98 a	98 a	98 a	96 a	99 a	44 a
Huskie+Puma+ AMS+NIS	13.5 oz+0.5 pt+ 0.5 lb+0.25%	98 a	98 a	98 a	96 a	99 a	40 a
WideMatch+ MCPA ester+Puma	1 pt+ 0.5 pt+0.5 pt	97 a	93 b	98 a	91 b	99 a	43 a
Affinity TM+Starane+ Puma+NIS	0.6 oz+0.33 pt+ 0.5 pt+0.25%	97 a	96 a	98 a	99 a	92 b	41 a
Huskie+MCPA ester+Puma	11 oz+0.5 pt+0.5 pt	98 a	96 a	98 a	91 b	98 a	45 a
Huskie+2,4-D ester+Puma	11 oz+0.5 pt+0.5 pt	98 a	93 b	98 a	85 c	99 a	45 a
WideMatch+ Affinity TM+Puma	0.75 pt+ 0.6 oz+0.5 pt	97 a	98 a	98 a	99 a	99 a	45 a
LSD (.10)		1	2	0	3	3	5

Table 21. Residual Herbicides in Spring Wheat

RCB; 4 reps
Variety: Briggs
Planting Date: 4/23/10
PRE: 4/27/10
EPOST: 6/2/10; SpWht 3-4 lf, 4-6 in; Bygr 4-6 in; Rrpw 2-3 in; Corw 2-4 in.
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation:

PRE:	1st week	0.91 inches
	2nd week	1.12 inches
EPOST:	1st week	0.49 inches
	2nd week	1.93 inches

Bygr=Barnyardgrass
Rrpw=Redroot pigweed
Corw=Common ragweed

Comments: The objective of this study was to evaluate weed control from residual herbicides in spring wheat. Because of dense grass growth, Puma was applied postemergence to all the treatments except the Everest treatments. Everest did not adequately control barnyardgrass which was somewhat surprising as we have seen good residual foxtail and wild oat control in previous studies. However, the preemergence applications of Everest seemed to provide some pigweed control whereas this herbicide is most often used for grass control. Common ragweed was only controlled by the early postemergence application of Orion (florasulam+MCPA) or the preemergence application of Sharpen at the high rate. In summary, the residual herbicides provided weed suppression but did not adequately control grass or broadleaf weed species.

Treatment	Rate/A	% Bygr 7/13/10	% Rrpw 7/13/10	% Corw 7/13/10
Check	----	0 c	0 b	0 d
PREEMERGENCE				
Everest	0.3 oz	97 a	75 a	5 d
Sharpen	1 oz	99 a	8 b	45 bcd
Sharpen	2 oz	99 a	8 b	82 ab
Everest+Sharpen	0.3 oz+1.5 oz	97 a	65 a	43 bcd
FirstStep	1.34 oz	99 a	33 b	44 bcd
Orion	17 oz	99 a	0 b	55 bc
EARLY POSTEMERGENCE				
Orion	17 oz	90 a	23 b	94 a
Everest+NIS	0.3 oz+0.25%	0 c	0 b	0 d
Everest+NIS	0.6 oz+0.25%	13 b	0 b	0 d
PREEMERGENCE				
Zidua	1 oz	99 a	0 b	33 cd
LSD (.10)		10	22	28

Table 22. Weed Control in Sunflower with Spartan and Dual

RCB; 3 reps
Variety: Triumph 660CL
Planting Date: 6/2/10
PRE: 6/2/10
POST: 7/6/10; Sunflower 6-8 in; Yeft 2-4 in;
Soil: Clay loam; 3.0% OM; 6.1 pH

Precipitation:

PRE:	1st week	0.49 inches
	2nd week	1.93 inches
POST:	1st week	1.50 inches
	2nd week	0.12 inches

Yeft=Yellow foxtail
Corw=Common ragweed
Wimu=Wild mustard
Pesw=Pennsylvania smartweed

Comments: The objective of this study was to evaluate tank-mixes of Spartan (sulfentrazone) and Dual (s-metolachlor) in sunflowers. The site was not tilled prior to planting and Roundup (glyphosate) was applied with each preemergence treatment. The best overall weed control resulted from the high rates of Spartan (6 oz/A) and Dual (28 oz/A). Common ragweed densities were very high at this location. Since Spartan is not highly effective on common ragweed, higher rates were required to get good control. The mix of Spartan at 3 oz/A + Dual at 14 oz/A resulted in similar weed control as Spartan at 6 oz/A alone. Results from this study indicated that Dual may be a good mix partner with Spartan to improve residual grass and broadleaf weed control.

Treatment	*Rate/A*	*% Yeft 6/30/10*	*% Corw 7/15/10*	*% Wimu 7/15/10*	*% Corw 9/20/10*	*% Pesw 9/20/10*
Check	----	0 d	0 f	0 d	0 c	0 e
PREEMERGENCE						
Roundup WeatherMax+	22 oz+					
Spartan 4F+Dual II Magnum	6 oz+28.4 oz	91 a	92 a	90 a	87 a	94 a
Roundup WeatherMax+	22 oz+					
Spartan 4F+Dual II Magnum	3 oz+14.3 oz	82 ab	82 bcd	75 ab	80 ab	89 ab
Roundup WeatherMax+	22 oz+					
Spartan 4F+Dual II Magnum	4.5 oz+21.3 oz	88 a	86 a-d	90 a	73 ab	93 a
Roundup WeatherMax+	22 oz+					
Spartan 4F	3 oz	57 c	81 cd	65 ab	68 b	65 d
Roundup WeatherMax+	22 oz+					
Spartan 4F	4.5 oz	58 c	81 cd	83 ab	68 b	77 c
Roundup WeatherMax+	22 oz+					
Spartan 4F	6 oz	58 c	88 ab	73 ab	80 ab	85 abc
Roundup WeatherMax+	22 oz+					
Dual Magnum	14.3 oz	80 ab	68 e	30 c	67 b	70 d
Roundup WeatherMax+	22 oz+					
Dual Magnum	21.3 oz	84 a	81 cd	69 ab	70 b	83 abc
Roundup WeatherMax+	22 oz+					
Dual Magnum	28.4 oz	89 a	88 ab	55 b	83 ab	92 a
Roundup WeatherMax+	22 oz+					
Prowl H2O	48 oz	71 b	79 d	78 ab	79 ab	91 a
PREEMERGENCE & POSTEMERGENCE						
Roundup WeatherMax+	22 oz+					
Spartan Charge&Select	4.5 oz&6 oz	57 c	87 abc	83 ab	77 ab	80 bc
LSD (.10)		9	4	17	10	7

Table 23. Preplant Burndown in No-Till Sunflowers with Spartan Advance

RCB; 4 reps
Variety: Triumph 660CL
Planting Date: 6/2/10
EPP: 6/2/10; Grft 3-5 in; Colq 1-3 in; Wibw 2-3 in; Wimu 2-4 in; Corw 2-4 in.
Soil: Clay loam; 4.1% OM; 5.8 pH

Precipitation:
EPP: 1st week 0.49 inches
2nd week 1.93 inches

Grft=Green foxtail
Colq=Common lambsquarter
Wibw=Wild buckwheat
Wimu=Wild mustard
Corw=Common ragweed

Comments: The objective of this study was to evaluate weed control after preplant burndown applications with Spartan (sulfentrazone) and Glyfos (glyphosate) or the premix of these herbicides, Spartan Advance. Most treatments resulted in good weed control. At least 4 oz of Spartan per acre was needed to get moderate common ragweed control. Adding Spartan with glyphosate greatly improved wild buckwheat control. Results from this study indicated that tank-mixes or premixes of Spartan and glyphosate may provide good foliar and residual broadleaf weed control in sunflowers.

