Plant Science Pamphlet 3
Annual Progress Repo

Progress Report 2007

Central Crops and Soils Research Station Highmore, South Dakota

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South Dakota State University • Plant Science Department • Brookings, South Dakota 5700

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Contents

Welcome

Mike Moechnig, Faculty Advisor
Robin Bortnem, Research Station Manager

The Central Crops and Soils Research Station at Highmore has completed another successful season of research and demonstration. The field tour on June 27 provided demonstrations on current research regarding several issues ranging from large scale crop production to new turf varieties for the farmstead and trees for the shelterbelts. Mike Moechnig, Extension Weed Specialist, and Darrell Deneke, Extension IPM Coordinator, discussed the efficacy of current, new, and experimental herbicides and weed management strategies in winter wheat, sunflowers, corn, pulse crops (chickpeas, field peas, and lentils), sorghum, and soybeans. Bob Hall, Extension Agronomy Specialist, discussed current and new wheat and oat varieties for SD and discussed their growth in the Highmore region. Larry Osborne, Plant Pathology Research Associate, discussed problematic wheat diseases in 2007 and management options. Shane Andersen, Turf Management Research Assistant, discussed his efforts to identify new grass varieties and mixtures that are best adapted to central SD climate conditions. Dwight Tober, USDA/NRCS Plant Materials Specialist, summarized his long-term research to identify tree and shrub species and varieties best adapted for drier climates. Gary Lemme, SDSU Dean of the College of Agriculture, John Kirby, Director of the Ag Experiment Station, and Sue Blodgett, Plant Science Department Head, also attended the tour to visit with attendees and answer questions regarding the future role of the station in the community. The diversity of topics discussed at the tour demonstrates the broad range of research projects conducted at the station and the possibilities this station provides to evaluate agronomic practices, crop/turf/tree growth, and pest management issues that are unique to the relatively dry climate in central SD.

We want to express great gratitude to Mike Volek, Station Superintendent, for his efforts in the daily operations of the farm and overseeing the successful establishment and maintenance of the research projects at the site. He is truly exceptional at overseeing the projects, managing the land, and keeping the station and plots in a clean and presentable condition. We also thank his wife, Dixie, and daughters, Shandra and Sherise, for their assistance in collecting weather data and cooking and serving meals at the field tour. Their desserts are certainly a highlight of the event.

We also would like to thank members of the community for their participation and input regarding the activities of the station. In the future, we hope to expand opportunities for community participation at the station. Community interaction is critical to ensure that SDSU research efforts are meeting the needs of South Dakota citizens.

2006 Central Substation Advisory Board

Name	Position	Address	Phone	County
Randy Hague	Chairman	Highmore	852-2874	Hyde
Ruth Beck*	Extension	Ft. Pierre	223-7730	Stanley
Dennis Beckman		Wessington Springs		Jerauld
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Corrine Huber**	District Extension Director-Central	Eagle Butte	964-4955	Dewey
Sue Blodgett**	Head, Plant Science Dept.	Brookings	688-5123	SDSU
Robin Bortnem**	Central Research Mgr.	Brookings	688-4958	SDSU
Mike Moechnig**	Faculty Advisor	Brookings	688-4591	SDSU
John Kirby**	Director, Ag Experiment Station	Brookings	688-4149	SDSU

* Extension Educator
** Non-Voting Advisor

Growing season temperature and precipitation data for the research station during 2007.

Month	Temperature (°F.) Maximum	Minimum	No. Days Max ≥ 90°	Precipitation (inches)
	Average			
April	55	31	0	6.2
May	74	49	0	6
June	81	56	0	5.15
July	91	64	14	0.15
August	82	59	5	8.8
September	78	50	5	0.85

Evaluation of Native and Naturalized Grasses for Reduced-Input Turf in the Northern Plains

L.C. Schleicher and **S.M. Andersen**
Dept. of Horticulture, Forestry, Landscape and Parks
South Dakota State University

Introduction

Buffalograss is a warm-season, sod-forming grass that requires less water, fertilizer, pesticides, and culture than more commonly used cool-season turfgrasses. Native to South Dakota and the Great Plains, buffalograss has excellent drought, heat and cold tolerance, and is well-adapted to the semi-arid climate common to most of South Dakota. The high cost of water and energy, as well as renewed emphasis on conservation of these resources, has increased the demand for reduced-input turf in recent years.

Objectives

1. Collect and preserve grass germplasm native to the Northern Plains

2. Evaluate germplasm for desirable turfgrass characteristics, response to environmental stress, and sustainability as reduced-input turfgrasses

3. Investigate environmental stress resistance mechanisms important to sustainability in the Northern Plains

4. Work collaboratively with interdisciplinary and multi-state scientists to enhance the value of the project

Materials and Methods

Three replicates each of 92 buffalograss accessions were previously established in 5 ft. x 5 ft. field plots. Plots received no supplemental irrigation or fertilizer, and were mowed only on July 20 at 3.25 in. Pendimethalin was applied preemergence relatively early in the season at 1.5 lb a.i./Acre on Mar. 28 due to early kochia emergence at the site in previous years. A sequential preemergence application of oxadiazon was applied at 3 lb a.i./Acre on June 5.

2007 Results

Buffalograss accessions were rated for unmowed canopy height, response to drought stress, genetic color, fall dormancy, and turfgrass quality (Table 1). Canopy height prior to mowing on July 20 ranged from 2.5 to 8.5 in. with a mean of 5.2 in. Fifty-five percent of the accessions were shorter than the mean height.

Precipitation totaled 1.44 in. during the 59 days prior to rating on July 19. Measured against an approximate daily evapotranspiration (Et) loss for unmowed buffalograss of 0.25 in./day, total water deficit may have been near 15 in. All accessions exhibited symptoms of at least slight visual drought stress, as indicated by loss of color and twisting-curling of leaf blades. Visual ratings, where 9 = no visual drought stress and 1 = dead turf, ranged from 7.7 to 3.3 with a mean of 5.2.

Buffalograss color is critical because dark green is generally preferable to the typical buffalograss bluish-gray. The overall mean (4.7) rating for genetic color was unacceptable (< 5.0); however, eight accessions rated ≥ 6.0.

Continuation of green leaf color during early fall is desirable since warm-season turfgrasses growing in the Northern Plains tend to turn brown with the onset of dormancy, usually in mid to late-Sept. Genetic color ratings of 11 accessions ranged from 8.0 and 9.0 on Sept. 18, and three of those exhibited no visual signs of dormancy (9.0).

Turfgrass quality was rated Sept. 13, 55 days following mowing on July 20. Forty percent of accessions were unacceptable (< 5.0); however, ratings of 13 accessions were ≥ 6.0.

Accession 057-04 (male) ranked at or near the top of all rated categories.

Table 1. Unmowed canopy height and evaluation ratings of 92 buffalograss accessions at the Highmore Research and Extension Center, Highmore, SD in 2007.

Accession	Canopy height (7/19)	Drought† stress (7/19)	Color‡ (9/13)	Fall§ dormancy (9/18)	Quality¶ (9/13)
	in.	1 to 9			
057-04	5.1	7.7	6.7	9.0	7.7
006-04	5.1	5.3	5.0	7.0	7.0
005-04	6.8	6.3	7.0	5.3	6.7
012-04	5.0	5.7	6.3	7.0	6.7
046-04	4.4	4.7	5.0	5.0	6.7
015-04	6.3	5.7	4.7	6.0	6.3
042-04	5.5	4.3	4.3	4.0	6.3
088-04	6.3	6.7	4.3	7.3	6.3
093-04	5.0	5.0	5.3	5.3	6.3
030-04	5.2	5.3	5.3	5.3	6.0
045-04	4.7	6.7	6.7	5.3	6.0
052-04	5.2	3.3	4.0	3.3	6.0
081-04	8.5	5.0	4.0	5.0	6.0
023-04	8.0	6.0	4.7	5.3	5.7
036-04	5.2	6.0	5.0	8.3	5.7
039-04	3.4	6.0	5.7	7.3	5.7
054-04	4.8	6.0	5.7	7.0	5.7
059-04	5.0	6.0	6.0	5.7	5.7
063-04	5.1	6.3	5.0	5.3	5.7
066-04	6.8	6.3	4.3	5.3	5.7
082-04	5.0	5.0	5.0	4.7	5.7
008-04	6.8	3.7	4.0	4.0	5.3
010-04	5.8	5.3	5.0	7.0	5.3
017-04	3.5	5.3	4.7	8.3	5.3
018-04	6.7	6.3	6.3	5.3	5.3
037-04	5.9	5.0	4.0	3.3	5.3
058-04	5.8	5.7	4.3	7.0	5.3
075-04	4.2	6.0	4.3	8.3	5.3
083-04	5.0	4.3	5.0	5.3	5.3
085-04	4.4	6.3	4.0	6.7	5.3
087-04	6.4	4.3	5.3	8.3	5.3
091-04	4.7	5.7	5.3	5.7	5.3
007-04	7.4	7.0	3.7	5.3	5.0
009-04	4.7	5.3	5.7	5.3	5.0
019-04	7.7	5.0	4.0	8.3	5.0

Table 1. (Continued . . .)

Accession	Canopy height (7/19)	Drought[†] stress (7/19)	Color[‡] (9/13)	Fall[§] dormancy (9/18)	Quality[¶] (9/13)
	in.	1 to 9			
022-04	5.0	5.7	4.3	5.0	5.0
029-04	7.1	5.3	4.3	4.7	5.0
033-04	7.0	4.7	4.3	4.7	5.0
038-04	5.9	5.3	5.0	4.0	5.0
043-04	3.5	4.3	4.0	5.7	5.0
044-04	4.8	5.3	4.7	6.7	5.0
048-04	4.3	5.0	4.0	5.7	5.0
061-04	4.7	3.7	5.0	5.0	5.0
070-04	5.7	4.7	5.7	5.3	5.0
078-04	5.8	4.3	4.7	7.3	5.0
001-04	4.7	5.3	5.3	5.3	4.7
002-04	6.4	5.0	5.3	5.3	4.7
003-04	7.0	3.7	4.3	5.0	4.7
021-04	4.1	5.0	4.0	3.3	4.7
026-04	7.0	5.3	6.0	5.7	4.7
031-04	6.7	6.3	4.0	7.0	4.7
032-04	5.7	5.7	4.0	8.3	4.7
035-04	4.7	3.7	5.0	4.0	4.7
040-04	4.3	5.3	4.0	5.7	4.7
050-01	4.7	5.7	4.3	5.0	4.7
051-04	4.7	4.3	4.0	8.3	4.7
053-04	2.9	5.3	4.0	5.3	4.7
055-04	5.8	5.0	5.3	5.3	4.7
065-04	2.8	4.3	4.7	5.0	4.7
072-04	3.4	5.0	4.0	3.7	4.7
073-04	4.2	6.0	5.0	9.0	4.7
076-04	6.7	3.7	4.3	5.7	4.7
077-04	6.0	5.0	5.7	5.0	4.7
086-04	7.2	5.3	5.7	4.0	4.7
090-04	4.0	4.0	3.7	5.3	4.7
004-04	3.7	6.7	5.0	5.3	4.3
013-04	7.1	4.0	4.3	5.0	4.3
024-04	5.4	5.0	6.0	8.3	4.3
027-04	4.9	3.3	4.0	5.3	4.3
034-04	4.8	5.0	4.7	7.0	4.3
062-04	3.0	4.7	5.0	5.3	4.3

Table 1. (Continued . . .)

