CEREAL FORAGES: A TOOL IN MANAGING LIMITED WATER RESOURCES

Dave Wichman[1]

Winter and spring cereal forage became a staple in many Montana forage production systems in the late 1990s as a result forage shortages caused by persisting drought conditions. Many producers used cereals as an emergency source of hay. Concurrent to the droughty period, the Montana Extension Service and Montana Agricultural Experiment Station did extensive cereal forage production investigations and producer education on production methods and utilization. The introduction and promotion of the hooded barley cultivar `Haybet' provided a vehicle to carry the message of the attributes of cereal forages. Haybet was a boon to both the forage producers and seed producer/dealers. Haybet became the second most widely grown barley in Montana. Only recently has Lavina, for dryland production, and Hays, for irrigated production, displaced much of the Haybet acres.

In Montana production environments, winter and spring cereal forages often produce more forage per acre than perennial forage species. The mean yields of winter cereal forage cultivar/species trials were compared to the mean yields of alfalfa cultivar trials at four Montana locations. For the data presented, the mean winter cereal for yield exceeded the mean alfalfa yield. While the data for these comparisons were derived from adjacent trials and thus not a true statistical comparisons, the message is clear, cereals have high forage yield potential. The winter cereals at the Bozeman and Huntley were produced in a crop-fallow dryland environment and had yields 138% and 280% greater than adjacent dryland alfalfa yields. The Kalispell yields were from irrigated environments and the winter cereal forage yields 141% of the mean alfalfa yield. The Moccasin winter cereal forage yields, produced in a continuous annual crop environment, were 328% of the dryland alfalfa yield. Over an eleven year period, at the dryland Moccasin site, spring and winter cereal forages continuously produce more dry matter per acre than established stands of alfalfa.

In Montana, there has been an increase in harvesting cereal forges as graze for variety of reasons and at various stages ranging from the three leaf through heading stage. Knowledge of the effect of maturity on forage quality and relative yield potential may be useful for the producer in developing their harvest strategy. Dryland winter cereals can accumulate 150 lbs. to > 200 lbs./ac. of dry matter per day during the stem elongation stage. Forage quality decreases as the plant matures, so harvest stage should be adjusted to obtain the desired forage quality. Plant tissue nitrate, which can accumulate at toxic levels, generally decreases with maturity. Plant nitrate accumulation is often associated with a nutrient imbalance that may be corrected with appropriate fertilizer use. In shallow loams Judith soils of central Montana, sulfur is often a limiting nutrient, along with phosphorus. Deficiencies in S and P contribute to accumulation of nitrates in cereal forages.

---

[1]David Wichman, Research Agronomist/Superintendent, Central Ag Research Center, Montana State University, 52583 US Hwy 87, Moccasin, MT 59462 (dwichman@montana.edu); **In**: Proceedings, 2015 Western States Alfalfa and Forage Symposium, Reno, NV, 2-4 December, 2015. UC Cooperative Extension, Plant Sciences Department, University of California, Davis, CA 95616. (See http://alfalfa.ucdavis.edu for this and other alfalfa conference Proceedings.)

Winter wheat is the primary annual crop in much of central and north central Montana. Utilizing cereal forages or other early season annual forage provides the opportunity to use a portion of the crop year moisture while retaining some soil moisture for the establishment of the September seeded winter wheat. When harvested for forage, the period of water use by the cereal forage is shortened by three to four weeks. This provides for retaining and accumulating soil moisture. The long term average precipitation in the June 25th to July 25th interval is 1.7 inches. Winter cereal forages typically head and are harvested prior to June 25th. Mid-late March seeded spring barley will head by June 25th. However, spring cereals are typically seeded in mid-April and head around July1. The cereal forage may be harvested at an early stage, by grazing, if allowing the cereal to head prior to harvest utilized too much soil water. The partial season forage crop provides the opportunity for income every year and help manage against the leaching of nitrogen into the shallow ground water and the formation of saline seeps.

Table 1. Alfalfa vs Winter cereal forage.

Location	Alf	WCF
	t/a	t/a
Bozeman	2.60	3.60
Huntley	1.65	4.62
Kalispell	5.11	7.21
Moccasin	0.85	2.79