Treatment	Rate/A	% Grft 6/10/10	% Colq 6/10/10	% Wibw 6/10/10	% Wimu 6/10/10	% Corw 7/15/10	% Colq 7/15/10	% Rrpw 9/22/10	% Corw 9/22/10	% Colq 9/22/10
EARLY PREPLANT										
Spartan Charge+	4 oz+									
Glyfos X-Tra+AMS	24 oz+3.4 lb	94 ab	98 a	98 a	98	82 qb	98 a	98 a	78 a	92 a
Spartan Charge+	5 oz+									
Glyfos X-Tra+AMS	24 oz+3.4 lb	95 ab	98 a	98 a	98 a	86 a	98 a	93 b	81 a	94 a
Spartan Advance+	24 oz+									
NIS+AMS	0.5%+3.4 lb	96 ab	98 a	98 a	98 a	80 ab	97 a	92 b	82 a	96 a
Spartan Advance+	32 oz+									
NIS+AMS	0.5%+3.4 lb	97 a	99 a	99 a	99 a	82 ab	98 a	91 bc	81 a	95 a
Spartan 4F+	3 oz+									
Glyfos X-tra+AMS	22 oz+3.4 lb	95 ab	97 a	97 a	97 b	72 b	98 a	75 d	55 b	95 a
Spartan 4F+	4 oz+									
Glyfos X-tra+AMS	24 oz+3.4 lb	94 ab	98 a	98 a	98 a	71 b	97 a	86 c	59 b	94 a
Glyfos X-tra+AMS	24 oz+3.4 lb	90 b	88 c	76 c	98 a	---	---	0 e	---	---
Aim EC+	0.5 oz+									
Glyfos X-tra+AMS	24 oz+3.4 lb	95 ab	93 b	92 b	98 a	---	---	0 e	---	---
Check	----	0 c	0 d	0 d	0 c	0 c	0 b	0 e	0 c	0 b
LSD (.10)		3	2	2	1	9	1	4	15	2

Fertilizer Application Influence on Nutrient Soil Tests and Soybean Grain Yield at the NE Research Farm in 2010. (25510)

A. Bly, R. Gelderman 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 testing's ability to predict crop response to fertilizer and fertilizer influence on soil tests.

Materials and Methods

Treatments listed in Table 1 are applied as below. These treatments have been applied since 1996.

Item:		**Description:**
Rotation		Soybean, Wheat, Corn (since 1996)
Variety		Asgrow 1403 RR
Fertilizer*	N	Rate = 50 lbs/a (urea)
	P	40 lbs P_2O_5/a/yr broadcast (Triple Super Phosphate, 0-46-0)
	K	40 lbs K_2O/a/yr broadcast (potash, 0-0-60)
	Zn	5 lbs/a/yr (zinc sulfate)
		* no fertilizer applied for 2007 soybean crop
Tillage		conventional, incorporate fertilizer treatments
Plot size		15 x 60 ft
reps		4 (randomize complete block)

Results and Discussion

The influence of annual fertilizer nutrient application on soil test is clearly shown in Table 1. The P check (No-P) had 1 ppm Olsen P compared to a range of 7 to 14 ppm P when fertilizer P was applied. The K check (No-K) had 123 ppm extractable K compared to 185 to 227 ppm K when fertilizer K was applied. The Zn check (No-Zn) had 0.74 ppm Zn compared to 7.47 to 10.45 when Zn was applied. The large soil test differences between treatment 1 and the nutrient check treatments can be used to determine if these lower tests are limiting grain yields.

During 2010, the P check plots limited soybean yield (Table 1). Soybean grain yield was approximately 9.5 bu/a less with no applied P. Soybeans did not respond to applied N or higher K or Zn soil test levels.

Table 1. Soybean grain yield and moisture response to long term N, P, K and Zn application at NE farm in 2010.

Fertilizer Nutrients Applied	Oct. 2010 Soil Test			2010 Soybean Grain	
	P	K	Zn	Moisture	Yield
	-------- ppm 0-6” -------			%	bu/a
1- all - NPKZN	7	185	7.47	11.4 a	38.8 a
2 - No N - PKZn	14	192	10.45	11.3 a	38.5 a
3 - No P - NKZn	1	227	9.6	11.3 a	29.3 b
4 - No K - PKZn	8	123	9.77	11.1 b	39.0 a
5 - No Zn - NPK	10	217	0.74	11.4 a	38.8 a
Pr>F				0.011	0.001
CV (%)				1.0	4.2
$LSD_{(.05)}$				0.17	2.4

Site in corn/soybean/spring wheat rotation since 1996.
Nutrients applied: N = 50 lbs/a, P_2O_5 = 40 lbs/a/yr, K_2O = 50 lbs/a/yr, Zn = 5 lbs/a/yr

Influence of phosphorus placement and rate on no-till corn, NE Farm 2010. (43710)

R. Gelderman, A. Bly and A. Heuer

Introduction

There is a need to compare different phosphorus placements for no-till corn in SD. Therefore, a research project was initiated at the NE farm to measure the influence of P placement on no-till corn yield.

Materials and Methods

Item:	Description:
Rotation	corn/soybeans
Hybrid	Dekalb (DKC 43-27 VT3)
Planting Date	May 21, 2010
N rate (lbs N/a) adjusted for N in MAP (N applied as surface broadcast urea)	Check = 150 lbs N/a 20 = 134 lbs N/a 40 = 130 lbs N/a
P_2O_5 rates applied as 11-52-0 (MAP)	0, 20, 40
K_2O rate (lbs/a) applied to all plots as potash	60
P_2O_5 applications methods	Seed furrow and broadcast
S rate (lbs/a) applied to all plots as AMS	15
Zn rate (lbs/a) applied to all plot as zinc sulfate	5
Tillage	No-till
Plot Size	10’ x 30’
Replications	4

Results and Discussion

Soil test Olsen P at this site was 4 ppm (low). A low P test level indicates a yield response to applied P would be expected in about 70% of the growing seasons. Corn grain yield was significantly influenced by P rate (Table 1 orthogonal contrast). There was no yield difference between P placement methods. The trend for both this year and last is that seed placed P maximized yield with 20 lbs/a while about 40 lbs/a of broadcasted P is needed to maximize yield.

Table 1. Influence of phosphorus placement and rate on no-till corn, NE Farm 2010. (43710)

P_2O_5 Rate	P Placement Method		Mean
	Seed Furrow	Broadcast	
lbs/a	-------------- bu/a --------------		
0	159		159
20	172	164	168
40	167	175	171
Mean	170	170	

Statistics	Pr>F	Orthogonal Contrast	Pr>F
P Rate (rate)	0.18	P vs no P	0.01
P Placement (place)	0.88	Placement at 20	0.26
Rate x place	0.21	Placement at 40	0.22
		P rate with seed	0.43
		P rate broadcast	0.13

Soil Test P = 4 ppm (Low)

Table 3. Seed Treatment Efficacy in Managing Root Disease on HRSW at Two Locations, 2010

		BROOKINGS				SOUTH SHORE (NE Farm)			
Treatment	Rate (fl. oz/cwt)	Stand Count plants/m²	Yield bu/A	Test Weight bu/A	Sub-Crown Internode[1]	Stand Count plants/m²	Yield bu/A	Test Weight bu/A	Sub-Crown Internode[1]
Untreated		34.68	41.63	50.69	--	34.68	67.33	51.8	2.7
Dividend Extreme	2.0	32.59	38.84	49.59	--	36.06	64.46	51.5	2.6
Dividend Extreme	2.0	31.05	39.52	50.11	--	33.15	66.61	52.3	2.6
Cruiser 5 FS	0.26								
Proceed MD	5.0	34.52	36.98	49.72	--	34.20	70.18	51.9	2.6
Rancona	0.05	38.23	37.34	49.17	--	32.51	67.06	52.9	2.5
Sebring 2.65 ST	0.10								
Senator 600	1.28								
Sativa IM Max	5.0	33.11	40.79	49.31	--	30.49	67.46	50.4	2.6
Sativa M RTU	5.0	32.67	42.13	49.95	--	29.20	67.55	51.0	2.7
Sativa M RTU	6.5	32.91	39.61	50.02	--	33.72	68.64	50.7	2.7
Sativa IM Max	5.0	36.15	41.97	50.13	--	36.30	66.77	52.1	2.6
Rancona	0.02								
Sativa IM Max	5.0	35.01	38.13	49.3	--	33.72	70.77	52.5	2.6
Rancona	0.04								
Sativa IM Max	5.0	29.76	40.68	48.97	--	32.75	69.67	52.3	2.5
Exp. Biological A	3.53								
Sativa IM Max	5.0	34.44	37.29	49.68	--	35.17	70.06	52.00	2.4
Exp. Biological B	3.53								
Exp. Biological A	3.53	32.02	40.77	50.33	--	32.26	68.12	51.10	2.5
Exp. Biological B	3.53	30.17	40.05	49.69	--	34.36	68.51	51.70	2.8
LSD (a=0.10)		NS	NS	NS	--	NS	NS	NS	NS

[1]Sub-crown internode ratings range from 0 (Healthy) - 3 (>75% discolored) & are an indicator of common (*Bipolaris*) root rot severity.

