Spring Cereal Forages

By David Wichman

Spring cereal forages are a significant component of Montana's forage production. Like most crops, soil fertility, variety selection and other cultural practices impact spring cereal forage yield and quality. Cereal forages are frequently utilized for two to three growing seasons to provide diversity in an alfalfa production system. Harvesting cereals as forages provides the opportunity to remove weeds prior to seed set without the use of herbicides. The firm soil and short stubble left after cereal forage harvest often provides an ideal seed bed for late summer and fall seeding of perennial forage species.

Early seeding of spring cereal forages, particularly barley, is encouraged to maximize plant growth during cooler spring temperatures. Spring germinating weeds are less of a concern in cereal forages compared to cereals for grain because the crop is typically harvested prior to weed seed maturation. Plus, the weedy plants can contribute to the forage yield. However, dense weed populations can reduce robust growth and rooting depth resulting in reduced yields. Also, some weed species, such as kochia, may accumulate nitrates at levels higher than the cereal forage.

Harvesting in the early milk stage or earlier is encouraged to insure high quality forage. It improves the chances of preventing the production of viable weed seeds. Harvesting at early reproductive stages reduces the losses to leaf drop, head breakage and seed shatter. Plus the absence of grain kernels reduces rodent attraction and feeding. Livestock are more apt to utilize the whole plant in long stem hay rather than selecting the heads and leaving the straw. The presence of barley grain in the cereal forage can increase the incidence of bloating when fed in conjunction with alfalfa. Further, harvesting at heading or soon after provides for more uniform curing. The more developed the grain kernel the more time the head requires to cure relative to the stem and leaves. Failure to consider kernel moisture when baling cereal forages has led to incidence of molding and heating in the bale.

Adequate soil fertility is critical to producing optimum cereal forage yields. In 2006, the addition of NPKS (10-10-10-05 lbs/a) with the seed plus 45 lbs N as top-dress urea produced an average of 0.442 t/a more dry matter than 45 lbs N per acre alone. A contributing factor to the higher yields with the "pop-up" fertilizer was an earlier heading date, by about 5 to 7 days, which allowed the cereals to escape some drought and heat stress. The yield response to pop-up fertilizer is dependent on soil fertility and weather. Disproportionate N levels relative to plant available P, K, S or other nutrients can contribute to nitrate accumulation in the plant tissue.

Hooded hay barley varieties are usually preferred over other spring cereals for forage. The hooded character is less apt to cause eye irritation or lump jaw when

fed as long stem hay. Early seeded barley produces higher dryland forage yields compared to oats, emmer and spelt (Table 2). Also, barley forage is generally higher in feed value than emmer, oats, spelt and wheat (Table 3). Using oats as cereal forage is discouraged because oats typically has higher nitrate content. Plus oats have higher ADF and NDF values than barley in the same environments.

Haybet, Hays and Stockford are three currently popular hooded barley varieties. Tables 4, 5 and 6 provide data showing the relative production of these varieties across several environments. Note the inconsistency of the yield rankings of these varieties. This illustrates the affect that the environment, including the weather on a given year, can have on the relative yield of a variety.

Data presented here was gathered by MSU Forage extension specialist Dennis Cash and Montana Ag Experiment Station researchers Ken Kephart- SARC, Marty Knox- WARC, Pat Hensleigh- MSU, Peggy Lamb – NARC, Dave Wichman –CARC and NDSU researcher Pat Carr – Dickinson ERC. Funding provided by the Montana Extension Service, the Montana and North Dakota Ag Experiment Stations and variety testing fees.

Table 1 2006 Spring cereal forage response to NPKS "pop-up" fertilizer with the seed.

Variety	NPKS 10+10+10+5	No "PopUp" fertilzer	Yield Difference
	t/a		
MT981427	1.943	1.439	0.504
MF050501	1.715	1.516	0.199
MT981397	1.799	1.394	0.405
MF0506	1.866	1.298	0.569
Haybet	1.854	1.261	0.593
MT981384	1.750	1.305	0.445
Bestford	1.857	1.169	0.688
Hays	1.694	1.330	0.364
Stockford	1.718	1.289	0.428
MF050502	1.569	1.424	0.145
MF050505	1.687	1.265	0.422
MF050507	1.642	1.257	0.384
Westford	1.700	1.043	0.656
Red 1 trit	1.451	1.070	0.381
Mean	**1.732**	**1.29**	**0.442**
CV 1	10.13	13.64	33.320
LSD(0.05)	0.294	0.294	0.246

Seeded: 10-April-06 NTRC on hayed winter triticale stubble
Fertilizer: **All plots** received **45 lbs** N as top-dress urea.

