PROJECT TITLE: Spring Cereal Forage Performance Evaluation under No-Till, Dryland, Chemical Fallow Conditions near Havre, Montana. (Exp. 10-FR03).

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OBJECTIVES:

To provide spring cereal forage producers in north central Montana with a reliable, unbiased, up-to-date source of information that will permit valid dryland forage production comparisons among improved and experimental cereal forage entries submitted for testing by participating commercial and university entities. This information should help cereal forage producers in north central Montana select varieties best suited to this region of the state.

METHODS:

There were eight barley and two triticale spring cereal forage experimental lines and named varieties submitted for testing under no-till, dryland, chemical fallow conditions near Havre, MT (Table 3). Of the entries, six are publically available and two are experimental lines.

The trial was seeded as randomized complete-block design, in replicated, 3-row, 22-foot plots on a 12-inch row spacing utilizing a self-propelled cone seeder. The cone-seeder was equipped with 'Haybuster' openers modified to provide narrow, paired-row seed placement for enhanced seed/fertilizer separation. Each plot was seeded with 41 grams, equal to seeding 60 lbs per acre. Seeding depth was 1 ½ inches. Heading date was recorded as the date when 50 percent of the heads within a plot had elongated above the collar of the flag leaf. Forage harvest date of each plot was seven days post heading. One entire row (18 feet) was hand clipped from each plot for determination of forage dry matter. Following dry matter determination, samples were ground and submitted for quality analyses. Results of these analyses are summarized for the spring cereal forage in Table 3. Two rows of each spring cereal forage plot were allowed to ripen in order to record seed production components of the cereal forage entries. Due to wildlife depredation, there were no heads left to harvest, therefore, no data is available. Trial management information is listed for the spring cereal forage trial in Table 4.

RESULTS and SUMMARY:

The cereal forage cropping environment in 2010 at the Research Center was categorized as above average with higher than normal precipitation and lower than normal temperatures. At Havre, total annual growing season precipitation (9/1/08 through 8/31/09) was 14.61 inches, 22.5 percent more than the average for all years since 1916 (Table 2). April 1 through July 31 precipitation was 9.69 inches or 144 percent of the 95 year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through October, were 2220, 93 percent of the average for the last 59 years (1951-2010). The last spring frost was one day early with the first fall frost 24 days late, resulting in 154 frost-free days, 25 days longer than the 95 year average. September 2009 through March 2010 precipitation was 91 percent of the long-term average. The April through June growing season saw an average daily temperature at 51.5 degrees F, 1.7 degrees below normal. July and August average temperatures were 3.1 percent lower than normal with the high for 2010 recorded on August 27 at 102 degrees F. There were 18 days 90 degrees F or above, and only 1 day with temperatures 100 degrees F or above. Overall, the growing season was cooler than the 95-year average. The minimum winter temperature was –35 degrees F on December 7. Crop outlook was very good with adequate fallow-stored soil moisture and generally favorable growing conditions.

Spring cereal forage dry matter yields averaged 3.0 ton/ac. 'Haybet', 'Hays', 'Hockett' and 'Stockford' barley were standouts, all yielding over 3.2 ton/ac. Forage yield and quality data including protein, adf, ndf, crude fiber and nitrates are located in Table 3 while nitrate concentration effects on livestock are summarized in Table 1.

FUTURE PLANS:

Although there is currently no funding available to support this research, Northern Agricultural Research Center, near Havre, Montana believes that this information is very important for local farmers and ranchers and will continue the spring cereal forage trial in 2011.

TABLE 1. Effect of nitrate concentration on livestock.

(Note: These guidelines for Montana are more conservative than those published from other states.)

Reported on 100% dry matter basis* as:		
NO_3-N (ppm)	**NO_3 (ppm)**	**Comment**
< 350	< 1500	Generally safe for all conditions and livestock.
350-1130	1500-5000	Generally safe for nonpregnant livestock. Potential early-term abortions or reduced breeding performance. Limit use to bred animals to 50% of the total ration.
1130-2260	5000-10,000	Limit feed to 25-50% of ration for nonpregnant livestock. **DO NOT FEED TO PREGNANT ANIMALS** - may cause abortions, weak calves and reduced milk production.
> 2260	> 10,000	**DO NOT FEED**. Acute symptoms and death.
*If nitrate content of a feed is reported on an "as is" basis, convert to 100% dry matter basis to compare it to levels in this table. For example, silage at 50% moisture that contains 600 ppm NO_3-N on an "as is" basis contains 1200 ppm on 100% dry basis; thus, it fits the second group in this table.		

Information adapted from MontGuide MT 200205 AG, "Nitrate Toxicity of Montana Forages", by Dennis Cash, Rick Funston, Marc King and Dave Wichman.

Table 2. Summary of climatic data by months for the 2009-2010 crop year (September to August) and averages for the period 1916-2010 at the Northern Agricultural Research Center, Havre, Montana.

Month Year	Sep 2009	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	Jun 2010	Jul 2010	Aug 2010	Crop Year
Precipitation (inches)													**Total**
Current Year	0.39	1.25	0.00	0.69	0.72	0.28	0.31	2.39	3.36	2.54	1.40	1.28	14.61
95-Year Average (1916 to 2009-10)	1.14	0.66	0.43	0.45	0.44	0.32	0.54	0.99	1.78	2.55	1.43	1.19	11.92
Mean Temperature (^{o}F)													**Average**
Current Year	64.1	38.8	38.8	7.0	13.1	12.2	32.7	44.7	49.4	60.3	66.7	66.7	41.2
95-Year Average (1916 to 2009-10)	56.2	45.7	30.2	19.5	15.4	19.9	30.0	43.6	54.0	61.8	69.2	67.3	42.7

Last killing frost in spring*

2010 _____ May 13th (31˚)
Ave. 1916-2010 _____ May 14th

First killing frost in fall*

2010 _____ October 14th (31˚)
Ave. 1916-2010 _____ September 20th

Frost free period

2010 _____ 154 days
Ave. 1916-2010 _____ 129 days

Growing degree days (base 50)

May 1-Oct 31, 2010 _____ 2219.5
Ave. 1951-2010 _____ 2379.2

Maximum summer temperature _____ 102˚ August 27th
Minimum winter temperature _____ -35˚ December 7th

*In this summary 32^{o} is considered a killing frost.