Table 4. Seed Treatment Efficacy on HRSW at South Shore, 2010

Treatment	Rate	Stand Count plants/m²	Grain Yield bu/A	Test Weight bu/A
Untreated		32.67	74.40	49.94
Charter	5.4	32.51	71.38	52.89
Axcess	0.2			
Charter	5.4	36.22	69.92	52.18
Stamina	0.4			
Axcess	0.2			
Dividend RTA	5.0	37.75	64.68	53.34
Axcess	0.2			
Proceed MD	5.0	31.38	67.38	50.3
Axcess	0.2			
Raxil MD	5.0	31.62	71.12	52.09
Axcess	0.2			
Experimental A		34.28	66.64	50.54
Experimental B		29.60	70.91	52.16
Experimental C		33.15	72.19	52.55
LSD (a=0.10)		NS	NS	NS

2010 Spring Wheat Foliar Fungicide Trials

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Introduction:

Spring wheat in northeast South Dakota is subject to several fungal diseases that can limit grain yield, quality and test weight. These diseases include leaf rust (*Puccinia triticina*) and stripe rust (*Puccinia striiformis* f. sp. *tritici*) as well as the residue-borne diseases tan spot (*Pyrenophora tritici-repentis*) and Septoria complex (*Septoria tritici*, *S. avenae*, and *Stagonospora nodorum*). Management of these diseases requires integrating varietal resistance, cultural practices, risk assessment and foliar fungicides. Early applications of some fungicides (applied at Feekes 2-4, often with post-emergence herbicides) have been shown to be effective at slowing disease development and increasing grain yield in wheat, especially in high residue and continuous cropping systems. Typically, however fungicides in wheat are applied at a stage to protect the flag leaf soon after it is fully emerged (Feekes 9), targeting leaf rust, tan spot, and the Septoria complex.

Fusarium head blight (scab or FHB) has also been a recurring problem in winter and spring wheat, durum, and barley grown in South Dakota. Scab outbreaks have been periodic and localized since the early 1990's. A small and localized outbreak occurred in the NE South Dakota in 2004 and a more widespread epidemic developed in 2005 causing extensive damage to winter wheat in the southeastern and south central counties of SD. Damage from FHB is two-fold: yield and test-weight losses are common, but quality losses due to mycotoxin contamination may be even more economically damaging. The fungus that causes FHB, *Fusarium graminearum*, produces potent mycotoxins such as deoxynivalenol (DON, vomitoxin), which contaminate the grain. Scab management also requires an integrated approach including the use of resistant varieties, good rotation and residue management, disease forecasting and foliar fungicides when necessary. Fungicides alone have provided only moderate suppression of FHB, however when combined with other management components, the disease can be effectively minimized. Proper timing of fungicides for FHB management is essential to achieving the greatest efficacy. Fungicides should be applied at or very near the flowering stage (Feekes 10.51) to be most effective on FHB as the host is at the peak of susceptibility to the pathogen. This timing also has some effect on flag-leaf diseases mentioned above.

Materials and Methods:

Hard red spring wheat study areas were established at two South Dakota locations in 2010; the Northeast Research Station, (NE Farm) near South Shore and the Plant Science Research Farm at Brookings, SD. Two types of studies were carried out: 1) foliar fungicide efficacy trials for management of leaf rust and foliar blights; and 2) fungicide efficacy trials for management of FHB and DON. All studies were conducted using red hard spring wheat cultivars: 'Select', a variety resistant to leaf rust and other foliar blights and moderately resistant to FHB; and ‘Reeder’, a variety with susceptibility to most major fungal diseases including rust and FHB. Trials were planted into factorial, randomized complete block designs incorporating wheat variety*treatment as the principle experimental unit (plot). Foliar disease and head blight studies utilized four replications. Fungicide treatments were applied at various growth stages from Feekes 2 (three to five leaf stage, early tillering) to Feekes 10.51 (initiation of flowering). Brookings FHB plots were misted at regular intervals from 6:00pm to 8:00am for ten days following anthesis to enhance the environment for FHB development. The Brookings FHB site was also inoculated with *Fusarium graminearum*-colonized corn grain to enhance inoculum levels in the study area.

At the soft dough stage of crop development, fungicide and FHB study plots were evaluated for leaf diseases, FHB incidence, FHB head severity, and FHB field severity. After harvest, Fusarium damaged kernels (FDK), deoxynivalenol (DON), grain yield, test weight, and protein data were collected. Leaf area assessments were used to estimate the percentage of the flag leaf that was necrotic due to either foliar blights or leaf rust. Specific information on dates of planting, treatment, assessment and harvest are outlined in Table 1.

Table 1. Cultural Information for Wheat Fungicide and FHB Trials.

Activity	Crop stage		Date/Location (2010)		
	Descriptive	Feekes	Brookings (Foliar)	Brookings (FHB)	NE Farm (Foliar/FHB)
Planting	-	-	5/4	5/4	4/20
Fungicide Appl.	Early/Tillering	2-3	--	--	6/2
“	Flag leaf	8-9	6/28	6/28	6/22
“	Fully Headed	10.5	--	7/2	7/2
“	Flowering	10.51	--	7/6	7/7
Disease Ratings	Soft Dough	11.2	7/23	7/27	7/28
Grain Harvest	Mature	11.4	8/18	8/18	8/16

Results and Discussion:

In general, foliar disease pressure and Fusarium head blight development were low in 2010. While there was adequate moisture in the environment most of the season, conditions turned dry as the plants reached flag leaf stage. Also, cooler temperatures perhaps reduced fungal development. Bacterial leaf streak was again present at high levels in South Dakota, confounding effects of both foliar fungal diseases as well as the fungicide treatments

Based on data reported in Table 2-5, foliar fungicides had varying effects, depending on the susceptibility of the variety grown. In 2010, foliar fungicide (non-FHB) treatments were divided into two distinct studies. A set of treatments targeting early infection were grouped and applied at Feekes 2, a stage corresponding with post-emergence herbicide applications in spring wheat production (Table 3). Products containing propiconazole were selected for early treatments due to the relative success of that active ingredient in past studies. These early applications typically are made at reduced rates, below the label recommendations. A second set of trials incorporated standard flag-leaf applications of fungicide products at full labeled rates applied just after flag leaves (uppermost leaf on plant) has fully emerged (Feekes 9). Most of the foliar products in 2010 were directed at flag leaf applications to manage leaf rust and other foliar blights on the flag leaf and upper parts of the wheat canopy. This second group of trials also included a few treatments where a standard flag leaf application was preceded by an early, reduced rate treatment at herbicide timing. These are grouped separately in Table 2 to examine their combined effects. Fusarium head blight studies were also separated and reported on in Tables 4 and 5.

The early season applications, as in previous early-application studies were marginally effective at improving production. Yield increases were modest in all cases and overall, the cost of inputs just balanced increased yields. Return on investment (see bottom of Table 3) for early fungicides or fungicides plus insecticides was calculated to be around $1.78 for the resistant variety ‘Select’, and a slightly negative return ($ -0.27) for the susceptible variety ‘Reeder’. No significant differences were observed among treatments in terms of yields or test weights.

Flag leaf timing is generally the more common timing for application of fungicide to wheat in South Dakota and was shown here to produce a more favorable return on input cost investment (Table 2, and bottom of Table 3). Among products that are in common use, several produced large yield increases over the untreated check, even though there was not a high level of foliar disease pressure. Even on the disease resistant variety ‘Select’, yield increases ranged from just under 1 bu/acre to nearly 15 bu/acre following Feekes 9 fungicide application. ‘Select’ appeared to be much more susceptible to bacterial leaf streak (BLS) and was somewhat reduced in yield potential overall it appears. The generally more susceptible ‘Reeder’ showed similar yield increases with treatment, but was less affected by BLS and seemed to have more stable yields across the experimental area, resulting in a lower ‘LSD’ value. The lower variability in the ‘Reeder’ trial resulted in many more treatments that, statistically, were significantly different from the untreated check. Premix products containing both a strobilurin and triazole such as TwinLine and Quilt Xcel resulted in the largest yield increases over the check, similar to those following Quilt plus Warrior II (insecticide). Experimental products that were tested produced yield increases that were generally not as high as for the products mentioned previously. The majority of the experimental formulations tested contained a carboximide fungicide, which represents a different mode of action from triazoles and strobilurin products. The carboximides along with benzamides are closely related to strobilurins in that they are respiration inhibitors, however they are ‘Succinate Dehydrogenase Inhibitors’ which target different sites of action in the fungus. They represent a medium to high risk for resistance development, slightly higher risk than triazoles and lower risk than strobilurins.