Table 2 2004 Spring cereal forages dry matter yields at three locatioins.

variety	species	CARC CC - SW9	CARC CC - SE 4	WARC Irrigated	3 Loc Average
		t/a	t/a	t/a	t/a
Logan	barley	2.416	2.231	**3.375**	2.674
Stockford	barley	2.327	2.341	3.226	2.631
Hays	barley	2.425	**2.356**	3.109	2.630
Valier	barley	**2.482**	2.248	3.099	2.610
Haybet	barley	2.415	2.037	3.279	2.577
Harrington	barley	2.362	2.172	3.120	2.551
Red 1	triticale	2.151	2.210	3.289	2.550
91002005	triticale	2.161	2.059	3.200	2.473
Bestford	barley	2.386	1.839	3.104	2.443
Westford	barley	2.296	1.826	3.092	2.405
Monico	oat	2.070	1.704	3.370	2.381
Moravian 37	barley	2.149	2.053	2.906	2.369
Maverick	oat	2.095	1.780	3.100	2.325
SK3P	spelt	1.980	1.810	3.107	2.299
Paul	oat	1.933	1.996	2.938	2.289
Otana	oat	1.899	1.576	3.243	2.239
93ST59	wht X splt	1.836	1.950	2.824	2.203
Lucile	emmer	1.751	1.525	2.931	2.069
Mean		2.174	1.984	3.128	2.429
P-value		0	0.0005	0.8172	
CV1 %		6.818	11.34	10.6	
LSD(0.05 by t)		0.246	0.3734	0.5505	

CARC - Central Agricultural Research Center near Moccasin, Montana
WARC - Western Agricultural Research Center near Corvallis, Montana

Table 3 Feed quality of six spring cereal forage species across three 2004 locations.

Variety	Species	ADF	NDF	Crude Protein	TDN	RFV	2 Locations Nitrate
		%	%	%	%	%	%
Hays	barley	**28.2**	**49.6**	11.5	**62.4**	114	0.073
Haybet	barley	**27.7**	**49.8**	11.8	**62.9**	115	0.050
Logan	barley	**25.4**	**44.5***	10.8	**66.0**	137	0.027
Westford	barley	**27.7**	**50.1**	**12.2**	**63.1**	114	0.088
Harrington	barley	**26.6**	**49.5**	10.5	**65.0**	118	0.042
Bestford	barley	**27.9**	51.5	11.4	**63.1**	111	0.058
Moravian 37	barley	**24.7***	**45.5**	11.4	**66.4***	**134**	0.038
Monico	oat	**28.0**	52.8	11.3	**62.8**	108	**0.145**
BZ 598-227	barley	**26.8**	**49.3**	10.9	**63.4**	116	0.033
Valier	barley	**26.9**	**50.5**	11.4	64.0	116	0.063
Otana	oat	29.9	52.8	11.4	60.9	106	**0.117**
Maverick	oat	29.7	54.5	11.2	**61.3**	102	**0.108**
Paul	oat	29.4	52.9	11.8	**61.2**	105	**0.120**
Red 1	triticale	32.8	56.4	11.8	58.0	95	0.043
91002005	triticale	31.7	53.1	11.5	58.9	102	0.033
93ST59	wht X splt	29.7	51.4	11.8	**61.2**	108	0.025
SK3P	spelt	31.8	53.2	**12.0**	58.8	102	0.075
Lucile	emmer	31.1	54.2	**12.0**	59.1	100	0.045
Mean		28.66	51.19	11.48	62.12	111.3	0.0658
P-value		0.026	0.1107	0.9998	0.0477	0.0368	0.7785
CV1		13.9	11.7	20.8	7.3	17.9	157.9
LSD(0.05)		4.584	6.892	ns	5.21	22.88	ns

ADF - acid detergent fiber (lower better) TDN - total digestible nutrients (highr better)

NDF - neutral detergent fiber (lower better) RFV - Relative feed value (higher better)

Table 4 2005 Montana uniform spring cereal forage variety trial dry matter yields.

Variety/line	Species	Post Farm Bozeman	WARC Corvallis	DREC Dickinson	NWARC Kalispell	CARC Moccasin	CARC Winifred	Average
		t/a	t/a	t/a	t/a	t/a	t/a	t/a
MT981427	barley	3.470	3.541	2.494	3.25	2.187	3.264	3.034
MT981384	barley	3.464	3.520	2.269	3.27	2.186	2.992	2.951
Hays	barley	3.427	3.613	2.315	3.01	2.067	3.046	2.914
Red 1 trit	triticale	2.827	2.573	2.585	3.51	2.422	2.799	2.785
MT981397	barley	3.526	3.123	1.655	3.04	2.095	3.194	2.773
Bestford	barley	2.890	3.164	2.140	3.48	2.166	2.369	2.701
Stockford	barley	3.138	3.019	1.505	2.83	2.006	3.641	2.690
Haybet	barley	3.197	3.208	1.905	2.93	2.066	2.822	2.688
Westford	barley	2.876	2.782	2.356	2.79	2.083	2.751	2.606
Lucile	emmer	2.490	3.380	2.651	2.55	1.775	2.650	2.583
Awnless SW7	triticale	2.802	3.500	2.560	2.77	1.699	1.946	2.547
Horsford	barley	2.813	2.236	1.894	3.23	2.202	2.516	2.482
91002005	triticale	2.620	2.763	2.275	2.87	2.061	1.840	2.404
Kntz1094	spelt	2.826	2.408	2.393	2.92	1.676	1.760	2.330
MTCF 30	triticale	2.851	2.899	1.858	2.67	1.305	2.242	2.304
92L012020	triticale	2.429	2.791	2.101	2.36	1.853	2.201	2.289
SK3P Select	spelt	3.005	2.817	1.815	2.35	1.646	2.042	2.280
Mondak	emmer	2.147	2.886	1.825	1.85	0.983	1.639	1.888
Mean		2.933	3.012	2.144	2.87	1.915	2.540	2.569