TABLE 3. SPRING CEREAL FORAGE - forage components. Spring Cereal Forage Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, MT. 2010. (Exp# 10-FR03-FR)

Species	CULTIVAR or SELECTION	2010 FORAGE DRY YIELD Lb/Ac	2010 FORAGE DRY YIELD Ton/Ac	FORAGE MOISTURE %	HEADING DATE Julian	HEADING DATE Calendar	PLANT HT inches	PROTEIN %	ACID DET FIBER %	NEUTRAL DET FIBER %	CRUDE FIBER %	NITRATES NO3 ppm
Barley	Haxby	4989.6	2.5	72.9	180.3	29-Jun	32.1	12.5	30.2	51.5	29.1	2535
Barley	Haybet	7354.4**	3.7	74.4	180.3	29-Jun	38.6	13.5	29.1	51.1	28.9	2462
Barley	Hays	6404.4*	3.2	73.6	183.0	2-Jul	32.3	11.1	29.9	51.3	27.7	1612
Barley	HB62-2	5941.0	3.0	73.3	183.0	2-Jul	30.2	9.2	49.9	53.4	29.1	4650
Barley	Hockett	6990.0*	3.5	71.1	182.7	3-Jul	29.5	10.3	29.8	50.8	29.4	2801
Barley	Horsford	4223.7	2.1	78.9	177.0	26-Jun	38.2	12.7	32.6	55.7	30.4	5846
Barley	Lavina	6795.0	3.4	73.0	183.0	2-Jul	31.5	9.0	32.6	53.2	31.5	2504
Barley	Stockford	6764.0*	3.4	74.8	180.3	29-Jun	36.7	9.1	31.1	52.3	29.4	1632
Triticale	04T90141-141	5396.4	2.7	73.8	184.0	3-Jul	50.3	10.5	36.3	58.4	33.7	2190
Triticale	Pronghorn	5658.4	2.8	76.3	180.0	29-Jun	43.9	14.5	32.9	54.5	31.5	4639
EXPERIMENTAL MEANS		6051.7	3.0	74.2	181.5	1-Jul	36.3	11.2	33.4	53.2	30.1	3087
LSD (0.05)		1278.4	0.6	2.4	0.5	-	3.1	ns	ns	ns	2.5	ns
C.V.: (S / MEAN)*100		12.3	12.3	1.9	0.2	-	5.0	15.0	26.3	4.0	3.7	64.3

** Indicates highest yielding cultivar within a column.

***** Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 4. Spring Cereal Forage Site Resource & Management Data: (Exp# 10-FR03)

Field	A-7-1	2" Soil Temp (°F) @ Plnt'g	67	Post PAW (in.) 0-6"	0.80	Herbicide App. Date	6/4
Quarter	NW	4" Soil Temp (°F) @ Plnt'g	67	Post PAW (in.) 6-24"	1.66	Herbicide Product	Box- M
Section	33	Fertilizer Formulation	Gran.Blend	Post PAW (in.) 24-36"	1.32	Herbicide Rate (/ac)	24 oz
Township	32N	Fertilizer Placement	Bnd at Plntg	Post PAW (in.) 36-48"	2.19	Precip (in.) Plnt'g-Harvest	n/a
Range	15E	Fert. Rate (lbs/ac) N	50	Post PAW (in.) 0-48"	5.97	Precip (>.1) Plnt'g-Harvest	n/a
Latitude	N48 29.742'	Fert. Rate (lbs/ac) P2O5	28	Precip (>.1) Hvst-Post	n/a	Harvest Date	variable
Longitude	W109 47.989'	Fert. Rate (lbs/ac) K2O	18	Dry Surf Soil (in.) @ Plnt'g	0.25	Rooting Depth (in.)	n/a
Soil Series	Joplin Cl	Herbicide App. Date	6/4	2" Soil Temp (°F) @ Plnt'g	67	Post PAW (in.) 0-6"	0.80
Cropping System	NT-ChmFlw	Herbicide Product	Box- M	4" Soil Temp (°F) @ Plnt'g	67	Post PAW (in.) 6-24"	1.66
Previous Crop	Lentils	Herbicide Rate (/ac)	24 oz	Fertilizer Formulation	Gran.Blend	Post PAW (in.) 24-36"	1.32
Planting Date	4/22	Precip (in.) Plnt'g-Harvest	n/a	Fertilizer Placement	Bnd at Plntg	Post PAW (in.) 36-48"	2.19
Planting Depth (in.)	1.5	Precip (>.1) Plnt'g-Harvest	n/a	Fert. Rate (lbs/ac) N	50	Post PAW (in.) 0-48"	5.97
Moist Soil Depth @ Plnt'g	48+	Harvest Date	variable	Fert. Rate (lbs/ac) P2O5	28	Precip (>.1) Hvst-Post	n/a
Dry Surf Soil (in.) @ Plnt'g	0.25	Rooting Depth (in.)	n/a	Fert. Rate (lbs/ac) K2O	18		