Return on investment (ROI) calculated for flag leaf applications of fungicide was, on average, around $40/acre for ‘Select’ treatments, and around $45/acre for ‘Reeder’ treatments. The split applications produced a positive ROI however they were under $10/acre for both ‘Select’ and ‘Reeder’ treatments, and were considered far inferior to single flag-leaf timing application.,

Tables 4 and 5 summarize the results of FHB management studies conducted at the NE Farm and on campus at Brookings. This year’s studies examined the effects of poorly timed treatments (i.e. pre-flowering, and post-flowering) compared to optimally timed application of Prosaro or Caramba at Feekes 10.51 (flowering). Also examined were head-applied treatments of Headline fungicide, which has been observed to increase vomitoxin levels in grain when applied to the heads of wheat at risk of FHB. As expected, Prosaro and Caramba applied at Feekes 10.51 reduced vomitoxin (DON) even when applied pre and post flowering; however the best reductions were observed when the products were applied at or after flowering. Pre-flowering applications were somewhat less effective in vomitoxin reduction. On susceptible ‘Reeder’, yield increases were significant for several treatments at both the irrigated nursery at Brookings and at South Shore. ‘Select’ did experience yield increases in response to several treatments at the South Shore site, especially when fungicides were applied a bit early, likely due to leaf disease suppression. Headline fungicide produced yield increases at all timings however f greatest note were the significant vomitoxin increases on ‘Reeder’ at both locations and on ‘Select’ under irrigation.

A principle conclusion reached based on the results of these and many related studies conducted over years and locations is that resistant varieties are a critical component to a sound plant disease management system. By selecting varieties with susceptibility to some of our common diseases, managing those diseases economically becomes more challenging. Fungicides can be used economically in many situations, however, some of the current need for these inputs can be mediated through the use of good rotations and selection of resistant varieties.

Acknowledgements:
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Table 2: Standard & Split Applications of Foliar Fungicides, efficacy on two varieties.

Treatment	Fung. Rate (oz/A)	Estim. Cost ($/A)[1]	Crop Stage[2]	'SELECT' - Resistant, *South Shore*: Lf Rust (%)[3]	Yield[4] (bu/A)	Test Wt[4] (lb/bu)	'REEDER'-Susceptible, *South Shore*: Lf Rust (%)	Yield[4] (bu/A)	Test Wt[4] (lb/bu)
Combined early, low rate + flag-leaf, standard rate application:									
Untreated Check		0		0.1%	58.76	56.9	6.8%	60.41	58.2
Tilt (early)	2	$27.50	2	0.1%	+11.72	+ 1.6	**5.6**	**+10.74**	- 1.7
fb: Quilt (late)	14		8-9						
Quilt (early)	7	31.50	2	0.3%	+12.38	+ 1.2	**5.8**	**+13.65**	- 3.6
fb: Quilt (late)	14		8-9						
Exp. D (early)	2	--	2	0	+ 7.14	+ 2.5	6.4	+ 4.68	- 1.4
fb: Exp. D (late)	4		8-9						
Exp. D (early)	2	--	2	0	+ 8.97	- 0.2	**5.8**	**+12.64**	- 2.1
fb: Prosaro (late)	6.25		8-9						
Flag-leaf, standard rate applications:									
Untreated Check		0		0.1%	58.76	56.9	6.8%	60.41	58.2
Folicur + NIS	4	$10.00	8-9	0.1	+ 0.73	+ 1.8	5.8	**+11.03**	-2.3
Headline + NIS	6	25.00	8-9	0.0	+11.74	+ 1.6	5.8	**+12.85**	-1.9
TwinLine	9	27.00	8-9	0.1	+14.75	+ 0.8	5.1	**+13.61**	-0.8
Quilt + NIS	14	24.00	8-9	0.1	+10.70	- 0.4	6.3	**+ 9.56**	-2.0
Quilt	14	24.00	8-9	0.0	+ 8.57	+ 1.7	5.8	**+12.48**	-2.5
Quilt + Warrior II[5]	14	29.00	8-9	0.0	+14.25	+ 1.4	5.9	**+10.91**	-1.0
Quilt Xcel	10.5	22.00	8-9	0.0	+12.12	+ 1.0	6.0	**+ 9.04**	-2.1
Chloride (as KCl) topdress early	60 lbs	23.00	PE	0.1	+ 1.13	- 0.3	6.5	+ 4.81	-2.4
Experimental D (triazole+strobi.)	4	--	8-9	0.1	+ 7.75	+ 1.3	6.4	**+ 9.73**	-2.5
Experimental E (carbox.+strobi.)	4.5	--	8-9	0.1	+10.87	+ 2.6	6.0	+ 5.97	-1.6
Experimental F (carbox.+strobi.)	9.6	--	8-9	0.0	+ 7.47	+ 0.8	6.1	**+ 8.73**	-1.5
Experimental F (carbox.+strobi.)	19.2	--	8-9	0.0	+ 7.40	+ 1.0	5.8	**+ 9.93**	-1.6
Experimental G (carbox.+strobi)	12	--	8-9	0.3	+ 9.90	+ 1.1	6.0	**+11.56**	-2.7
Experimental G (carbox.+strobi.)	18	--	8-9	0.2	+ 6.79	- 0.3	6.0	**+11.87**	-2.4
Experimental H (carboximide)	10	--	8-9	0.2	+ 2.37	+ 1.7	6.4	**+11.68**	-2.1
Experimental H (carboximide)	24	--	8-9	0.0	+ 9.84	+ 0.7	6.0	**+10.29**	-2.1
Averages for (early + late) split applications:					***+10.05 (bu/A)***	***+ 1.3 (lb/bu)***		***+10.43 (bu/A)***	***- 2.2 (lb/bu)***
Averages for flag leaf only, std. rate apps:					***+ 8.52 (bu/A)***	***+ 1.0 (lb/bu)***		***+ 10.25 (bu/A)***	***- 2.0 (lb/bu)***
		LSD (a=0.05):		NS	NS	NS	0.5	6.73	NS

BOLDED data indicates yield or test weight significantly higher than the untreated check.

[1]Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply flag-leaf trt was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2]Feekes Growth Stage (2=tillering, 8= flag leaf, 9= early boot)

[3]Percentage of flag leaf affected by leaf rust

[4]Yield and test weight data presented as difference from relevant untreated check, bu/A or lb/bu gained or lost

[5]Insecticide treatment: Warrior II with Zeon Technology, 1.28 oz/acre, tank-mixed with fungicide

Table 3: Early Application of Foliar fungicide, efficacy on two HRSW varieties.