Accession	Canopy height (7/19)	Drought[†] stress (7/19)	Color[‡] (9/13)	Fall[§] dormancy (9/18)	Quality[¶] (9/13)
	in.	—	1 to 9	—	—
064-04	3.2	4.3	4.3	5.3	4.3
067-04	4.5	5.0	5.0	5.0	4.3
069-04	4.4	5.3	4.0	7.3	4.3
079-04	4.7	4.0	4.7	5.7	4.3
092-04	4.3	4.7	5.0	5.3	4.3
011-04	3.0	3.7	5.0	3.3	4.0
014-04	2.5	4.3	4.7	3.3	4.0
025-04	7.8	4.3	4.3	5.0	4.0
047-04	3.9	5.0	4.0	5.0	4.0
056-04	3.7	5.3	4.0	5.0	4.0
071-04	3.9	6.0	4.3	5.7	4.0
084-04	4.7	4.3	4.3	3.7	4.0
089-04	5.8	4.7	4.3	5.7	4.0
098-04	5.3	5.7	5.0	4.0	4.0
016-04	5.7	5.7	4.7	5.3	3.7
020-04	6.4	5.3	4.3	6.0	3.7
068-04	3.0	5.3	4.0	5.3	3.7
097-04	7.2	5.0	4.0	3.3	3.7
028-04	3.4	4.0	4.0	7.3	3.3
074-04	4.8	5.3	4.7	7.0	3.3
049-04	7.9	6.0	3.3	9.0	2.7
CV	27.6	23.5	16.6	13.4	19.8
LSD (0.05)	2.3	2.0	1.3	1.2	1.6

[†] drought stress, 1 to 9, where 1=dead turf, 9=no visual symptoms
[‡] genetic color, 1 to 9, where 1=brown turf, 5=acceptable, 9=dark green
[§] fall dormancy , 1 to 9, where 1=fully dormant, 9=no visual signs of dormancy
[¶] turfgrass

2006 NTEP Tall Fescue Ancillary Trial for Drought Tolerance

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South Dakota State University

Introduction

Tall fescue is among the most drought-tolerant of the cool-season grasses commonly used for turfgrass in the U.S.; primarily due to its deep, extensive root system. This 5-year cultivar evaluation is sponsored by the National Turfgrass Evaluation Program (NTEP) as an ancillary study to the 2006 National Tall Fescue Trial being conducted at more than 25 university locations. The Highmore Research and Extension Center was selected for this ancillary trial because of typically low, infrequent precipitation and high summer temperatures. Entries will be rated for turfgrass quality, percent living ground cover, fall/winter color retention, winter injury, percent weed infestation, and drought recovery. Data are available at the NTEP website (www.ntep.org).

Materials and Methods

Three replicates each of 113 tall fescue entries were seeded into individual 5 ft. x 5 ft. field plots arranged in a randomized complete block design on Sept. 7, 2006. A 20-27-5 starter fertilizer was incorporated into the seedbed immediately prior to seeding at the rate of 1.0 lb. N/1000 ft^2. Entries were rated for percent ground cover 21 days after planting on Sept. 28, 2006. A postemergence herbicide containing MCPA + fluroxypyr + triclopyr (2.85 + 0.29 +0.27 lb. a.i./ gal, respectively) was applied at 64 oz./ Acre on June 5, 2007 due to heavy broadleaf weed pressure in early spring following fall seeding.

Management protocol includes:

Mowing height	3.0 in.
Mowing frequency	2 to 3 wks
Irrigation	50% Et_P or less
Fertilization	None
Fungicides, Insecticides	None
Weed control	Minimal; only to prevent stand loss

Potential evapotranspiration (Et_P) will be calculated using lysimeters and soil moisture sensors.

2007 Results

Low temperature injury appeared to cause partial winterkill in all 113 entries in 2007. Minimum daily temperatures from Jan. 27 through Feb. 15 were $\leq 0^0$F, with a low temperature of -23^0F on Feb. 15 (Fig. 1). Although maximum low temperature hardiness of turfgrass usually peaks in early winter, it generally decreases in February and is drastically reduced in late winter. A warming trend followed by a sharp temperature decline may increase susceptibility to injury or death, particularly if crowns are hydrated. Maximum daily temperatures during 15 of the 26 days prior to Jan. 27 were above freezing. Although tall fescue tolerates lower temperatures than perennial ryegrass, minimum survival temperatures of tall fescue are not as low as Kentucky bluegrass, fineleaf fescues, and creeping bentgrass.

Precipitation was relatively frequent with sufficient moisture through mid-June, and visible drought stress symptoms were not apparent (Fig. 3); however, 0.25 and 0.5 in. of supplemental irrigation were applied July 16 and 31 during a 44-day period when total rainfall did not exceed 0.26 in.

Winterkill, averaged over all entries, was 42% and ranged from 14 to 69% (Table 1); however, surviving plants rapidly recovered, as demonstrated by the increase in percent turf cover between May 4 (33%) and June 26 (67%) (Fig. 2). By Sept. 19, turf plot cover averaged 81%. Percent turf cover was the only variable rated in 2007 because of winterkill. Few differences among entries at each rating date were detected; however, IS-TF-153 recovery and subsequent growth following winterkill was significantly greater than all but 5 other entries.

Acknowledgements

This research is sponsored and funded by the National Turfgrass Evaluation Program, the SDSU Agricultural Experiment Station, and the Dept. of Horticulture, Forestry, Landscape & Parks. The authors also acknowledge the support of the Plant Science Department and the Highmore Research and Extension Center.

Table 1. Percent living turf cover, winterklll, and recovery of tall fescue entries in the 2006 NTEP Ancillary Tall Fescue Trial at the Highmore Research and 2007 Extension Center in 2007.

Entry	Name	28-Sep ('06)	4-May	26-Jun	20-Jul	19-Sep	Winter kill†	Recovery‡
		Percent living turf cover						
		%						
001	Ky-31	60.0	46.7	80.0	83.3	80.0	21.3	75.0
02	Z-200	56.7	38.3	81.7	81.7	93.3	32.7	149.7
03	DP 50-9407	61.7	30.0	63.3	65.0	83.3	51.7	198.7
04	DP 50-9411	60.0	45.0	66.7	63.3	78.3	25.3	81.0
05	DP 50-9440	48.3	33.3	56.7	60.0	81.7	29.7	147.0
06	TG 50-9460	68.3	40.0	71.7	73.3	86.7	40.7	118.7
07	Plato	60.0	38.3	63.3	73.3	81.7	37.0	126.0
08	Lindbergh	66.7	28.3	65.0	65.0	83.3	58.0	211.0
09	Aristotle	63.3	26.7	58.3	65.0	80.0	56.7	20.0
010	Einstein	65.0	35.0	71.7	78.3	83.3	46.3	146.0
011	Silverado	66.7	35.0	71.7	75.0	80.0	48.0	142.3
012	Monet (LTP-610 CL)	65.0	25.0	60.0	63.3	81.7	62.0	231.7
013	Cezanne Rz (LTP-CRL)	55.0	30.0	60.0	68.3	75.0	48.7	234.3
014	Van Gogh (LTP-RK2)	56.7	31.7	61.7	68.3	81.7	44.3	17.7
015	ATF 1247	63.3	35.0	63.3	66.7	81.7	44.0	161.3
016	RKCL	60.0	30.0	60.0	56.7	80.0	51.0	264.3
017	RK4	68.3	46.7	73.3	75.0	83.3	31.0	85.0
018	RK 5	65.0	40.0	75.0	83.3	90.0	38.0	125.3
019	GE-1	63.3	33.3	68.3	73.3	80.0	47.0	141.3
020	SC-1	65.0	45.0	75.0	76.7	86.7	31.3	108.7
021	ATF 1328	50.0	25.0	58.3	63.3	75.0	49.7	20.0
022	Skyline	58.3	21.7	60.0	70.0	75.0	62.7	269.7
023	Hemi	43.3	25.0	53.3	60.0	65.0	50.7	285.0
024	Burl-TF8	60.0	30.0	65.0	68.3	78.3	50.0	177.7
025	Turbo	58.3	48.3	73.3	73.3	90.0	17.0	86.3
026	Bullseye	55.0	46.7	70.0	70.0	86.7	14.3	88.3
027	IS-TF-152	51.7	43.3	78.3	80.0	91.7	15.7	114.3
028	IS-TF-138	48.3	26.7	53.3	60.0	73.3	46.7	20.0
029	IS-TF-147	56.7	35.0	75.0	76.7	88.3	38.7	164.7
030	IS-TF-128	66.7	36.7	68.3	71.7	81.7	45.0	155.0
031	IS-TF-151	55.0	33.3	63.3	65.0	78.3	38.3	141.7
032	IS-TF-135	53.3	30.0	58.3	65.0	80.0	42.0	172.3
03	MVS-TF-158	55.0	33.3	70.0	71.7	86.7	39.3	163.7
034	IS-TF-159	50.0	35.0	63.3	70.0	81.7	30.0	17.7
035	IS-TF-153	53.3	20.0	40.0	45.0	66.7	60.7	462.7
036	IS-TF-154	61.7	30.0	66.7	68.3	78.3	50.0	196.3
037	IS-TF-161	55.0	41.7	66.7	73.3	86.7	23.3	112.0
038	MVS-341	63.3	40.0	71.7	76.7	81.7	36.3	109.3
039	MVS-1107	55.0	21.7	63.3	66.7	75.0	60.7	248.3
040	MVS-BB-1	53.3	18.3	56.7	55.0	66.7	65.3	258.3
041	MVS-MST	56.7	26.7	70.0	76.7	88.3	54.0	277.0
042	M4	55.0	18.3	58.3	65.0	75.0	66.7	340.0
043	0312	48.3	15.0	55.0	61.7	63.3	69.0	322.3

Table 1. (Continued . . .)

Entry	Name	Percent living turf cover 28-Sep ('06)	4-May	26-Jun	20-Jul	19-Sep	Winter kill†	Recovery‡
		%						
044	PSG-TTST	51.7	26.7	58.3	73.3	80.0	47.3	203.3
045	Col-I	46.7	31.7	65.0	71.7	80.0	29.7	160.0
046	J-130	51.7	25.0	51.7	61.7	66.7	51.7	182.3
047	Col-M	51.7	36.7	66.7	70.0	81.7	30.7	145.0
048	Col-J	56.7	33.3	66.7	66.7	83.3	42.7	197.0
049	Hunter	51.7	37.0	75.0	76.0	86.7	28.7	10.0
050	Biltmore	60.0	31.7	73.3	71.7	88.3	47.0	191.0
051	Padre	58.3	40.0	66.7	71.7	83.3	30.7	108.3
052	Magellan	70.0	36.7	80.0	80.0	88.3	48.3	175.0
053	NA-BT-I	60.0	33.3	71.7	70.0	80.0	44.7	145.7
054	NA-SS	58.3	40.0	73.3	75.0	85.0	32.0	118.7
055	RP 2	61.7	31.7	70.0	71.7	86.7	48.7	180.0
056	CE I	53.3	33.3	61.7	63.3	78.3	38.3	154.7
057	RK6	65.0	33.3	73.3	78.3	83.3	47.0	161.0
058	ATM	63.3	36.7	66.7	66.7	78.3	40.3	117.7
059	SH 3	70.0	48.3	73.3	80.0	86.7	30.7	79.7
060	BAR Fa 6363	63.3	38.3	71.7	73.3	83.3	39.3	120.3
061	BAR Fa 6253	63.3	23.3	55.0	61.7	70.0	63.7	296.3
062	RP 3	63.3	36.7	68.3	70.0	81.7	41.0	134.0
063	Tahoe II	63.3	35.0	76.7	80.0	83.3	46.7	197.7
064	06-WALK	55.0	25.0	61.7	70.0	76.7	52.3	244.7
065	Escalade	61.7	33.3	70.0	80.0	85.0	46.0	156.3
066	06-DUST	56.7	23.3	58.3	70.0	75.0	59.0	223.3
07	RAD-TF17	55.0	30.0	70.0	73.3	83.3	45.3	182.0
068	PSG-85QR	51.7	26.7	71.7	75.0	81.7	48.3	205.7
069	STR-8GRQR	46.7	23.3	53.3	61.7	63.3	56.0	283.3
070	PSG-82BR	51.7	35.0	73.3	76.7	85.0	3.0	17.3
071	K06-WA	63.3	46.7	76.7	75.0	91.3	27.0	109.3
072	GO-IBFD	58.3	35.0	71.7	80.0	85.0	40.3	162.3
073	SR 8650 (STR-8LMM)	56.7	46.7	75.0	73.3	83.3	17.0	84.3
074	STR-8BB5	56.7	41.7	68.3	73.3	88.3	27.0	134.7
075	Tulsa III	55.0	40.0	66.7	68.3	81.7	26.7	106.7
076	PSG-RNDR	46.7	21.7	55.0	53.3	75.0	54.7	322.7
077	PSG-TTRH	61.7	38.3	68.3	70.0	78.3	39.0	112.7
078	Speedway (STR-8BPDX)	56.7	35.0	71.7	73.3	83.3	37.7	141.0
079	Rembrandt	63.3	38.3	75.0	80.0	80.0	39.7	110.7
080	JT-41	55.0	31.7	68.3	71.7	80.0	42.3	161.0
081	JT-36	51.7	40.0	66.7	68.3	80.0	21.3	116.7
082	JT-45	56.7	38.3	75.0	78.3	83.3	31.0	137.7
083	JT-42	53.3	21.7	58.3	60.0	65.0	60.7	222.7
084	JT-3	53.3	20.0	60.0	65.0	78.3	61.7	291.7
085	BGR-TF1	48.3	28.3	60.0	60.0	83.3	37.7	206.0
086	BGR-TF2	60.0	36.7	71.7	76.7	88.3	37.7	155.7
087	PST-5HP	66.7	43.3	78.3	78.3	85.0	35.7	123.7
088	PST-5WMD	63.3	28.3	66.7	73.3	78.3	55.0	178.0
089	AST 702	56.7	26.7	65.0	70.0	78.3	52.3	208.3

Table 1. (Continued . . .)