Post Farm: air dry basis. Other locations: dry weight basis. WARC - Western Ag Research Center
DREC - Dickinson, ND Research and Extension Center NWARC -Northwest Ag Research Center
CARC- Central Ag Research Center

Table 5 2006 Montana multi-Location spring cereal forage dry matter yields.

Variety/Line	CARC after Mustard	CARC after winter Cereal forage	SARC Dryland Fallow	SARC Irrigated Recrop	NARC Dryland Fallow	Bozeman Irrigated Recrop	Six Location Average
	t/a	t/a	t/a	t/a	t/a	t/a	t/a
MT981397	2.350	1.799	3.221	4.461	1.632	2.943	2.734
MT981384	2.188	1.750	3.288	4.457	1.369	2.987	2.673
MF050501	2.277	1.715	3.362	4.057	1.403	3.075	2.648
MT981427	2.383	1.943	3.059	4.154	1.274	3.064	2.646
Stockford	2.430	1.718	2.898	3.705	1.666	3.395	2.635
MF050502	2.261	1.569	2.871	3.969	1.640	3.259	2.595
MF050507	2.240	1.642	2.927	3.867	1.398	3.152	2.538
Haybet	2.426	1.854	3.065	3.653	1.520	2.525	2.507
MF050505	2.245	1.687	2.822	3.518	1.680	2.863	2.469
MF0506	1.968	1.866	2.765	3.823	1.391	3.023	2.473
Hays	2.118	1.694	2.897	3.398	1.476	2.618	2.367
Red 1 trit	1.579	1.451	2.700	4.138	1.537	2.532	2.323
Bestford	1.796	1.857	2.660	3.721	0.961	2.097	2.182
Westford	1.828	1.700	2.387	3.383	1.494	2.069	2.144
Mean	2.149	1.732	2.923	3.879	1.46	2.829	
CV 1 %	9.8	10.1	8.4	7.9	30.2	9.7	
LSD(0.05 by t	0.3514	0.2935	0.4128	0.5117	0.740	0.392	

NARC - Northern Ag Research Center, Havre
SARC - Southern Ag Research Center, Huntley
CARC - Moccasin no till recrop
Bozmn - Bozeman Fort Ellis

Table 6 2007 Spring cereal forage variety trial under no-till continuous crop.
Exp2370 Central Agricultural Research Center. Moccasin, Montana

Vareiety/Line	Head Date	Plant Height	Dry Matter Content	Dry Matter Yield	Grain Yield	Test Weight	Grain Yld Rank
	d of y	cm	%	t/a	lbs/a	lbs/bu	
MF050501	183	68	0.391	**2.777**	2557	48.2	7
Stockford	180	79	0.351	**2.747**	2414	48.3	10
MT981384	181	70	0.382	**2.739**	**2770**	50.5	4
MF050505	180	68	0.369	**2.670**	**3191**	50.0	**1**
MT981427	180	83	0.339	**2.465**	2182	51.4	11
MT981397	180	72	0.36	**2.454**	2700	50.8	**5**
MF0506	181	75	0.326	**2.402**	**2863**	51.1	2
Hays	183	66	0.372	**2.388**	2473	48.5	9
Goose Wheat	181	68	0.358	**2.265**	2574	50.9	6
MF050507	179	64	0.349	2.132	**2820**	51.2	3
Bestford	183	86	0.286	2.062	2478	43.6	8
Haybet	180	70	0.362	2.044	1854	49.8	13
Red 1 trit	179	101	0.342	2.016	1725	44.7	14
Westford	184	72	0.316	1.870	2076	44.1	12
mean	181	74.43	0.3502	2.359	2477	48.79	
P value	0.0			0.0158	0.0		
CV 1	0.402			13.71	10.87		
LSD 0.05	1.221			0.543	451.9		

Seed date: 23-Apr-07 Harvest Date: 2 July and 6 July 2007
Fertilizer: 10-10-10-5 NPKS w/seed 45 N topdress on 7-May-07

Bold yield data indicates the yield is similar to the highest yield.