Treatment	Fung. Rate (oz/A)	Estim. Cost ($/A) [1]	Crop Stage[2]	'SELECT' - Resistant South Shore Lf Rust (%)[3]	Yield[4] (bu/A)	Test Wt[4] (lb/bu)	'REEDER'-Susceptible South Shore Lf Rust (%)	Yield (bu/A)	Test Wt (lb/bu)
Early, reduced rate applications:									
Untreated Check		0		--	61.36	55.5	--	66.83	55.9
Headline+NIS	3	$ 7.50	2	--	+ 2.58	+ 2.4	--	+ 4.63	+ 1.3
Quilt	7	7.00	2	--	+ 1.73	+ 0.2	--	+ 2.98	+ 1.5
Quilt Xcel	7.5	8.25	2	--	- 1.91	+ 1.2	--	- 1.61	+ 0.6
Quilt+Warrior II[5]	7	12.00	2	--	+ 6.28	+ 2.5	--	+ 3.56	+ 1.4
Tilt+NIS	2	3.50	2	--	+ 1.98	+ 2.0	--	+ 0.14	+ 1.1
Tilt+Warrior II[5]	2	8.50	2	--	+ 4.86	+ 3.0	--	+ 3.56	+ 2.3
Chloride topdress (as KCl)	60 lbs	23.00	PE	--	- 1.82	+ 0.6	--	- 1.95	+ 1.6
Experimental A (carbox. + strob.)	2.5	--	2	--	+ 2.87	+ 2.7	--	- 0.21	+ 1.7
Experimental A (carbox.+strob.)	4.5	--	2	--	+ 2.65	+ 1.7	--	+ 4.25	+ 0.7
Experimental B (strobilurin)	3	--	2	--	+ 0.07	+ 0.4	--	+ 1.00	+ 0.8
Experimental C (carboximide)	10	--	2	--	+ 0.67	+ 1.4	--	+ 4.00	+ 1.1
		LSD (a=0.05)		NS	NS	NS	NS	NS	NS
Averages for early, red. rate applications:					***+ 1.81 (bu/A)***	***+ 1.6 (lb/bu)***		***+ 1.80 (bu/A)***	***+ 1.3 (lb/bu)***

[1]Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply flag-leaf trt was $10/A. *Certain treatment cost estimates were unavailable at publication time.
[2]Feekes Growth Stage (2=tillering, 8= flag leaf, 9= early boot)
[3] Percentage of flag leaf affected by leaf rust
[4]Yield and test weight data presented as difference from relevant untreated check, bu/A or lb/bu gained or lost
[5]Insecticide treatment: Warrior II with Zeon Technology, 1.28 oz/acre, tank-mixed with fungicide

Per Acre Return on Investment Summaries: ***Calculated only for treatments with cost data available (chloride treatment excluded) = (avg. yield gain or loss * $6.00/bu) – avg. trt. cost***	***'SELECT' – Resistant Variety***	***'REEDER' – Susceptible Variety***
Average net return ($) for early applications:	***$ 1.78***	***$ (0.27)***
Average net return ($) for split applications:	***$ 7.73***	***$ 5.47***
Average net return ($) for flag-leaf applications:	***$ 39.45***	***$ 45.13***

Table 4. Foliar fungicide efficacy on two HRSW varieties for management of Fusarium Head Blight near Brookings, SD

Location: Brookings

				'SELECT' HRSW						'REEDER' HRSW					
Treatment	Rate (oz/A)	Cost[1] ($/A)	Growth Stage[2]	Leaf Score (0-9)[3]	Leaf Rust (%)[3]	FHB (%)[4]	Yield bu/A	Test Weight bu/A	DON ppm	Leaf Score (0-9)[3]	Leaf Rust (%)	FHB (%)[4]	Yield bu/A	Test Weight bu/A	DON ppm
Untreated		$ -		6.8	0.07	8.35	36.03	52.5	2.3	6.2	0.80	6.05	28.25	51.33	3.3
Prosaro + NIS	6.5	36.00	10.51	6.7	0	5.52	39.69	54.8	**1.3**	5.7	**0.07**	5.22	**36.03**	53.87	2.7
Prosaro + NIS	6.5	36.00	10.51+ 5days	6.7	0	4.49	37.71	55.4	**1.1**	6.3	**0.13**	5.03	**33.00**	52.84	**1.9**
Caramba + NIS	13.5	30.00	10.51	7.0	0.07	2.91	40.13	55.0	**1.1**	5.8	**0.17**	4.01	**35.38**	53.37	3.4
Caramba + NIS	13.5	30.00	10.51+5days	6.7	0.07	4.44	36.37	55.6	**1.2**	5.8	0.90	5.21	30.12	52.78	3.2
Headline + NIS	6	25.00	9	6.3	0.13	8.09	38.62	53.7	***3.8***	5.5	0.57	8.18	**33.55**	51.44	***7.2***
Headline + NIS	6	25.00	10	6.3	0.07	5.00	36.17	54.1	***3.9***	5.2	0.63	5.00	31.93	52.86	***7.3***
Experimental A	7	--	10.51	6.3	0.07	4.30	38.62	54.5	1.9	5.3	**0.07**	6.36	31.73	53.32	3.1
Experimental B	24	--	10.51	7.0	0.13	6.78	36.01	54.3	2.6	5.8	0.53	5.85	**32.66**	52.30	***4.8***
Experimental C	2	--	2	6.3	0.1	5.32	37.50	53.69	**1.5**	5.7	0.53	4.51	**37.42**	53.41	3.8
Prosaro + NIS	6.5		10.51												
		LSD (a=0.10)		NS	NS	NS	NS	NS	0.7	NS	0.44	NS	4.32	NS	1.3

BOLDED data indicates disease control, yield or test weight were significantly better than the untreated check. *Italic-Bold indicates significantly worse than check.*

[1] Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply foliar trts was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2] Feekes Growth Stage (2=tillering, 9= early boot, 10.51= flowering)

[3] Percentage of flag leaf affected by leaf blights (tan spot, Septoria complex) or leaf rust,

[4] Percentage of all spike tissue affected by FHB

Table 5. Foliar fungicide efficacy on two HRSW varieties for management of Fusarium Head Blight near South Shore, SD

Location: South Shore (NE Farm)

Treatment	Rate (oz/A)	Cost[1] ($/A)	Growth Stage[2]	'SELECT' HRSW Leaf Score (0-9)[3]	'SELECT' HRSW Leaf Rust (%)[3]	'SELECT' HRSW FHB (%)[4]	'SELECT' HRSW Yield bu/A	'SELECT' HRSW Test Weight bu/A	'SELECT' HRSW DON ppm	'REEDER' HRSW Leaf Score (0-9)[3]	'REEDER' HRSW Leaf Rust (%)	'REEDER' HRSW FHB (%)[4]	'REEDER' HRSW Yield bu/A	'REEDER' HRSW Test Weight bu/A	'REEDER' HRSW DON ppm
Untreated		$ -		7.1	0.03	2.05	56.28	57.76	0.7	6.5	2.73	2.47	59.74	57.12	2.2
Prosaro + NIS	6.5	36.00	10.5	**6.8**	0	1.97	**63.17**	59.74	**0.2**	**5.7**	**0.83**	2.02	**64.19**	**58.23**	**1.3**
Prosaro + NIS	6.5	36.00	10.51	7.2	0	2.65	59.39	59.25	**0.3**	6.1	**1.17**	2.61	62.99	**58.56**	**1.5**
Prosaro + NIS	6.5	36.00	10.51+ 5days	6.9	0.03	1.48	59.49	58.23	**0.1**	**5.7**	**0.83**	2.22	63.31	**58.01**	**1.4**
Caramba + NIS	13.5	30.00	10.5	**6.7**	0	1.08	**64.31**	59.34	**0.1**	**5.7**	**1.37**	0.94	**67.8**	**58.58**	**1.4**
Caramba + NIS	13.5	30.00	10.51	**6.8**	0	0.98	**63.3**	58.98	**0**	**6.0**	**0.90**	1.25	**65.25**	**57.81**	**1.3**
Caramba + NIS	13.5	30.00	10.51+5days	7.1	0	1.12	57.5	58.79	**0.2**	6.1	**1.07**	2.54	63.38	**58.06**	**1.3**
Headline + NIS	6	25.00	9	**6.8**	0	1.05	**63.12**	59.13	0.5	**5.9**	**1.23**	2.76	**66.36**	57.47	2.7
Headline + NIS	6	25.00	10	**6.8**	0.03	0.97	**64.85**	59.21	0.5	**5.9**	1.87	2.3	**64.79**	**57.99**	2.3
Headline + NIS	6	25.00	10.5	**6.5**	0	1.63	**63.36**	59.09	0.7	6.2	1.93	2.98	**63.63**	57.45	2.7
Experimental A	7	--	10.51	**6.8**	0	2.99	59.54	58.35	0.4	**5.9**	**1.30**	3.5	**64.84**	**57.92**	1.9
Experimental B	24	--	10.51	7.0	0	3.14	60.22	58.33	0.5	6.3	**1.80**	2.66	63.29	**58.17**	2.0
Experimental C	2	--	2	**6.7**	0	1.42	**60.7**	57.94	**0.3**	**5.5**	**0.87**	2.13	**67.43**	57.63	**1.4**
Prosaro + NIS	6.5		10.51												
		LSD (a=0.10)		0.3	NS	NS	4.21	NS	0.3	0.4	0.93	NS	3.28	0.62	0.6