Entry	Name	28-Sep ('06)	4-May	26-Jun	20-Jul	19-Sep	Winter kill†	Recovery‡
		Percent living turf cover						
		%						
090	AST 701	55.0	33.3	66.7	70.0	85.0	39.7	164.7
091	CS-TFI	53.3	35.0	66.7	65.0	78.3	35.0	150.7
092	KZ-I	53.3	28.3	60.0	61.7	71.7	47.0	246.7
093	LS-11	53.3	26.7	61.7	65.0	75.0	50.7	245.3
094	LS-06	50.0	28.3	58.3	63.3	75.0	45.0	247.3
095	DKS	55.0	38.3	66.7	76.7	81.7	27.0	117.3
096	LS-03	53.3	40.0	65.0	71.7	81.7	30.0	181.3
097	GWTF	53.3	40.0	71.7	45.0	81.7	27.3	149.7
098	KZ-2	50.0	35.0	63.3	65.7	81.7	30.7	155.7
099	AST-2	55.0	33.3	68.3	71.7	81.7	41.0	173.3
10	AST-3	56.7	31.7	71.7	75.0	85.0	43.7	169.7
101	RNP	48.3	26.7	56.7	51.7	66.7	46.7	182.0
102	AST-4	48.3	36.7	65.0	68.3	80.0	24.7	13.0
103	AST 703	56.7	30.0	63.3	70.0	81.7	48.0	187.0
104	AST-1	55.0	26.7	56.7	66.7	76.7	51.7	224.0
105	J-140	60.0	45.0	76.7	85.0	90.0	23.7	10.0
106	ATF-1199	50.0	28.3	68.3	71.7	80.0	47.0	309.0
107	Justice	60.0	35.0	70.0	75.0	85.0	40.7	145.7
108	Rebel IV	63.3	25.0	63.3	68.3	83.3	61.0	241.7
109	Millennium	71.7	43.3	78.3	81.7	86.7	39.0	104.0
110	RK-1	50.0	23.3	61.7	61.7	73.3	50.0	252.0
111	Rhambler	51.7	23.3	63.3	60.0	73.3	55.7	257.0
112	Firenza	58.3	33.3	66.7	68.3	80.0	43.3	162.7
113	Falcon IV	55.0	33.3	76.7	81.7	85.0	39.0	160.0
CV		14.1	33.8	19.5	17.0	12.1	42.5	59.6
LSD (0.05)		13.0	18.0	20.8	19.1	15.7	28.9	169.8

† Winterkill = 100-(col. 2/ col.1* 100)

‡ Recovery and spread = 100* (col. 5 - col. 2)/ col. 2

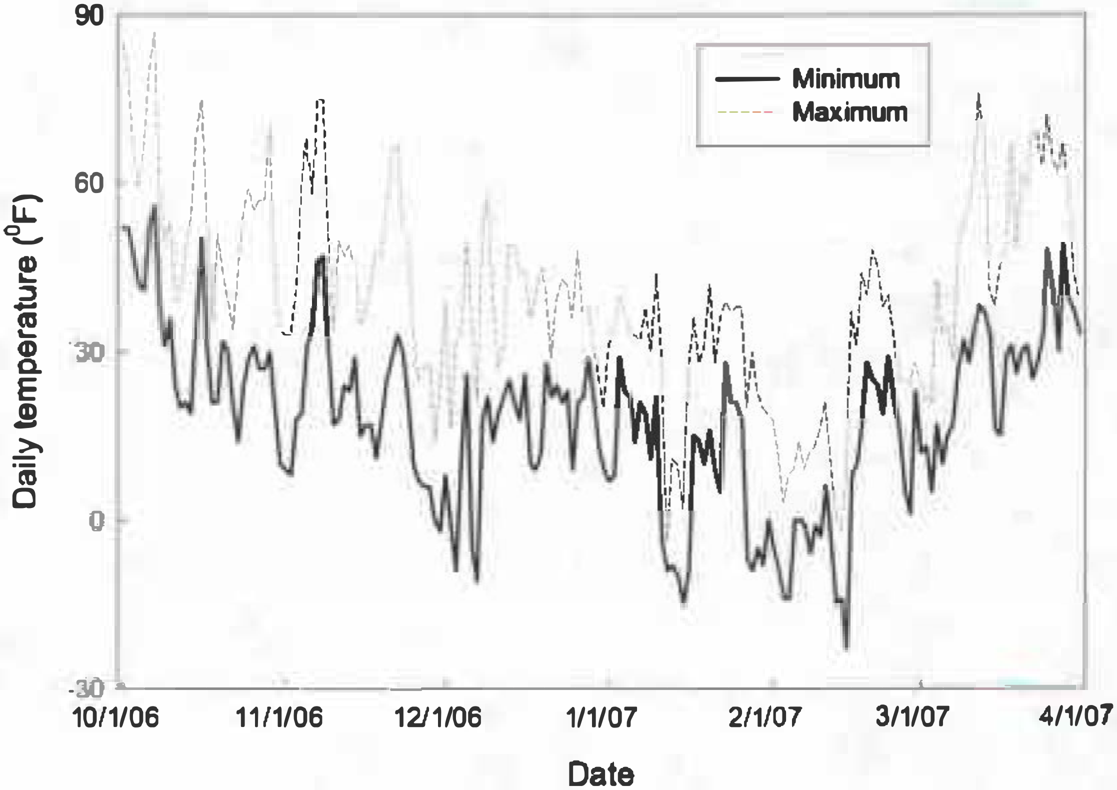

Fig. 1. **Extreme daily temperatures at the Highmore Research and Extension Center, 10/1/06–4/1/07.**

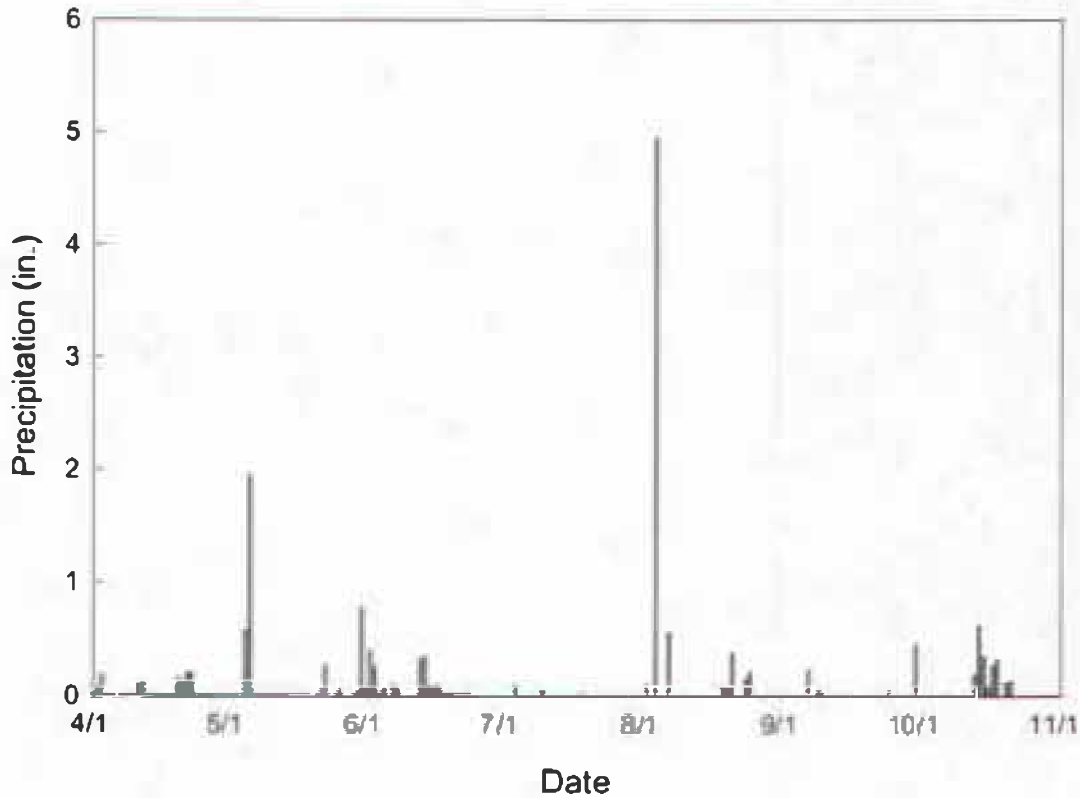

Fig. 2. **Daily precipitation at the Highmore Research and Extension Center, 4/1 to 11/1/07.**

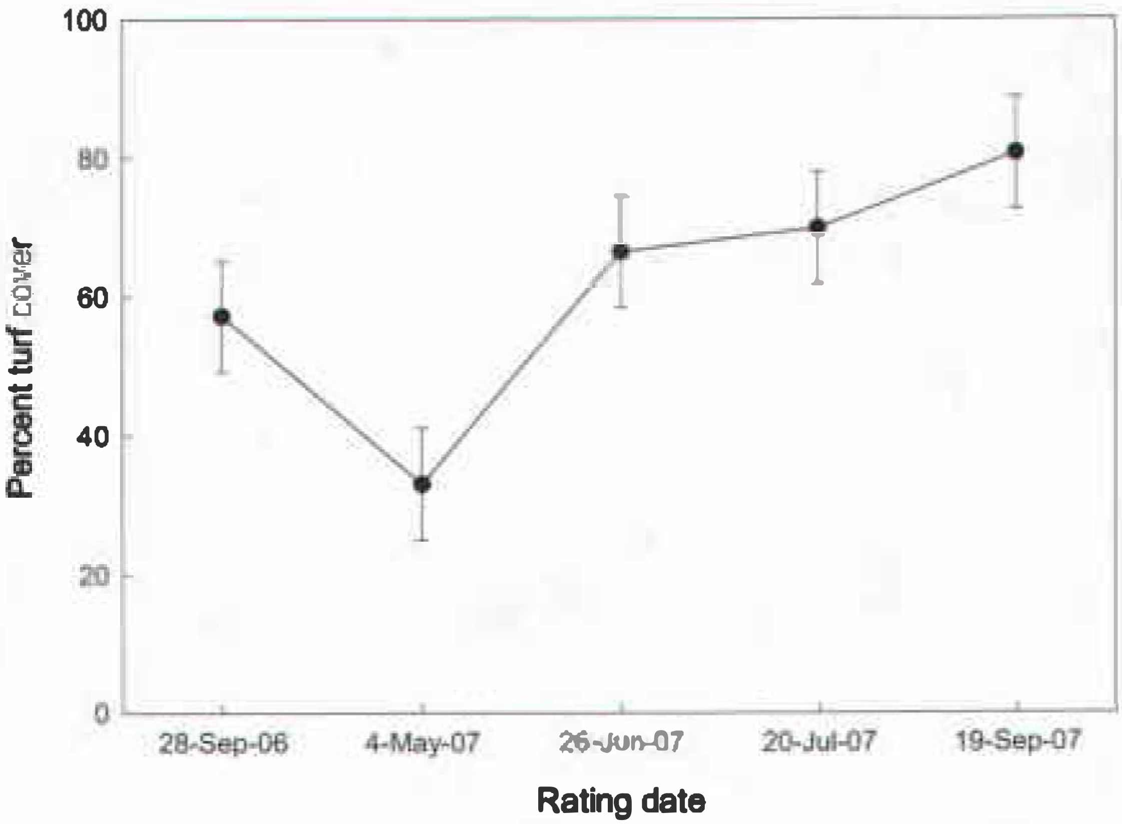

Fig. 3. **Effect of winterkill and subsequent recovery on percent turf cover at the Highmore Research and Extension Center in 2007. Each data point is the mean ± SE of 113 tall fescue entries.**

Sunflower Evaluation for Resistance to the Red Sunflower Seed Weevil

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The red sunflower seed weevil, *Smicronyx fulvus* LeConte, is a serious pest of sunflower in North and South Dakota. Adult females lay eggs in immature seeds and larvae consume a portion of the kernel, causing economic damage in the form of lost yield and oil content of oilseed sunflower and reduced yield and quality of confection sunflower. Recent crop surveys sponsored by the National Sunflower Association have shown increasing incidence and damage by this insect pest in South Dakota. The goal of this project is to identify sunflower germplasm with genetic resistance to the red sunflower seed weevil (RSSW). Resistant germplasm, if identified, will be made available to seed companies for incorporation into hybrids.

This was the sixth year of cooperative trials conducted by the USDA-ARS Sunflower Research Unit, Fargo, ND and the South Dakota Experiment Station, South Dakota State University. Sunflower germplasm tested at Highmore, SD and Prosper, ND in 2007 consisted of 3 separate trials. The first trial included 12 previously-tested interspecific crosses or accessions obtained from the North Central Plant Introduction Station, Ames, IA, 7 new lines or accessions, and 3 susceptible checks. The second trial consisted of 32 S_1 lines, developed by the USDA-ARS through a recurrent selection breeding procedure that genetically combined lines with quantitatively-inherited insect tolerance factors from previous trials, and 4 checks. The third trial tested 41 new interspecific crosses and 4 checks. All the entries were subjected to natural insect infestations at Highmore, SD (RSSW) and Prosper, ND (RSSW and banded sunflower moth).

The plots at Highmore, SD were seeded on June 20, 2007. Five heads from each plot were bagged following pollination to protect them from bird damage. The bagged heads were harvested and threshed individually. Seed was sent to the USDA-ARS, Northern Crop Science Laboratory, Fargo, ND for evaluation of seed damage. Results are pending. Results from the previous 3 years of trials are outlined below.

In 2004, 18 accessions and the check variety USDA Hybrid 894 were planted in single-row plots, 4 replications. Up to 5 heads were harvested and threshed from each row and a pooled seed sample sent to Fargo for damage evaluation. The results (Table 1) showed that a high level of RSSW infestation occurred at Highmore in 2004. Seed damaged ranged from 6 to 49%. The accession PI 431542 had the lowest amount of damage. Ames 3269 also had a low amount of damage (12.5%) in 2004 and had shown low damage levels in 2003 as well.

The 2005 trial at Highmore consisted of 17 accessions, 2 interspecific crosses, and Hybrid 894 planted in two-row plots with 3 replications. Eight of the lines were previously tested and 12 were new. Up to 10 heads from each plot were harvested and threshed individually. Seed damage from the RSSW ranged from 2 to 59% damaged seed. Three accessions showed seed damage of less than 18%. Ames 3269 had low levels of damage (18%) for the third year of testing and PI 431542 had the least amount of damage recorded in 2004 (6%) and 2005 (2%). PI 431545, which had not been tested previously, also showed low levels of seed damage in 2005 (13.5%).

Two separate trials were conducted in 2006. The first contained 2 interspecific crosses, 4 retested accessions, 5 accessions that showed low banded sunflower moth damage in previous trials, 2 interspecific crosses and 5 accessions with low sunflower moth damage, and Hybrid 894. Seed damage from the RSSW ranged from 7 to 52% in this trial. Eight lines had seed damage of 15% or less, including Ames 3269 (7.3%), PI 431545 (10.4%), and PI 431542 (14%). Crosses are being made with these lines to transfer the resistance into a good agronomic background. The second trial in 2006 screened 60 S_1 lines from a sunflower population developed by USDA sunflower breeder Dr. Jerry Miller by intercrossing lines that showed insect tolerance factors in previous trials. This population is currently undergoing phenotypic recurrent selection, whereby the frequency of favorable genes in a population is increased by selecting superior plants in each generation and recombining them to produce a new population. This process is performed repeatedly and then superior parent lines can be developed from the improved population. RSSW seed damage levels in the 60 S1 lines ranged from less than 1% to 40%. Twenty-five of the lines had less than 13% seed damage. These lines were retested in 2007 to reconfirm their RSSW resistance. Results of the 2004 through 2006 screenings are summarized in Table 1.

Acknowledgements: The Highmore, SD portion of this research was funded by the National Sunflower Association and the SDSU Agricultural Experiment Station.

Table 1. Mean percentage of seed damaged by red sunflower seed weevil from sunflower lines and accessions evaluated at Highmore, SD from 2004 to 2007.

Line or Accession	ID	% Damaged Seed 2004	2005	2006	2007
PI 170385		37.7 ± 2.9	—	—	*
PI 494861		26.4 ± 3.0	—	—	*
HYB 894	Hybrid 894(check)	23.9 ± 1.2	43.3 ± 1.5	33.6 ± 2.5	*
PI 431506	(Susceptible check)	—	38.5 ± 4.1	38.2 ± 6.5	—
Hir 828-3	(Susceptible check)	49.0 ± 3.7	58.9 ± 2.9	20.5 ± 3.3	*
Str 1622-2	(Susceptible check)	32.4 ± 4.5	34.0 ± 2.7	29.3 ± 5.9	*
Ames 3269	PURPUREUS	12.5 ± 1.6	18.0 ± 1.9	7.3 ± 0.7	*
Ames3391		23.6 ± 1.9	25.3 ± 2.1	—	—
Ames 3454		16.7 ± 5.3	35.4 ± 4.1	52.1 ± 5.4	*
PI431542		6.0 ± 1.6	2.0± 0.8	14.0 ± 5.3	*
PI 497939		12.6 ± 1.8	53.7 ± 3.9	—	—
PI431516		—	36.3 ± 3.7	—	—
PI 431514		—	37.2 ± 3.5	—	—
PI431518		—	45.4 ± 3.4	—	—
PI 431520		—	29.5 ± 3.9	—	—
PI431524		—	39.7 ± 4.4	—	—
PI431528		—	42.9 ± 4.2	—	—
PI 431529		—	32.5 ± 6.5	—	—
PI 431545		—	13.5 ± 5.5	10.4 ± 3.5	*
PI431549		—	41.9 ± 2.7	—	—
PI 431563		—	35.8 ± 2.4	—	—
PI 431568		—	25.3 ± 3.5	—	—
PI 431569		—	36.0 ± 4.1	—	—
PI 170391	Low banded moth damage	—	—	14.3 ± 2.1	*
PI 170401	Low banded moth damage	—	—	16.0 ± 4.4	*
PI 251902	Low banded moth damage	—	—	16.5 ± 5.3	—
PI 265503	Low banded moth damage	—	—	30.4 ± 5.3	—
PI 372259	Low banded moth damage	—	—	36.9± 5.2	—
Par 1673-1	Low sunflower moth damage	—	—	14.7 ± 3.9	*
Pra Pra 1142	Low sunflower moth damage	—	—	41.7 ± 4.0	—
PI 162453	Low sunflower moth damage	—	—	11.1 ± 3.3	*
PI 170405	Low sunflower moth damage	—	—	24.7 ± 3.5	—
PI 175728	Low sunflower moth damage	—	—	11.3 ± 2.4	*

Table I. (Continued . . .)

Line or Accession	ID	% Damaged Seed 2004	2005	2006	2007
PI 193775	Low sunflower moth damage	—	—	10.9 ± 2.2	*
PI 170424		—	—	—	*
PI 181994		—	—	—	*
PI 432516		—	—	—	*
PI 195573		—	—	—	*
PI 219649		—	—	—	*
PI 250085		—	—	—	*
PI 250855		—	—	—	*

* Seed damage evaluations from 2007 are in process

2007Alfalfa Production

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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 trials do not contain all available cultivars, they should be a helpful tool in identifying cultivars suitable for your specific needs. Table 1 provides forage production data from 11 cultivars planted at Highmore in 2005. Table 2 includes 9 cultivars planted in a new trial at Highmore in 2007. Three cuttings were harvested from the 2005 trial and one from the 2007 trial. Cultivars are ranked from highest to lowest based on total cumulative yield. The least significant difference (LSD) listed at the bottom of the table is used to identify significant differences between the cultivars. If the difference in yield between two cultivars exceeds the given LSD, then they are significantly different.

Alfalfa was planted at both trials at a seeding rate of 18 lbs pure live seed (PLS)/acre. Experimental design consists of six replications in a randomized complete block. Fifty pounds of super phosphate (P_2O_5) was applied preplant, as was Treflan for weed control.

Plots were 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 (Tables 1 and 2).

Table 1. Yield of eleven alfalfa cultivars entered in the South Dakota State University alfalfa testing program at the Central Research Station. Plots were planted 3 May 2005.

Entry	2007				2006	2005	3-year
	4-Jun	3-Jul	5-Sep	Total	Total	Total	Total
	------------------------ Tons Dry Matter/Acre ------------------------						
361 HY	2.70	1.32	1.33	5.36	2.26	1.56	9.17
6400 HT	2.69	1.39	1.30	5.38	2.02	1.61	9.01
4A421	2.44	1.32	1.15	4.91	2.02	1.57	8.50
Labrador	2.52	1.25	1.06	4.84	1.97	1.64	8.45
Mountaineer 2.0	2.29	1.25	1.09	4.63	1.99	1.68	8.29
54V46	2.48	1.25	1.11	4.84	1.96	1.32	8.13
Rebound 5.0	2.39	1.13	1.02	4.54	1.83	1.55	7.91
Vernal	2.51	1.06	0.88	4.45	1.72	1.73	7.90
WL 335HQ	2.50	1.17	1.05	4.72	1.80	1.23	7.75
LegenDairy 5.0	2.23	1.08	1.01	4.32	1.79	1.43	7.53
Integrity	2.30	1.00	0.97	4.28	1.83	1.22	7.32
Average	2.47	1.21	1.10	4.79	1.94	1.51	8.24
Maturity (Kalu & Fick)	5.2	5.6	4.2				
LSD (P=0.10)	NS	NS	0.20	NS	NS	NS	NS
CV (%)	15.3	20.0	18.9	15.7	17.7	27.9	14.6
P-value	0.415	0.128	0.013	0.139	0.356	0.466	0.181

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

Table 2. Yield of nine alfalfa cultivars entered in the South Dakota State University alfalfa testing program at the Central Research Station. Plots were planted 26 April 2007.