BOLDED data indicates disease control, yield or test weight were significantly better than the untreated check. *Italic-Bold indicates significantly worse than check.*

[1] Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply foliar trts was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2] Feekes Growth Stage (2=tillering, 9= early boot, 10.51= flowering)

[3] Percentage of flag leaf affected by leaf blights (tan spot, Septoria complex) or leaf rust,

[4] Percentage of all spike tissue affected by FHB

2010 Spring Wheat Foliar Fungicide Trials

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Introduction:

Spring wheat in northeast South Dakota is subject to several fungal diseases that can limit grain yield, quality and test weight. These diseases include leaf rust (*Puccinia triticina*) and stripe rust (*Puccinia striiformis* f. sp. *tritici*) as well as the residue-borne diseases tan spot (*Pyrenophora tritici-repentis*) and Septoria complex (*Septoria tritici*, *S. avenae*, and *Stagonospora nodorum*). Management of these diseases requires integrating varietal resistance, cultural practices, risk assessment and foliar fungicides. Early applications of some fungicides (applied at Feekes 2-4, often with post-emergence herbicides) have been shown to be effective at slowing disease development and increasing grain yield in wheat, especially in high residue and continuous cropping systems. Typically, however fungicides in wheat are applied at a stage to protect the flag leaf soon after it is fully emerged (Feekes 9), targeting leaf rust, tan spot, and the Septoria complex.

Fusarium head blight (scab or FHB) has also been a recurring problem in winter and spring wheat, durum, and barley grown in South Dakota. Scab outbreaks have been periodic and localized since the early 1990's. A small and localized outbreak occurred in the NE South Dakota in 2004 and a more widespread epidemic developed in 2005 causing extensive damage to winter wheat in the southeastern and south central counties of SD. Damage from FHB is two-fold: yield and test-weight losses are common, but quality losses due to mycotoxin contamination may be even more economically damaging. The fungus that causes FHB, *Fusarium graminearum*, produces potent mycotoxins such as deoxynivalenol (DON, vomitoxin), which contaminate the grain. Scab management also requires an integrated approach including the use of resistant varieties, good rotation and residue management, disease forecasting and foliar fungicides when necessary. Fungicides alone have provided only moderate suppression of FHB, however when combined with other management components, the disease can be effectively minimized. Proper timing of fungicides for FHB management is essential to achieving the greatest efficacy. Fungicides should be applied at or very near the flowering stage (Feekes 10.51) to be most effective on FHB as the host is at the peak of susceptibility to the pathogen. This timing also has some effect on flag-leaf diseases mentioned above.

Materials and Methods:

Hard red spring wheat study areas were established at two South Dakota locations in 2010; the Northeast Research Station, (NE Farm) near South Shore and the Plant Science Research Farm at Brookings, SD. Two types of studies were carried out: 1) foliar fungicide efficacy trials for management of leaf rust and foliar blights; and 2) fungicide efficacy trials for management of FHB and DON. All studies were conducted using red hard spring wheat cultivars: 'Select', a variety resistant to leaf rust and other foliar blights and moderately resistant to FHB; and ‘Reeder’, a variety with susceptibility to most major fungal diseases including rust and FHB. Trials were planted into factorial, randomized complete block designs incorporating wheat variety*treatment as the principle experimental unit (plot). Foliar disease and head blight studies utilized four replications. Fungicide treatments were applied at various growth stages from Feekes 2 (three to five leaf stage, early tillering) to Feekes 10.51 (initiation of flowering). Brookings FHB plots were misted at regular intervals from 6:00pm to 8:00am for ten days following anthesis to enhance the environment for FHB development. The Brookings FHB site was also inoculated with *Fusarium graminearum*-colonized corn grain to enhance inoculum levels in the study area.

At the soft dough stage of crop development, fungicide and FHB study plots were evaluated for leaf diseases, FHB incidence, FHB head severity, and FHB field severity. After harvest, Fusarium damaged kernels (FDK), deoxynivalenol (DON), grain yield, test weight, and protein data were collected. Leaf area assessments were used to estimate the percentage of the flag leaf that was necrotic due to either foliar blights or leaf rust. Specific information on dates of planting, treatment, assessment and harvest are outlined in Table 1.

Table 1. Cultural Information for Wheat Fungicide and FHB Trials.

Activity	Crop stage		Date/Location (2010)		
	Descriptive	Feekes	Brookings (Foliar)	Brookings (FHB)	NE Farm (Foliar/FHB)
Planting	-	-	5/4	5/4	4/20
Fungicide Appl.	Early/Tillering	2-3	--	--	6/2
“	Flag leaf	8-9	6/28	6/28	6/22
“	Fully Headed	10.5	--	7/2	7/2
“	Flowering	10.51	--	7/6	7/7
Disease Ratings	Soft Dough	11.2	7/23	7/27	7/28
Grain Harvest	Mature	11.4	8/18	8/18	8/16

Results and Discussion:

In general, foliar disease pressure and Fusarium head blight development were low in 2010. While there was adequate moisture in the environment most of the season, conditions turned dry as the plants reached flag leaf stage. Also, cooler temperatures perhaps reduced fungal development. Bacterial leaf streak was again present at high levels in South Dakota, confounding effects of both foliar fungal diseases as well as the fungicide treatments

Based on data reported in Table 2-5, foliar fungicides had varying effects, depending on the susceptibility of the variety grown. In 2010, foliar fungicide (non-FHB) treatments were divided into two distinct studies. A set of treatments targeting early infection were grouped and applied at Feekes 2, a stage corresponding with post-emergence herbicide applications in spring wheat production (Table 3). Products containing propiconazole were selected for early treatments due to the relative success of that active ingredient in past studies. These early applications typically are made at reduced rates, below the label recommendations. A second set of trials incorporated standard flag-leaf applications of fungicide products at full labeled rates applied just after flag leaves (uppermost leaf on plant) has fully emerged (Feekes 9). Most of the foliar products in 2010 were directed at flag leaf applications to manage leaf rust and other foliar blights on the flag leaf and upper parts of the wheat canopy. This second group of trials also included a few treatments where a standard flag leaf application was preceded by an early, reduced rate treatment at herbicide timing. These are grouped separately in Table 2 to examine their combined effects. Fusarium head blight studies were also separated and reported on in Tables 4 and 5.

The early season applications, as in previous early-application studies were marginally effective at improving production. Yield increases were modest in all cases and overall, the cost of inputs just balanced increased yields. Return on investment (see bottom of Table 3) for early fungicides or fungicides plus insecticides was calculated to be around $1.78 for the resistant variety 'Select', and a slightly negative return ($ -0.27) for the susceptible variety 'Reeder'. No significant differences were observed among treatments in terms of yields or test weights.

Flag leaf timing is generally the more common timing for application of fungicide to wheat in South Dakota and was shown here to produce a more favorable return on input cost investment (Table 2, and bottom of Table 3). Among products that are in common use, several produced large yield increases over the untreated check, even though there was not a high level of foliar disease pressure. Even on the disease resistant variety 'Select', yield increases ranged from just under 1 bu/acre to nearly 15 bu/acre following Feekes 9 fungicide application. 'Select' appeared to be much more susceptible to bacterial leaf streak (BLS) and was somewhat reduced in yield potential overall it appears. The generally more susceptible 'Reeder' showed similar yield increases with treatment, but was less affected by BLS and seemed to have more stable yields across the experimental area, resulting in a lower 'LSD' value. The lower variability in the 'Reeder' trial resulted in many more treatments that, statistically, were significantly different from the untreated check. Premix products containing both a strobilurin and triazole such as TwinLine and Quilt Xcel resulted in the largest yield increases over the check, similar to those following Quilt plus Warrior II (insecticide). Experimental products that were tested produced yield increases that were generally not as high as for the products mentioned previously. The majority of the experimental formulations tested contained a carboximide fungicide, which represents a different mode of action from triazoles and strobilurin products. The carboximides along with benzamides are closely related to strobilurins in that they are respiration inhibitors, however they are 'Succinate Dehydrogenase Inhibitors' which target different sites of action in the fungus. They represent a medium to high risk for resistance development, slightly higher risk than triazoles and lower risk than strobilurins.