Entry	5-Sep 2007
	Tons DM/acre
6200HT	1.46
6417	1.60
FSG 351	1.50
FSG 408DP	1.32
Genoa	1.58
Lander	1.50
Phirst	1.43
Vernal	1.53
WL 343HQ	1.37
Average	1.40
Maturity (Kalu & Fick)	5.2
LSD (P=0.10)	NS
CV (%)	13.4
P-value	0.260

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

Acknowledgements

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Spring-Seeded Small Grains – 2007, Eastern South Dakota Variety Test Results

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Trial Methods

A randomized complete block design was used in all trials. Plots measured 5 feet wide and 14 feet long and were harvested with a small plot combine. Yield means were generated from four variety replications per location each year (2005, 2006, and 2007). Plots were fertilized with 60 lb per acre of 18-46-0(10.8 lb of N and 27.6 lb of phosphorus per acre) down the seed tube at planting. A post-emergence application of Bronate (1.0 pint) was for weed control. The oat and barley plots were seeded at 28 pure-live-seeds (PLS) per square foot or 1,219,680 PLS seeds per acre; this seeding rate generally results in about 25 seedlings per square foot (1,089,000 seedlings per acre) at emergence. The spring wheat plot seeding rates were increased from 28 (1,219,680 PLS per acre) to 42 PLS per square foot (1,830,000 PLS per acre) in 2007. This increased the wheat density at emergence from 25 seedlings per square foot (1,089,000 seedlings per acre) to about 37-38 seedlings per square foot (1,633,500 seedlings per acre).

Performance Trail Results

General comments – Small grain performance results for the Highmore Research Farm and other area locations are presented in tables 1a and b (spring wheat), 2a and b (oats), and 3a and b (barley). Two types of means were generated for statistical analysis (Statistical Analysis System, SAS). First, yield averages (four replicates) were analyzed by location. Second, performance averages for the variables bushel weight, height, lodging and grain protein were analyzed across locations using location as a replicate. This enabled SAS to determine entry (treatment) differences for these variables. The top performance group (TPG) for each variable was determined by location (yield) or statewide (bushel weight, height, lodging, and grain protein). The least significant difference (LSD value) for each variable and the minimum value needed for an entry to qualify for the TPG are listed at the bottom of each column where SAS analysis was done. Look for TPG values identified with a plus sign (+) in each table.

More importantly, when evaluating entries in the yield tables note the values in the State Top-Yield Frequency columns. These values (percentages) indicate how frequently an entry is in the TPG across all locations. For example, an entry with a top-yield-frequency value of 50% is in the TPG at half of the locations tested. Generally, a top-yield-frequency of 50% is considered very good, and entries with percentages of 50% or higher exhibit good yield stability. That means they are adapted to a wider range of environments compared to entries with a top-yield-frequency of 0 to 40%. High percentages are better, look for entries with top-yield-frequencies of 50% or higher.

HRS Wheat (Tables 1a-b) - The top entries for yield for the past 3 years as determined by state top yield frequency (3-Yr column in Table 1a) included Traverse at 100%; SD 3868, Steele-ND, Briggs, and Granger at 86%; and SD 3870, SD 3851, and Freyr at 71%. In 2007, among the entries tested for three years, only Traverse and Howard had a top-yield-frequency above 50% (2007 column). Likewise in

2007, among the entries tested for less than three years, only SD 3944, SD 3942, SD 3943, Faller, and SD 3948 had high top-yield-frequencies above 50% (2007 column).

The top bushel weight entries (Table 1b) included nine entries that averaged 59 pounds. Eight entries averaged the test trial average of 58 pounds, while one averaged 57 pounds, and six averaged 56 pounds in bushel weight. The tallest entry at 37 inches was the check variety Chris, while other entries had to differ by 1 inch in height to be significantly different from one another. The lodging results on a statewide basis indicated there were no entry differences in the lodging ratings in 2007. The TPG for grain protein included Glen, Kelby, and the check variety Chris.

Oat (Tables 2a-b) - The top entries for yield for the past 3 years as determined by state top yield frequency (3-Yr column in Table 2a) included Stallion, HiFi, Beach, Morton, Loyal at 100%; Don and Jerry at 75%; and Reeves at 50%. In 2007, among the entries tested for three years, only Stallion had a top-yield-frequency above 50% (2007 column). Likewise in 2007, among the entries tested for less than three years, only SD 041405; SD 041451, SD 041445, SD 030888, Souris, and SD 020883 exhibited top-yield-frequencies above 50% (2007 column).

The top bushel weight entry (Table 2b) was the hulless experimental line SD 020301-20 at 45 pounds followed closely by Buff at 44 pounds. Among the standard hulled oat entries, eight averaged the test trial average of 39 pounds, five averaged 38 pounds, three averaged 37 pounds, two averaged 36 pounds, and HiFi averaged a low of 35 pounds in bushel weight. The statewide plant height average was 37 inches and the data indicated entries had to differ by 1 inch to be significantly different in height. The tallest entries were Morton at 41 inches, followed by Stallion, Loyal and Beach at 40 inches. The lodging results indicated Morton and Buff were the most resistant to lodging with a score of 1 while the other entries equaled the statewide average of 2. The TPG for grain protein included Hytest and the hulless SD 020301-20.

Barley (Tables 3a-b) - The top entries for yield for the past 3 years as determined by state top yield frequency (3- Yr column in Table 3a) included Eslick at 67%; and Lacey, Drummond, and Conlon at 50%. In 2007, among the entries tested for three years, only Eslick, Conlon and Lacey had a top-yield-frequency greater or equal to 50% (2007 column). Likewise in 2007, among the entries tested less than three years, only Pinnacle had a top-yield-frequency above 50% (2007 column).

The top bushel weight entries (Table 3b) included four entries that averaged 46 pounds. Three entries averaged the statewide average of 45 pounds, two averaged 44 pounds, and one (Stellar-ND) averaged a low of 43 pounds per bushel. Plant height averaged 31 inches and entries had to differ by 2 inches to be significantly different in height. The seven tallest entries averaged 31 inches or more in height. The six best lodging resistant entries equaled the statewide average score of 1. The TPG for grain protein included the varieties Conlon, Lacey, Robust, Drummond, Legacy, Eslick, and Tradition.

Table Ia. Hard red spring wheat yield results- four eastern South Dakota locations, 2005-2007.

Variety (Hdg)* - by 3-yr then 2007 state yield avg	Location Yield Avg. (BU/A at 13% moist.)								East Yield Avg. (Bu/A)		State Yield Avg. (Bu/A)		State Top-Yield Freq. ** (%)	
	Miller		Spink Co		Selby		Brown Co							
	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr
Traverse (0)	40+	35+	58+	61+	51+	52+	49	58+	50	53	47	50	63	100
Howard(4)	36	34+	57+	60+	45	46	53+	58+	50	50	47	49	63	47
SD 3868 (-)	40+	37+	50	62+	44	48+	50	58+	48	52	44	49	25	86
Steele-ND (3)	35	34+	52+	59+	47	48+	52	55+	49	50	45	48	38	86
Briggs (0)	38	35+	49	59+	45	47+	50	56+	48	50	45	48	25	86
Granger(0)	37	32+	46	57+	44	50+	47	54+	46	49	43	47	13	86
SD 3870(-)	38	38+	46	58+	44	46	47	54+	46	50	43	47	13	71
SD 3851 (-)	35	36+	45	55+	39	43	43	52+	43	48	41	46	13	71
Freyr (1)	32	32+	47	57+	44	45	41	52+	42	47	41	45	13	71
Walworth (0)	31	31+	38	52	41	43	46	52+	42	45	41	44	13	43
Glenn (3)	31	32+	47	57+	42	45	40	50	42	46	39	44	0	43
Forge (-1)	32	33+	34	50	39	43	40	48	40	45	39	44	25	29
Banton (1)	33	31+	47	56+	37	39	45	49	43	45	41	43	13	43
Ulen (2)	31	29+	42	56+	38	42	42	52+	41	45	39	43	0	43
Russ (2)	32	33+	41	49	38	43	38	50	41	45	39	43	0	29
Oxen (2)	29	31+	36	52	34	41	44	50	38	44	38	43	13	29
Reeder (3)	26	31+	30	45	36	40	40	51	38	43	37	41	13	29
Alsen (4)	30	29+	37	50	35	41	39	48	38	43	37	41	13	14
Chris,CK (3)	24	26+	29	40	25	31	31	43	29	35	28	34	0	0
SD3944(-)	38	-	54+	-	54+	-	58+	-	53	-	49	-	88	
SD 3942 (-)	40+	-	52+	-	48+	-	56+	-	51	-	48	-	88	
Faller(-)	43+	-	55+	-	52+	-	48	-	50	-	47	-	63	
SD 3943 (-)	39+	-	54+	-	49+	-	56+	-	52	-	47	-	88	
SD 3948 (-)	36	-	57+	-	44	-	53+	-	51	-	47	-	63	
SD 3965 (-)	37	-	51	-	50+	-	50	-	49	-	46	-	38	
RB07 (2)	37	-	50	-	49+	-	46	-	47	-	45	-	38	
SD 3927 (-)	35	-	52+	-	43	-	46	-	45	-	43	-	25	
SD 3956(-)	33	-	44	-	41	-	48	-	45	-	43	-	13	
Kelby (2)	31	-	44	-	43	-	46	-	44	-	41	-	13	
Kuntz (2)	35	-	47	-	43	-	47	-	44	-	40	-	0	
Hat Trick (3)	32	-	43	-	44	-	42	-	41	-	39	-	0	
Ada (1)	31	-	43	-	47	-	40	-	41	-	39	-	0	
Test avg :	34	33	46	54	43	44	46	52	44	47	42	45		
High avg :	43	38	58	62	54	52	58	58	53	53	49	50		
Low avg :	24	26	29	40	25	31	31	43	29	35	28	34		
# Lsd(.05) :	4	NS	6	8	6	5	5	6						
## TPG-value :	39	26	52	54	48	47	53	52						
### C.V. :	8	13	10	7	10	8	8	8						

* Heading, the relative days to heading, compared to the variety - Briggs.
** Frequency or percent of all test locations that a variety was in the TPG for yield
# Lsd - the amount column values must differ to be significantly different or if the differences are non-significant (NS).
TPG-value, the minimum value required for the top-performance group (TPG) for yield
A plus sign (+) indicates values within a column that qualify for the TPG.
Coef. of variation, a measure of trial experimental error. 15% or less is best

Table 1b. Eastern South Dakota and state spring wheat averages for bushel wt. (BW), height (HT), lodging (LDG), and grain protein (PRT) in 2007.

	East Avg. - BW, HT, LDG, PRT				State Avg. - BW, HT, LDG, PRT			
Variety (Hdg.)* - by state BW avg.	BW lb	HT in	LDG	PRT %	BW lb	HT in	LDG	PRT %
SD 3956 (-)	59	33	1	13.8	59+	33	1	13.8
Banton (1)	59	33	1	14.4	59+	33	1	14.4
SD 3927 (-)	59	33	1	13.8	59+	33	1	13.8
SD 3944 (-)	58	33	1	13.7	59+	33	1	13.7
SD 3948 (-)	59	34	1	14.1	59+	34	1	14.1
RB07 (2)	58	32	1	14.4	59+	32	1	14.4
Hat Trick (3)	59	32	1	13.9	59+	32	1	13.9
Kelby (2)	58	30	1	14.7	59+	30	1	14.7+
SD 3851 (-)	59	34	1	13.8	59+	34	1	13.8
Ada (1)	58	32	1	13.9	58	32	1	13.9
Alsen (4)	58	32	1	14.5	58	32	1	14.5
Ulen (2)	58	33	1	14.3	58	33	1	14.3
Briggs (0)	58	33	1	14.2	58	33	1	14.2
Granger(0)	57	35	1	13.7	58	35	1	13.7
SD 3870 (-)	58	36	1	13.9	58	36	1	13.9
SD 3965 (-)	57	35	1	13.4	58	35	1	13.4
Freyr (1)	57	32	1	14.1	58	32	1	14.1
Kuntz (2)	57	30	1	13.7	57	30	1	13.7
Howard (4)	58	34	1	14.3	57	34	1	14.3
SD 3943 (-)	58	33	1	13.3	57	33	1	13.3
Glenn (3)	58	33	1	14.9	57	33	1	14.9+
SD 3942 (-)	58	31	1	12.8	57	32	1	12.8
Forge (-1)	57	34	1	13.0	57	34	1	13.0
Steele-ND (3)	58	34	1	14.5	57	34	1	14.5
Walworth (0)	57	33	1	13.9	57	33	1	13.9
Russ (2)	56	34	1	13.9	57	34	1	13.9
Faller(-)	57	33	1	13.7	56	33	1	13.7
SD 3868 (-)	57	34	1	13.2	56	34	1	13.2
Reeder (3)	57	33	1	13.3	56	32	1	13.3
Traverse (0)	56	34	1	13.4	56	34	1	13.4
Chris,CK (3)	55	37	2	14.6	56	37+	1	14.6+
Oxen (2)	55	32	1	13.4	56	31	1	13.4
Test avg. :	58	33	1	13.9	58	33	1	13.9
High avg. :	59	37	2	15.2	59	37	1	15.2
Low avg. :	55	30	1	12.8	56	30	1	12.8
# Lsd(.05) :					1	1		0.6
## TPG-value :					59	37	1	14.6
### C.V. :					4	6	18	4.0

* Heading, the relative days to heading, compared to the variety - Briggs

** Lodging score: 0= all plants erect, 3= 50% of plants lodged at 45°-angle, 5= all plants flat

\# Lsd - the amount column values must differ to be significantly different

A plus sign (+) indicates values within a column that qualify for the TPG.

\### Coef. of variation, a measure of trial experimental error, 15% or less is best

Table 2a. Oat yield results - three eastern South Dakota locations, 2005-2007.

Variety (Hdg.)* - by 3-yr then 2007 state yield avg.	Location Yield Avg (BU/A at 13% moist)						East Yield Avg (BU/A)		State Yield Avg. (BU/A)		State Top-Yield Freq. ** (%)	
	Miller		Selby		Brown Co							
	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr
Hulled types:												
Stallion (8)	115+	-	124	-	133+	115+	128	122	113	122	63	100
HiFi (8)	107+	-	113	-	127+	121+	116	122	104	122	25	100
Beach (6)	97	-	119	-	123+	116+	121	118	107	118	38	100
Morton (7)	103	-	114	-	119	108+	117	115	105	115	0	100
Loyal (8)	106+	-	109	-	113	102+	114	113	100	113	13	100
Don (1)	104	-	128	-	118	100+	118	106	107	106	0	75
Jerry (5)	94	-	109	-	111	95+	110	106	100	106	0	75
Reeves (2)	99	-	124	-	105	93+	115	103	103	103	0	50
Hytest(4)	80	-	66	-	79	84	78	84	74	84	0	0
SD 041405 (-)	119+	-	134+	-	130+	-	130	-	119	-	88	
SD041451 (-)	109+	-	140+	-	121	-	127	-	115	-	75	
SD 041445 (-)	116+	-	118	-	128+	-	127	-	114	-	75	
Souris (6)	105+	-	126	-	132+	-	124	-	112	-	63	
SD 030888 (-)	108+	-	123	-	122+	-	125	-	112	-	75	
SD 020883-10 (-)	110+	-	120	-	113	-	121	-	110	-	50	
SD 020883-29 (-)	112+	-	116	-	118	-	120	-	109	-	38	
SD 020883-11 (-)	99	-	122	-	115	-	120	-	109	-	38	
SD 020883-17 (-)	103	-	122	-	114	-	119	-	108	-	25	
SD041117 (-)	104	-	121	-	113	-	119	-	108	-	25	
Hulless types:												
Buff Hls (3)	71	-	67	-	78	74	81	84	76	84	0	
SD 020301-20 (-)	84	-	80	-	101	-	93	-	84	-	0	
Test avg. :	100	-	110	-	112	98	113	104	102	104		
High avg. :	119	-	140	-	133	121	130	122	119	122		
Low avg. :	60	-	21	-	55	67	53	67	49	67		
# Lsd(.05) :	14		11		11	29						
## TPG-value :	105		129		122	92						
### C.V. :	10		7		7	10						

* Heading, the relative days to heading, compared to the variety - Don

** Frequency or percent of all test locations that a variety was in the TPG for yield

Lsd - the amount column values must differ to be significantly different

TPG-value, the minimum value required for the top-performance group (TPG) for yield

A plus sign (+) indicates values within a column that qualify for the TPG.

Coef. of variation, a measure of trial experimental error. 15% or less is best

Table 2b. Eastern South Dakota and state oat averages for bushel weight (BW), height (HT), lodging (LDG), grain protein (PRT) in 2007.

Variety (Hdg.)* - by state BW avg.	East Avg. - BW, HT, LDG, PRT				State Avg. - BW, HT, LDG, PRT			
	BW lb	HT in	LDG	PRT %	BW lb	HT in	LDG	PRT %
Hulled types:								
SD 020883-29 (-)	40	36	3	16.9	39	36	2	16.9
SD 020883-11 (-)	40	36	2	16.8	39	35	2	16.8
SD 020883-10 (-)	40	37	2	16.3	39	36	2	16.3
SD 041451 (-)	40	40	3	15.8	39	38	2	15.8
Hytest (4)	39	40	2	19.1	39	39	2	19.1+
SD 020883-17 (-)	39	37	3	16.5	39	36	2	16.5
Reeves (2)	39	40	3	18.0	39	39	2	18.0
SD 041445 (-)	40	40	2	15.6	39	39	2	15.6
SD 041117 (-)	39	36	2	16.4	38	35	2	16.4
Beach (6)	39	42	2	14.7	38	40+	2	14.7
SD 041405 (-)	38	35	3	15.0	38	34	2	15.0
Jerry (5)	38	39	2	16.0	38	38	2	16.0
SD 030888 (-)	38	34	2	15.4	38	33	2	15.4
Stallion (8)	39	42	2	16.6	37	40+	2	16.6
Don (1)	37	34	3	15.3	37	33	2	15.3
Souris (6)	37	36	2	15.6	37	34	2	15.6
Loyal (8)	37	41	2	17.0	36	40+	2	17.0
Morton (7)	37	42	2	15.8	36	41+	1+	15.8
HiFi (8)	37	39	2	15.4	35	38	2	15.4
Hulless types:								
Buff Hls (3)	45	36	2	17.9	44	35	1+	17.9
SD 020301-20 (-)	46	39	2	18.8	45+	38	2	18.8+
Test avg. :	39	38	2	16.5	39	37	2	16.5
High avg. :	46	42	3	19.1	45	41	2	19.1
Low avg. :	37	34	2	14.7	35	33	1	14.7
# Lsd(.05) :					1	1	1	0.8
## TPG-value :					44	40	1	18.3
### C.V. :					5	6	27	4

* Heading, the relative days to heading, compared to the variety - Don

** Lodging score: 0= all plants erect, 3= 50% of plants lodged at 45°-angle, 5= all plants flat

Lsd - the amount column values must differ to be significantly different

TPG-value, the minimum or maximum value required for the top-performance group (TPG).

A plus sign (+) indicates values within a column that qualify for the TPG

Coef. of variation, a measure of trial experimental error.

Table 3a. Barley yield results - three eastern South Dakota locations, 2005-2007.

Variety (Hdg.)* - by 3-yr then 2007 state yield avg.	Location Yield Avg. (BU/A at 13% moist.)						Best Yield Avg. (BU/A)		State Yield Avg. (BU/A)		State Top-Yield Freq ** (%)	
	Miller		Selby		Brown Co.							
	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr	2007	3-Yr
Eslick (3)	64+	61+	76+	84+	36	64+	62	74	60	71	57	67
Lacey (0)	52	51	74+	75+	43	64+	63	69	59	66	29	50
Tradition (0)	55	49	72+	73	46+	64+	62	67	60	65	43	33
Drummond (2)	59	47	77+	76+	44	63+	63	67	59	64	29	50
Legacy (3)	53	45	64	66	41	60+	59	64	55	61	14	17
Conlon (0)	62	58+	58	63	33	59+	60	65	58	60	43	50
Stellar-ND (2)	57	46	73+	69	39	59+	60	64	57	60	14	17
Robust (3)	54	43	64	61	39	57+	57	60	53	56	0	17
Pinnacle (3)	71+	.	71	.	53+	.	70	.	63	.	57	
Rawson (2)	63	.	68	.	49+	.	67	.	60	.	43	
Test avg.	60	50	71	71	44	61	63	66	59	63		
High avg.	71	61	81	84	53	64	70	74	63	71		
Low avg.	52	43	58	61	33	57	57	60	53	56		
# Lsd(.05)	7	8	9	10	8	NS						
## TPG-value	64	53	72	74	45	57						
###C.V.	8	8	9	8	12	9						

* Heading, the relative days to heading, compared to the variety - Lacey.

** Frequency or percent of all test locations that a variety was in the TPG for yield.

Lsd - the amount column values must differ to be significantly different or if differences are non-significant (NS)

TPG-value, the minimum value required for the top-performance group (TPG) for yield.

A plus sign (+) indicates values within a column that qualify for the TPG.

Coef. of variation, a measure of trial experimental error, 15% or less is best.

Table 3b. Eastern South Dakota and state barley averages for bushel weight (BW), height (HT), lodging (LDG), and grain protein (PRT) in 2007.

	East Avg. - BW, HT, LDG, PRT				State Avg. - BW, HT, LDG, PRT			
Variety (Hdg.)* - by state BW avg.	BW lb	HT in	LDG	PRT %	BW lb	HT in	LDG	PRT %
Conlon (0)	47	28	2	13.6	46+	29	2	13.6+
Eslick (3)	47	26	1	13.0	46+	27	1+	13.0+
Tradition (0)	46	31	2	12.7	46+	31+	1+	12.7+
Rawson (2)	46	31	1	12.3	46+	31+	1+	12.3
Lacey (0)	45	31	2	13.3	45	31+	1+	13.3+
Robust (3)	45	32	2	13.3	45	33+	2	13.3+
Pinnacle (3)	45	30	1	11.0	45	30	1+	11.0
Drummond (2)	45	32	2	13.1	44	32+	2	13.1+
Legacy (3)	45	32	2	13.1	44	31+	2	13.1+
Stellar-ND (2)	44	31	2	12.2	43	31+	1+	12.2
Test avg. :	45	30	2	12.7	45	31	1	12.7
High avg. :	47	32	2	13.6	46	33	2	13.6
Low avg. :	44	26	1	11.0	43	27	1	11.0
# Lsd(.05) :					1	2	1	0.9
## TPG-value :					46	31	1	12.7
###C.V. :					4	10	23	6

* Heading, the relative days to heading, compared to the variety - Lacey.

** Lodging score: 0= all plants erect, 3= 50% of plants lodged at 45°-angle, 5= all plants flat.

Lsd - the amount column values must differ to be significantly different.

TPG-value, the minimum or maximum value required for the top-performance group (TPG). A plus sign (+) indicates values within a column that qualify for the TPG.

Coef. of variation, a measure of trial experimental error.

Herbicide Programs, Experimental Herbicide and Herbicide-Crop Interactions in Wheat, Sunflowers, Corn, Sorghum, and Pulse Crops

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Experiment stations make it possible to evaluate experimental treatments and to demonstrate weed control practices. The Highmore Station is a strategic location for several weed control field trials. The location provides performance data and field tour training opportunities for producers and industry in central South Dakota.