Return on investment (ROI) calculated for flag leaf applications of fungicide was, on average, around $40/acre for 'Select' treatments, and around $45/acre for 'Reeder' treatments. The split applications produced a positive ROI however they were under $10/acre for both 'Select' and 'Reeder' treatments, and were considered far inferior to single flag-leaf timing application.,

Tables 4 and 5 summarize the results of FHB management studies conducted at the NE Farm and on campus at Brookings. This year's studies examined the effects of poorly timed treatments (i.e. pre-flowering, and post-flowering) compared to optimally timed application of Prosaro or Caramba at Feekes 10.51 (flowering). Also examined were head-applied treatments of Headline fungicide, which has been observed to increase vomitoxin levels in grain when applied to the heads of wheat at risk of FHB. As expected, Prosaro and Caramba applied at Feekes 10.51 reduced vomitoxin (DON) even when applied pre and post flowering; however the best reductions were observed when the products were applied at or after flowering. Pre-flowering applications were somewhat less effective in vomitoxin reduction. On susceptible ‘Reeder’, yield increases were significant for several treatments at both the irrigated nursery at Brookings and at South Shore. ‘Select’ did experience yield increases in response to several treatments at the South Shore site, especially when fungicides were applied a bit early, likely due to leaf disease suppression. Headline fungicide produced yield increases at all timings however f greatest note were the significant vomitoxin increases on ‘Reeder’ at both locations and on ‘Select’ under irrigation.

A principle conclusion reached based on the results of these and many related studies conducted over years and locations is that resistant varieties are a critical component to a sound plant disease management system. By selecting varieties with susceptibility to some of our common diseases, managing those diseases economically becomes more challenging. Fungicides can be used economically in many situations, however, some of the current need for these inputs can be mediated through the use of good rotations and selection of resistant varieties.

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Table 2: Standard & Split Applications of Foliar Fungicides, efficacy on two varieties.

Treatment	Fung. Rate (oz/A)	Estim. Cost ($/A)[1]	Crop Stage[2]	'SELECT' - Resistant, *South Shore*: Lf Rust (%)[3]	Yield[4] (bu/A)	Test Wt[4] (lb/bu)	'REEDER'-Susceptible, *South Shore*: Lf Rust (%)	Yield[4] (bu/A)	Test Wt[4] (lb/bu)
Combined early, low rate + flag-leaf, standard rate application:									
Untreated Check		0		0.1%	58.76	56.9	6.8%	60.41	58.2
Tilt (early)	2	$27.50	2	0.1%	+11.72	+ 1.6	**5.6**	**+10.74**	- 1.7
fb: Quilt (late)	14		8-9						
Quilt (early)	7	31.50	2	0.3%	+12.38	+ 1.2	**5.8**	**+13.65**	- 3.6
fb: Quilt (late)	14		8-9						
Exp. D (early)	2	--	2	0	+ 7.14	+ 2.5	6.4	+ 4.68	- 1.4
fb: Exp. D (late)	4		8-9						
Exp. D (early)	2	--	2	0	+ 8.97	- 0.2	**5.8**	**+12.64**	- 2.1
fb: Prosaro (late)	6.25		8-9						
Flag-leaf, standard rate applications:									
Untreated Check		0		0.1%	58.76	56.9	6.8%	60.41	58.2
Folicur + NIS	4	$10.00	8-9	0.1	+ 0.73	+ 1.8	5.8	**+11.03**	-2.3
Headline + NIS	6	25.00	8-9	0.0	+11.74	+ 1.6	5.8	**+12.85**	-1.9
TwinLine	9	27.00	8-9	0.1	+14.75	+ 0.8	5.1	**+13.61**	-0.8
Quilt + NIS	14	24.00	8-9	0.1	+10.70	- 0.4	6.3	**+ 9.56**	-2.0
Quilt	14	24.00	8-9	0.0	+ 8.57	+ 1.7	5.8	**+12.48**	-2.5
Quilt + Warrior II[5]	14	29.00	8-9	0.0	+14.25	+ 1.4	5.9	**+10.91**	-1.0
Quilt Xcel	10.5	22.00	8-9	0.0	+12.12	+ 1.0	6.0	**+ 9.04**	-2.1
Chloride (as KCl) topdress early	60 lbs	23.00	PE	0.1	+ 1.13	- 0.3	6.5	+ 4.81	-2.4
Experimental D (triazole+strobi.)	4	--	8-9	0.1	+ 7.75	+ 1.3	6.4	**+ 9.73**	-2.5
Experimental E (carbox.+strobi.)	4.5	--	8-9	0.1	+10.87	+ 2.6	6.0	+ 5.97	-1.6
Experimental F (carbox.+strobi.)	9.6	--	8-9	0.0	+ 7.47	+ 0.8	6.1	**+ 8.73**	-1.5
Experimental F (carbox.+strobi.)	19.2	--	8-9	0.0	+ 7.40	+ 1.0	5.8	**+ 9.93**	-1.6
Experimental G (carbox.+strobi)	12	--	8-9	0.3	+ 9.90	+ 1.1	6.0	**+11.56**	-2.7
Experimental G (carbox.+strobi.)	18	--	8-9	0.2	+ 6.79	- 0.3	6.0	**+11.87**	-2.4
Experimental H (carboximide)	10	--	8-9	0.2	+ 2.37	+ 1.7	6.4	**+11.68**	-2.1
Experimental H (carboximide)	24	--	8-9	0.0	+ 9.84	+ 0.7	6.0	**+10.29**	-2.1
Averages for (early + late) split applications:					***+10.05 (bu/A)***	***+ 1.3 (lb/bu)***		***+10.43 (bu/A)***	***- 2.2 (lb/bu)***
Averages for flag leaf only, std. rate apps:					***+ 8.52 (bu/A)***	***+ 1.0 (lb/bu)***		***+ 10.25 (bu/A)***	***- 2.0 (lb/bu)***
LSD (a=0.05):				NS	NS	NS	0.5	6.73	NS

BOLDED data indicates yield or test weight significantly higher than the untreated check.

[1]Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply flag-leaf trt was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2]Feekes Growth Stage (2=tillering, 8= flag leaf, 9= early boot)

[3]Percentage of flag leaf affected by leaf rust

[4]Yield and test weight data presented as difference from relevant untreated check, bu/A or lb/bu gained or lost

[5]Insecticide treatment: Warrior II with Zeon Technology, 1.28 oz/acre, tank-mixed with fungicide

Table 3: Early Application of Foliar fungicide, efficacy on two HRSW varieties.

Treatment	Fung. Rate (oz/A)	Estim. Cost ($/A) [1]	Crop Stage[2]	'SELECT' - Resistant South Shore Lf Rust (%)[3]	Yield[4] (bu/A)	Test Wt[4] (lb/bu)	'REEDER'-Susceptible South Shore Lf Rust (%)	Yield (bu/A)	Test Wt (lb/bu)
Early, reduced rate applications:									
Untreated Check		0		--	61.36	55.5	--	66.83	55.9
Headline+NIS	3	$ 7.50	2	--	+ 2.58	+ 2.4	--	+ 4.63	+ 1.3
Quilt	7	7.00	2	--	+ 1.73	+ 0.2	--	+ 2.98	+ 1.5
Quilt Xcel	7.5	8.25	2	--	- 1.91	+ 1.2	--	- 1.61	+ 0.6
Quilt+Warrior II[5]	7	12.00	2	--	+ 6.28	+ 2.5	--	+ 3.56	+ 1.4
Tilt+NIS	2	3.50	2	--	+ 1.98	+ 2.0	--	+ 0.14	+ 1.1
Tilt+Warrior II[5]	2	8.50	2	--	+ 4.86	+ 3.0	--	+ 3.56	+ 2.3
Chloride topdress (as KCl)	60 lbs	23.00	PE	--	- 1.82	+ 0.6	--	- 1.95	+ 1.6
Experimental A (carbox. + strob.)	2.5	--	2	--	+ 2.87	+ 2.7	--	- 0.21	+ 1.7
Experimental A (carbox.+strob.)	4.5	--	2	--	+ 2.65	+ 1.7	--	+ 4.25	+ 0.7
Experimental B (strobilurin)	3	--	2	--	+ 0.07	+ 0.4	--	+ 1.00	+ 0.8
Experimental C (carboximide)	10	--	2	--	+ 0.67	+ 1.4	--	+ 4.00	+ 1.1
		LSD (a=0.05)		NS	NS	NS	NS	NS	NS
Averages for early, red. rate applications:					***+ 1.81 (bu/A)***	***+ 1.6 (lb/bu)***		***+ 1.80 (bu/A)***	***+ 1.3 (lb/bu)***