2007 Projects

The Highmore Research Station has provided opportunities to conduct weed management research in small grains, corn, sorghum, chickpeas, field peas, lentils, and soybeans in 2007. Small grains research focused on controlling downy brome and wild oats, which are among the greatest grass weed problems in small grains. For downy brome control, we compared several herbicide options in conventional winter wheat to Beyond in Clearfield wheat with fall or spring applications. For wild oat control, we compared several standard herbicide options with Everest, an herbicide that also has activity on downy brome. We also evaluated winter wheat tolerance to tank mixtures of herbicides with the fungicide, Headline, under extremely stressful conditions. This study was partially funded by the South Dakota Wheat Commission. The Highmore Station enables demonstrations of corn weed control programs in typically dry conditions. The no-till corn herbicide demonstration indicated weed control differences between Liberty and Roundup and the importance of using the proper adjuvant with Option. We continued a sunflower trial from 2006 to evaluate an experimental herbicides, KIH-485, for use in sunflowers. This study was partially funded by the National Sunflower Association and is part of a collaborative effort with universities in three other states. Demonstrations were established for sorghum and pulse crops (chickpeas, field peas, and lentils) to evaluate registered and non-registered herbicides to identify additional herbicide chemistries that may be suitable in these crops. Although soybeans have not been evaluated at the Highmore station recently, a study was established this year to evaluate the combined effects of densities and row spacing on weed control programs. Like corn, soybean production seems to be continually shifting farther west and the Highmore Station provides a site to evaluate soybean production in a very difficult climate. This research was partially funded by the South Dakota Soybean Research and Promotion Council.

2007 Season

Early-season moisture was adequate for good crop establishment. Conditions were somewhat dry in mid- to late-summer, but crop growth and productivity was good. Weed populations were generally moderate in most studies.

2007 Field Research

1. Downy Brome Control in Winter Wheat with Beyond or Conventional Herbicides
2. Wild Oat Control with Everest
3. Herbicide Tank Mixes with Headline
4. No-Till Corn Herbicide Demonstration
5. Sunflower Tolerance to KIH-485
6. Express Programs in Express-Tolerant Sunflowers
7. Alternative Herbicides for Sorghum
8. Pulse Demonstration
9. Soybean Row Spacing and Density Effects on Weed Management

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Program input and partial support is also acknowledged:

1. South Dakota Soybean Research and Promotion Council
2. National Sunflower Association
3. South Dakota Wheat Commission
4. Crop Protection Industries

NOTE: Data reported in this publication results from field tests that include experimental products, experimental uses, or experimental rates, combinations, or other unregistered uses for herbicide products. Users are responsible for applying herbicide according to label directions. Refer to the appropriate weed control fact sheets available from county Extension offices for herbicide recommendations.

Table 1. Downy brome control in winter wheat with Beyond or conventional herbicides

RCB; 3 reps
Variety: CF Winter Wheat
Planting Date: 9/14/06
FALL: 10/16/06; Wwht 3 lf, 3 in; Dobr 2 lf, 1.5 in
SPRING: 4/26/07; Wwht 4-6 in, 5 lf tillered; Dobr 3-4 lf, 2 in; Wibw 2-4 lf; KOCZ 1-2 in.
Soil: Clay loam; 2.5% OM; 6.2 pH

Precipitation:

FALL:	1st week	0.04 inches
	2nd week	0.00 inches
SPRING:	1st week	0.00 inches
	2nd week	2.53 inches

VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)
Dobr=Downy brome
Wibw=Wild buckwheat
KOCZ=Kochia

Comments: The objective of this study was to compare downy brome control with Beyond to several conventional herbicides. Herbicides were applied in the fall (October 16, 2006) and in the spring (April 26, 2007) and weed control evaluated July 10, 2007. All treatments applied in the fall resulted in nearly complete downy brome control. Olympus Flex resulted in nearly complete control when applied in the spring, but Maverick and Everest resulted in 75 and 77% control, respectively. Beyond resulted in the least control when applied in the spring (40%). For downy brome control, it is generally recommended to apply herbicides in the fall. Maverick appeared to also control wild buckwheat with spring or fall applications. Several herbicides seemed to also partially control kochia when spring applied.

Treatment	***Rate/A***	***Wwht % VCRR 4/24/07***	***Wwht % VCRR [illegible]***	***% Dobr 7/10/07***	***% Wibw 7/10/07***	***% KOCZ 7/10/07***
Untreated Check	----	0	0	0	0	0
FALL						
Maverick+NIS	.66 oz+.5%	0	0	98	93	50
Everest+NIS	.6 oz+.25%	0	0	98	20	72
Olympus Flex+NIS+28% N	3.5 oz+.5%+4 pt	0	0	98	20	75
Olympus+NIS	.92 oz+.5%	0	0	98	37	78
Beyond+NIS+28% N	4 oz+.3%+2.5%	0	0	98	62	67
SPRING						
Olympus Flex+MSO	3.5 oz+1.5 pt	0	12	97	35	92
Maverick+NIS	.66 oz+.5%	0	3	75	96	77
Everest+NIS	.6 oz+.25%	0	5	77	50	90
Beyond+NIS+28% N	4 oz+.3%+2.5%	0	10	40	88	90
LSD (.05)		0	10	13	18	15

Table 2. Wild oat control with Everest

RCB; 4 reps
Variety: Granger
Planting Date: 4/20/07
EPOST: 6/1/07; SpWht tillered, 5 lf, 6 in,
Wioa tillered, 5 lf., 6-7 in.
Soil: Clay loam; 2.8% OM; 6.3 pH

Precipitation:
EPOST: 1st week 0.92 inches
2nd week 0.77 inches

Wioa=Wild oat

Comments: The objective of this study was to compare wild oat control from Everest (flucarbazone) with other standard herbicides. Wild oat control with Everest was approximately 96%, which was similar to Puma (10.5 oz/A), Discover, or Axial. Silverado (mesosulfuron), Rimfire (propoxycarbazone+mesosulfuron), or the low rate of Puma (fenoxaprop) resulted in the least control on July 10.

Treatment	*Rate/A*	*% Wioa 6/27/07*	*% Wioa 7/10/07*
Untreated Check	—	0	0
EARLY POSTEMERGENCE			
Everest+Quad 7	.408 oz+1%	96	97
Rimfire+Quad 7	1.75 oz+1%	89	89
Puma	10.5 oz	99	98
Puma	8 oz	95	89
Discover NG	12.8 oz	99	98
Axial+Adigor	8.2 oz+0.6 oz	98	98
Silverado+Quad 7	1.78 oz+1.5 pt	87	79
LSD (.05)		4	5

Table 3. Herbicide tank mixes with Headline

RCB; 3 reps
Variety: Harding
Planting Date: 9/14/06
POST: 4/5/07; Wwht 2-3 lf, 3 in.
Soil: Clay loam; 2.5% OM; 6.2 pH

Precipitation:
POST: 1st week 0.27 inches
2nd week 0.01 inches

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

Comments: The objective of this study was to evaluate winter wheat tolerance to tank mixtures of Headline fungicide (pyraclostrobin) with several herbicides. The treatments were applied in the spring during freezing conditions with approximately 1 inch of snow on the ground, but wheat was in the 2-3 leaf stage. The treatments were intentionally applied during stressful growing conditions to increase the chance of causing some wheat injury. However, no differences in wheat growth or head development were noticed among any of the tank mix treatments. Partial funding was provided by the SD Wheat Commission.

Treatment	***Rate/A***	***% VCRR 7/10/07***
Untreated Check	----	0
POSTEMERGENCE		
Bronate Advanced+Headline	19.2 oz+3 oz	0
Bronate Advanced+Headline	38.4 oz+6 oz	0
Bronate Advanced	38.4 oz	0
Silverado+Bronate Advanced+Headline+MSO	1.78 oz+12.8 oz+3 oz+1.5 pt	0
WideMatch+Headline	16 oz+3 oz	0
WideMatch+Headline	32 oz+6 oz	0
WideMatch	32 oz	0
WideMatch+MCPA ester+Headline	16 oz+12 oz+3 oz	0
Silverado+WideMatch+MCPA ester+ Headline+MSO	1.78 oz+16 oz+12 oz+ 3 oz+1.5 pt	0
Weedmaster+Headline	12 oz+3 oz	0
Weedmaster+Headline	24 oz+6 oz	0
Weedmaster	24 oz	0

Table 4. No-till corn herbicide demonstration

Demonstration
Variety: Pioneer 38H72 RR2 LL
Planting Date: 5/10/07
EPOST: 6/5/07; Corn 3 lf, 3-4 in; Grass 1-3 lf, 1-4 in.
LPOST: 6/14/07; Corn 5 lf, 6-8 in; Grass 2-5 lf, 2-6 in.
Soil: Clay loam; 2.8% OM; 5.9 pH

Precipitation:

EPOST:	1st week	0.17 inches
	2nd week	1.00 inches
LPOST:	1st week	0.35 inches
	2nd week	0.03 inches

Grass=Green foxtail and wild oat

Comments: The objective of this demonstration was to evaluate weed control among several herbicide programs in no-till corn. The weed community was dominated by green foxtail and wild oat. Liberty generally resulted in less control than the Roundup programs. Conditions were dry at the time of application, which may have reduced the activity of Liberty. Adding atrazine to Liberty slightly improved control. Roundup alone resulted in at least 95% control, so tank mix partners were not necessary to increase weed control. The conventional herbicide programs resulted in the least weed control. Adding Laudis (tembotione) to Stout+Atrazine greatly increased grass control from 40 to 63%. Laudis is a new "bleacher" herbicide intended for broadleaf weed control but has some activity on grasses. Grass control was greater with Option+Status than Option+Callisto becuase tank mixing with Status allows the use of MSO whereas a COC is required for Callisto. It is important to use an MSO with Option to optimize grass control.

Treatment	*Rate/A*	*% Grass 6/28/07*
Untreated Check	----	0
	LIBERTY LINK	
EARLY POSTEMERGENCE		
Liberty+AMS	32 oz+3 lb	72
Liberty+atrazine+AMS	32 oz+1 pt+3 lb	81
	ROUNDUP READY	
EARLY POSTEMERGENCE		
Roundup WeatherMax+AMS	22 oz+2.5 lb	95
Roundup WeatherMax+Resolve+AMS	22 oz+1 oz+2.5 lb	97
Roundup WeatherMax+Resolve+ Atrazine+AMS	22 oz+1 oz+ 1 pt+2.5 lb	98
Roundup WeatherMax+Atrazine+AMS	22 oz+1.5 pt+2.5 lb	98
LATE POSTEMERGENCE		
Roundup WeatherMax+AMS	22 oz+2.5 lb	99
Roundup WeatherMax+Status+AMS	22 oz+2.5 oz+2.5 lb	99
Roundup WeatherMax+Clarity+AMS	22 oz+8 oz+2.5 lb	99
Roundup WeatherMax+Aim+AMS	22 oz+.5 oz+2.5 lb	99
Roundup WeatherMax+Laudis+AMS	22 oz+1 oz+2.5 lb	99
	CONVENTIONAL	
EARLY POSTEMERGENCE		
Stout+Atrazine+COC+AMS	.75 oz+1.5 pt+1.5 pt+2 lb	40
Laudis+Atrazine+Stout+MSO+28% N	2 oz+1 pt+.5 oz+1%+1.5 qt	63
Option+Callisto+COC+28% N	1.5 oz+2 oz+1%+1.5 qt	30
Option+Status+MSO+28% N	1.5 oz+5 oz+1.5 pt+2 qt	52

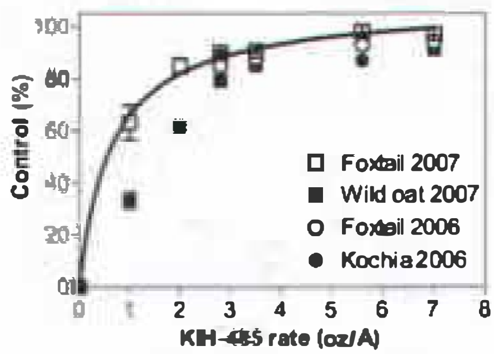
Table 5. Sunflower Tolerance to KIH-485

RCB; 3 reps
Variety: Legend 218 NCL
Planting Date: 6/5/07
PRE: 6/5/07
Soil: Clay loam; 2.8% OM; 5.9 pH

Precipitation:
PRE: 1st week 0.17 inches
2nd week 1.00 inches

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

Comments: The objective of this study was to evaluate weed control and sunflower tolerance associated with KIH-485. This research is part of a collaborative effort with North Dakota State University, Kansas State University, and Colorado State University and funded by the National Sunflower Association. KIH-485 is an experimental herbicide with a similar mode of action as Dual, but may have greater activity on broadleaf weeds. This study was also conducted in 2006, but drought conditions damaged studies in several locations. In 2007, green foxtail and wild oat were the dominant weed species present. Slight stunting and leaf deformities were noticed at the high KIH-485 rates, but the sunflowers eventually grew out of this injury and did not affect yield. The optimum rate for weed control was approximately 3.5 oz/A. Weed control with KIH-485+Spartan (2.8 oz+3 oz) was slightly greater than KIH-485 at 2.8 oz/A. Sunflower yield was similar among the herbicide treatments.