[1]Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply flag-leaf trt was $10/A. *Certain treatment cost estimates were unavailable at publication time.
[2]Feekes Growth Stage (2=tillering, 8= flag leaf, 9= early boot)
[3] Percentage of flag leaf affected by leaf rust
[4]Yield and test weight data presented as difference from relevant untreated check, bu/A or lb/bu gained or lost
[5]Insecticide treatment: Warrior II with Zeon Technology, 1.28 oz/acre, tank-mixed with fungicide

Per Acre Return on Investment Summaries: *Calculated only for treatments with cost data available (chloride treatment excluded) = (avg. yield gain or loss * $6.00/bu) – avg. trt. cost*	***'SELECT' – Resistant Variety***	***'REEDER' – Susceptible Variety***
Average net return ($) for early applications:	***$ 1.78***	***$ (0.27)***
Average net return ($) for split applications:	***$ 7.73***	***$ 5.47***
Average net return ($) for flag-leaf applications:	***$ 39.45***	***$ 45.13***

Table 4. Foliar fungicide efficacy on two HRSW varieties for management of Fusarium Head Blight near Brookings, SD

Location: Brookings

Treatment	Rate (oz/A)	Cost[1] ($/A)	Growth Stage[2]	'SELECT' HRSW Leaf Score (0-9)[3]	'SELECT' HRSW Leaf Rust (%)[3]	'SELECT' HRSW FHB (%)[4]	'SELECT' HRSW Yield bu/A	'SELECT' HRSW Test Weight bu/A	'SELECT' HRSW DON ppm	'REEDER' HRSW Leaf Score (0-9)[3]	'REEDER' HRSW Leaf Rust (%)	'REEDER' HRSW FHB (%)[4]	'REEDER' HRSW Yield bu/A	'REEDER' HRSW Test Weight bu/A	'REEDER' HRSW DON ppm
Untreated		$ -		6.8	0.07	8.35	36.03	52.5	2.3	6.2	0.80	6.05	28.25	51.33	3.3
Prosaro + NIS	6.5	36.00	10.51	6.7	0	5.52	39.69	54.8	**1.3**	5.7	**0.07**	5.22	**36.03**	53.87	2.7
Prosaro + NIS	6.5	36.00	10.51+ 5days	6.7	0	4.49	37.71	55.4	**1.1**	6.3	**0.13**	5.03	**33.00**	52.84	**1.9**
Caramba + NIS	13.5	30.00	10.51	7.0	0.07	2.91	40.13	55.0	**1.1**	5.8	**0.17**	4.01	**35.38**	53.37	3.4
Caramba + NIS	13.5	30.00	10.51+5days	6.7	0.07	4.44	36.37	55.6	**1.2**	5.8	0.90	5.21	30.12	52.78	3.2
Headline + NIS	6	25.00	9	6.3	0.13	8.09	38.62	53.7	***3.8***	5.5	0.57	8.18	**33.55**	51.44	***7.2***
Headline + NIS	6	25.00	10	6.3	0.07	5.00	36.17	54.1	***3.9***	5.2	0.63	5.00	31.93	52.86	***7.3***
Experimental A	7	--	10.51	6.3	0.07	4.30	38.62	54.5	1.9	5.3	**0.07**	6.36	31.73	53.32	3.1
Experimental B	24	--	10.51	7.0	0.13	6.78	36.01	54.3	2.6	5.8	0.53	5.85	**32.66**	52.30	***4.8***
Experimental C	2	--	2	6.3	0.1	5.32	37.50	53.69	**1.5**	5.7	0.53	4.51	**37.42**	53.41	3.8
Prosaro + NIS	6.5		10.51												
		LSD (a=0.10)		NS	NS	NS	NS	NS	0.7	NS	0.44	NS	4.32	NS	1.3

BOLDED data indicates disease control, yield or test weight were significantly better than the untreated check. *Italic-Bold indicates significantly worse than check.*

[1] Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply foliar trts was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2] Feekes Growth Stage (2=tillering, 9= early boot, 10.51= flowering)

[3] Percentage of flag leaf affected by leaf blights (tan spot, Septoria complex) or leaf rust,

[4] Percentage of all spike tissue affected by FHB

Table 5. Foliar fungicide efficacy on two HRSW varieties for management of Fusarium Head Blight near South Shore, SD

Location: South Shore (NE Farm)

Treatment	Rate (oz/A)	Cost[1] ($/A)	Growth Stage[2]	'SELECT' HRSW Leaf Score (0-9)[3]	'SELECT' HRSW Leaf Rust (%)[3]	'SELECT' HRSW FHB (%)[4]	'SELECT' HRSW Yield bu/A	'SELECT' HRSW Test Weight bu/A	'SELECT' HRSW DON ppm	'REEDER' HRSW Leaf Score (0-9)[3]	'REEDER' HRSW Leaf Rust (%)	'REEDER' HRSW FHB (%)[4]	'REEDER' HRSW Yield bu/A	'REEDER' HRSW Test Weight bu/A	'REEDER' HRSW DON ppm
Untreated		$ -		7.1	0.03	2.05	56.28	57.76	0.7	6.5	2.73	2.47	59.74	57.12	2.2
Prosaro + NIS	6.5	36.00	10.5	**6.8**	0	1.97	**63.17**	59.74	**0.2**	**5.7**	**0.83**	2.02	**64.19**	**58.23**	**1.3**
Prosaro + NIS	6.5	36.00	10.51	7.2	0	2.65	59.39	59.25	**0.3**	6.1	**1.17**	2.61	62.99	**58.56**	**1.5**
Prosaro + NIS	6.5	36.00	10.51+ 5days	6.9	0.03	1.48	59.49	58.23	**0.1**	**5.7**	**0.83**	2.22	63.31	**58.01**	**1.4**
Caramba + NIS	13.5	30.00	10.5	**6.7**	0	1.08	**64.31**	59.34	**0.1**	**5.7**	**1.37**	0.94	**67.8**	**58.58**	**1.4**
Caramba + NIS	13.5	30.00	10.51	**6.8**	0	0.98	**63.3**	58.98	**0**	**6.0**	**0.90**	1.25	**65.25**	**57.81**	**1.3**
Caramba + NIS	13.5	30.00	10.51+5days	7.1	0	1.12	57.5	58.79	**0.2**	6.1	**1.07**	2.54	63.38	**58.06**	**1.3**
Headline + NIS	6	25.00	9	**6.8**	0	1.05	**63.12**	59.13	0.5	**5.9**	**1.23**	2.76	**66.36**	57.47	2.7
Headline + NIS	6	25.00	10	**6.8**	0.03	0.97	**64.85**	59.21	0.5	**5.9**	1.87	2.3	**64.79**	**57.99**	2.3
Headline + NIS	6	25.00	10.5	**6.5**	0	1.63	**63.36**	59.09	0.7	6.2	1.93	2.98	**63.63**	57.45	2.7
Experimental A	7	--	10.51	**6.8**	0	2.99	59.54	58.35	0.4	**5.9**	**1.30**	3.5	**64.84**	**57.92**	1.9
Experimental B	24	--	10.51	7.0	0	3.14	60.22	58.33	0.5	6.3	**1.80**	2.66	63.29	**58.17**	2.0
Experimental C	2	--	2	**6.7**	0	1.42	**60.7**	57.94	**0.3**	**5.5**	**0.87**	2.13	**67.43**	57.63	**1.4**
Prosaro + NIS	6.5		10.51												
		LSD (a=0.10)		0.3	NS	NS	4.21	NS	0.3	0.4	0.93	NS	3.28	0.62	0.6

BOLDED data indicates disease control, yield or test weight were significantly better than the untreated check. *Italic-Bold indicates significantly worse than check.*

[1] Cost estimates are based on limited market information and may not represent true costs; early trts would be tank-mixed with herbicide; est. cost to apply foliar trts was $10/A. *Certain treatment cost estimates were unavailable at publication time.

[2] Feekes Growth Stage (2=tillering, 9= early boot, 10.51= flowering)

[3] Percentage of flag leaf affected by leaf blights (tan spot, Septoria complex) or leaf rust,

[4] Percentage of all spike tissue affected by FHB