Treatment	***Rate***	***Sunf % VCRR Stunt 6/27/07***	***Sunf % VCRR Stunt 7/10/07***	***% Grft 7/10/07***	***% Wioa 7/10/07***	***Sunf Yield lb/A***
Untreated Check	—	0	0	0	0	872
PREEMERGENCE						
KIH-485	1 oz	0	0	63	33	768
KIH-485	2 oz	0	0	85	62	758
KIH-485	2.8 oz	0	0	90	79	716
KIH-485	3.5 oz	5	0	91	85	873
KIH-485	5.6 oz	17	3	98	94	873
KIH-485	7 oz	22	15	97	91	843
KIH-485+Spartan 4F	2.8 oz+3 oz	2	0	93	85	913
KIH-485+Spartan 4F	3.5 oz+3 oz	0	0	95	89	845
KIH-485+Spartan 4F	2.8 oz+4 oz	10	0	97	92	989
KIH-485+Spartan 4F	3.5 oz+4 oz	5	0	97	92	833
LSD(.05)		6	3	7	6	208

Table 6. Express programs in Express-tolerant sunflowers

RCB; 3 reps
Variety: 63N81
Planting Date: 6/5/07
PRE: 6/5/07
POST: 6/27/07; Sunf 6 lf; Bygr
Soil: Clay loam; 2.8% OM; 5.9 pH

Precipitation:

PRE:	1st week	0.17 inches
	2nd week	1.00 inches
POST:	1st week	0.10 inches
	2nd week	0.05 inches

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

Comments: The objective of this study was to evaluate weed control using Express in Express-tolerant sunflowers. Express may be used to control broadleaf and some grass species, but broadleaf weed densities were not adequate to get control ratings. Grass control was less when Assure was tank-mixed with Express at 0.5 oz/A than at 0.25 oz/A suggesting possible antagonism.

Treatment	*Rate/A*	*% VCRR 7/10/07*	*% Bygr 7/10/07*
PREEMERGENCE & POSTEMERGENCE			
Prowl 3.3 EC&Express 50SG+ Assure II+COC	2 pt&.25 oz+ 8 oz+1.5 pt	0	89
Prowl 3.3 EC&Express 50SG+ Assure II+COC	2 pt&.5 oz+ 8 oz+1.5 pt	0	89
Spartan 4F&Express 50SG+ Assure II+COC	4.5 oz&.5 oz+ 8 oz+1.5 pt	0	86
Spartan 4F&Express 50SG+ Assure II+COC	4.5 oz&.25 oz+ 8 oz+1.5 pt	0	88
POSTEMERGENCE			
Express 50SG+Assure II+COC	.25 oz+8 oz+1.5 pt	0	88
Express 50SG+Assure II+COC	.5 oz+8 oz+1.5 pt	0	72
Untreated Check	----	0	0
LSD (.05)		0	9

Table 7. Alternative herbicides for sorghum

Demonstration
Variety: Garst 5624
Planting Date: 6/5/07
PRE: 6/5/07
POST: 6/27/07; Sorghum 4-5 lf, 5-7 in; Grass 2-5 in.
Soil: Clay loam; 2.8% OM; 5.9 pH

Precipitation:

PRE:	1st week	0.17 inches
	2nd week	1.00 inches
POST:	1st week	0.10 inches
	2nd week	0.05 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)
Grass=Barnyardgrass, foxtail

Comments: The objective of this demonstration was to evaluate some registered and non-registered herbicides for sorghum. Grasses (foxtail and barnyardgrass) were the dominant weeds in this demonstration. Lumax (S-metolachlor + mesotrione + atrazine) and KIH-485 (experimental) resulted in similar weed control as other registered herbicides and did not cause visual crop injury. Paramount, one of the few registered postemergence herbicides for grass control, resulted in about 75% control. Non-registered postemergence herbicides were evaluated for crop tolerance in an attempt to identify options for Canada thistle control in sorghum. Ally (metsulfuron), Status (dicamba+diflufenzopyr+safener), and Distinct (dicamba+diflufenzopyr) caused 40-60% sorghum stunting. However, WideMatch (fluroxypyr+clopyralid) did not cause noticeable sorghum injury.

Treatment	*Rate/A*	*% VCRR Stunting 7-10-07*	*% Grass 9-17-07*
Untreated Check	----	0	0
PREEMERGENCE			
Dual II Magnum	1.67 pt	0	93
G-Max Lite	2 pt	0	96
Micro-Tech	2.5 qt	0	95
Lumax	1.5 qt	0	96
KIH-485	2.8 oz	0	93
POSTEMERGENCE			
Paramount+MSO	4 oz+1 qt	0	75
Buctril	1.5 pt	0	0
2,4-D amine	.5 pt	0	0
Ally+2,4-D amine	.05 oz+8 oz	40	0
Clarity	.5 pt	0	0
Status+NIS+28% N	10 oz+.25%+1.25%	50	0
Distinct+NIS+28% N	4 oz+.25%+1.25%	60	0
WideMatch	1.33 pt	0	0

Table 8. Pulse demonstration

Demonstration
Variety: Chickpea - Dwelly
Field pea - Salute
Lentil - Richlen
Planting Date: 5/10/07
PPI&PRE: 5/10/07
POST: 6/8/07; Chickpea 2-5 in, Field pea 2-7 in; Lentil 3-5 in.
Soil: Clay loam; 2.1% OM; 6.4 pH

Precipitation:

PPI&PRE:	1st week	0.00 inches
	2nd week	0.32 inches
POST:	1st week	0.77 inches
	2nd week	0.27 inches

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

Comments: The objective of this demonstration was to evaluate several herbicide chemistries for crop tolerance in chickpea, field pea, and lentils. Several PPI herbicides appeared to cause some stand reduction to field peas and lentils. Intrro (alachlor) appeared to cause less injury when applied PRE than PPI. Karmex (diuron), Valor (flumioxazin), FirstRate (cloransulam), and Balance Pro (isoxaflutole) applied PRE caused significant stand reduction to field peas and lentils. Among the PRE treatments, FirstRate caused the greatest chickpea stand reduction. Treatments with Basagran cause unacceptable injury to chickpeas and lentils, but relatively minor injury to peas.

		Chickpea		Field Pea		Lentil	
Treatment	***Rate***	% VCRR Stand Reduction 7/10/07	% VCRR Stunt 7/10/07	% VCRR Stand Reduction 7/10/07	% VCRR Stunt 7/10/07	% VCRR Stand Reduction 7/10/07	% VCRR Stunt 7/10/07
Untreated Check	----	0	0	0	0	0	0
PREPLANT INCORPORATED							
Treflan	2 pt	0	0	10	0	20	0
Sonalan	3 pt	5	0	20	0	20	0
Prowl H_2O	2.75 pt	0	0	0	0	0	0
Intrro	3 qt	0	0	20	0	20	0
PREEMERGENCE							
Dual II Magnum	1.67 pt	0	0	10	0	0	0
Stalwart	1.67 pt	5	0	0	0	0	0
Python	1 oz	20	0	15	0	0	0
Outlook	19 oz	0	0	0	0	0	0
Intrro	3 qt	0	0	0	0	0	0
Spartan 4F	6 oz	0	0	0	0	0	0
Lorox DF	1.5 lb	0	0	0	0	0	0
Karmex DF	1.4 lb	15	0	50	0	70	20
Aim	1 oz	0	0	0	0	0	0
Degree	4.25 pt	0	0	0	0	10	0
Define SC	15 oz	0	0	0	0	0	0
Sencor DF	.5 lb	20	0	0	0	10	0
Axiom	10 oz	0	0	0	0	0	0
Valor	3 oz	15	0	50	20	50	20
FirstRate	.6 oz	70	20	70	30	60	0
Balance Pro	1.5 oz	0	10	60	20	50	0

Table 8. Pulse Demonstration (Continued . . .)

		Chickpea		Field Pea		Lentil	
Treatment	***Rate/A***	***% VCRR Stand Reduction 7/10/07***	***% VCRR Stunt 7/10/07***	***% VCRR Stand Reduction 7/10/07***	***% VCRR Stunt 7/10/07***	***% VCRR Stand Reduction 7/10/07***	***% VCRR Stunt 7/10/07***
PREEMERGENCE (Continued . . .)							
Princep 4F	1 qt	0	0	25	0	10	0
Pursuit 2L	3 oz	15	15	10	0	0	0
Pursuit 2L	1.5 oz	0	0	0	0	0	0
Pursuit Plus	2.5 pt	15	15	10	0	0	0
POSTEMERGENCE							
Pursuit 2L+NIS	3 oz+.25%	0	0	0	0	0	0
Raptor+NIS	4 oz+.25%	0	0	0	0	0	0
Raptor+Basagran+NIS	4 oz+2 pt+.25%	30	30	0	10	99	99
Basagran+NIS	2 pt+.25%	40	50	0	0	99	99
Ultra Blazer+NIS	8 oz+.25%	0	0	0	0	0	0
Outlook	19 oz	0	0	0	0	0	0
Sencor DF	.33 lb	0	0	0	0	0	10
2,4-DB+NIS	1 pt+.5%	10	0	0	15	0	0
Aim+NIS	.5 oz+.25%	0	0	10	0	0	0

Table 9. Soybean row spacing and density effects on weed management

RCB; 3 reps
Variety: AG 1401
Planting Date: 6/5/07
PRE: 6/5/07
LPOST: 7/19/07
Soil: Clay loam; 2.8% OM; 5.9 pH

Precipitation:		
PRE:	1st week	0.17 inches
	2nd week	1.00 inches
LPOST:	1st week	0.00 inches
	2nd week	0.11 inches

Comments: The objective of this study was to evaluate the benefit of preemergence herbicides in soybeans planted at a moderate and low density (180,000 to 100,000 plants/A) or in wide or narrow rows (30 to 7.5 inches). Weed pressure was relatively low, but caused approximately 25% yield loss in the untreated check. Making a single application of Roundup late postemergence (July 19), resulted in approximately 15% yield loss relative to the treatments where a preemergence herbicide was applied. There was no density effect on yield at the 30 inch row spacing, but yield was greater at the high density in several treatments with rows spaced 7.5 inches apart. Yields were also greater at 7.5 than 30 inch row spacing for several treatments. The highest yields resulted from the combination of planting 7.5 inch wide rows, 180,000 plants per acre, and applying either Valor (2 oz/A) or Intro+Spartan prior to a late postemergence application of Roundup. This study was also replicated at the Southeast Experiment Farm near Beresford, SD. Partial funding was provided by the South Dakota Soybean Research and Promotion Council.

Treatment	*Rate/A*	*Population*	*SOYBEAN YIELD (bu/A)* Row Spacing (30 in)	Row Spacing (7.5 in)
Untreated Check	----	100	30	34
		180	34	49
PREEMERGENCE & LATE POSTEMERGENCE				
Valor&Roundup WeatherMax+AMS	1 oz&22 oz+2.5 lb	100	44	51
		180	45	53
Valor&Roundup WeatherMax+AMS	2 oz&22 oz+2.5 lb	100	40	49
		180	46	61
Intro+Spartan4F& Roundup WeatherMax+AMS	1.5 qt+4 oz& 22 oz+2.5 lb	100	45	52
		180	45	60
LATE POSTEMERGENCE				
Roundup WeatherMax+AMS	22 oz+2.5 lb	100	37	40
		180	39	49
LSD (.05)				[illegible]

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