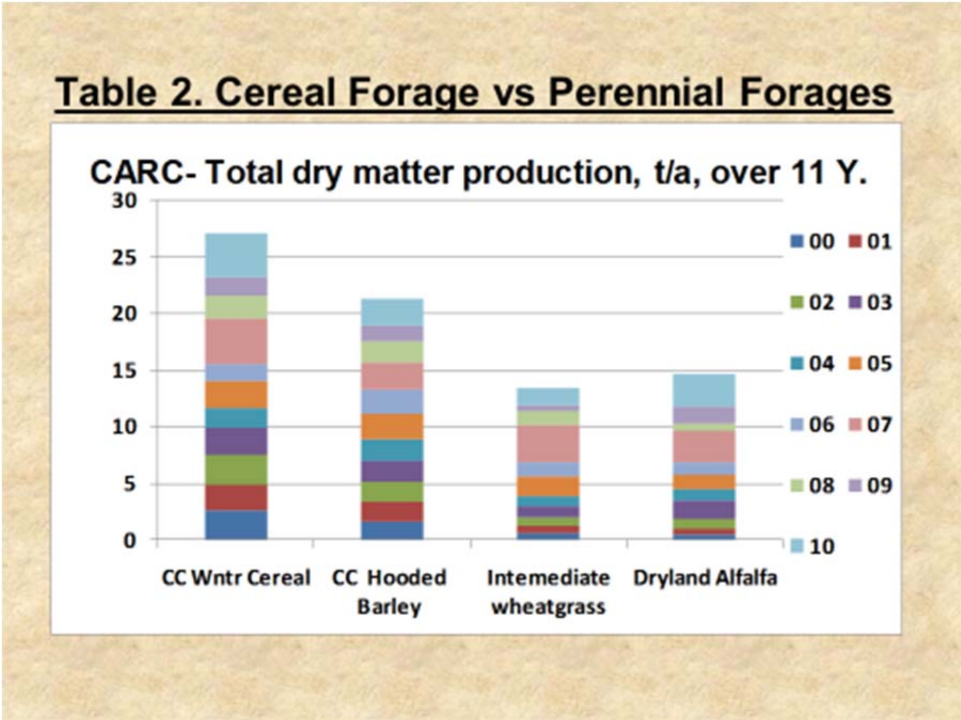
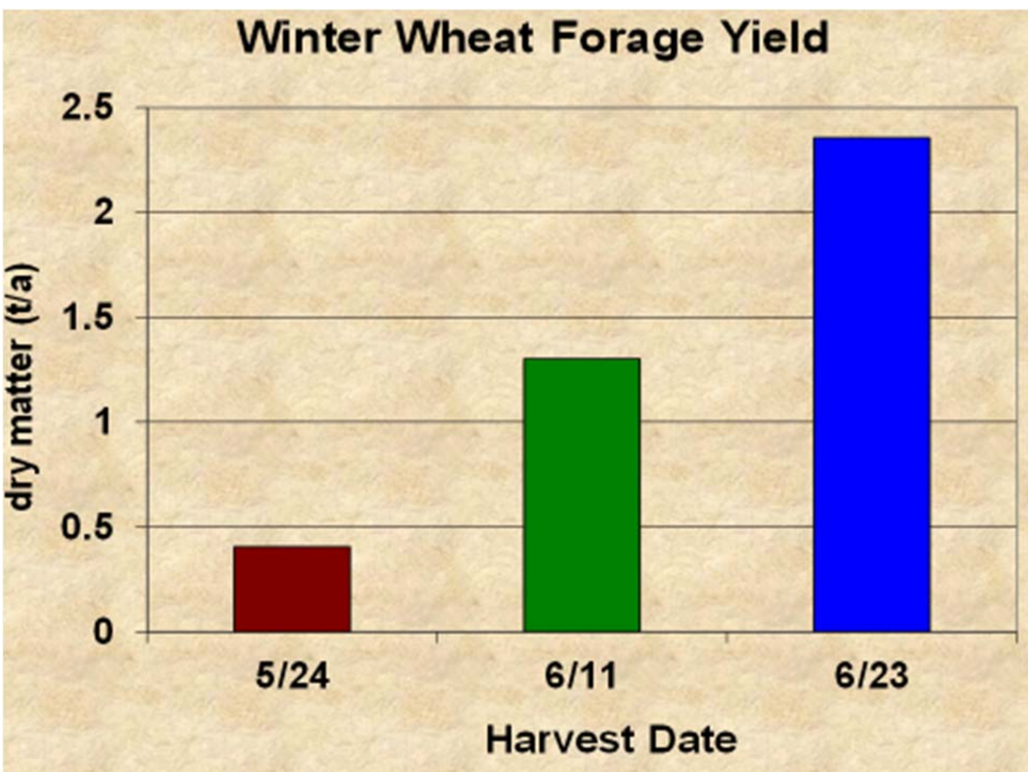


Table 2. Cereal Forage vs Perennial Forages
CARC- Total dry matter production, t/a, over 11 Y.
30
25
20
15
10
5
0
00
01
02
03
04
05
06
07
08
09
10
CC Wntr Cereal
CC Hooded Barley
Intemediate wheatgrass
Dryland Alfalfa


Winter Wheat Forage Yield
dry matter (t/a)
2.5
2
1.5
1
0.5
0
5/24
6/11
6/23
Harvest Date

Maturity affect on quality

Harvest date effect on spelt & w. wheat forage Quality.

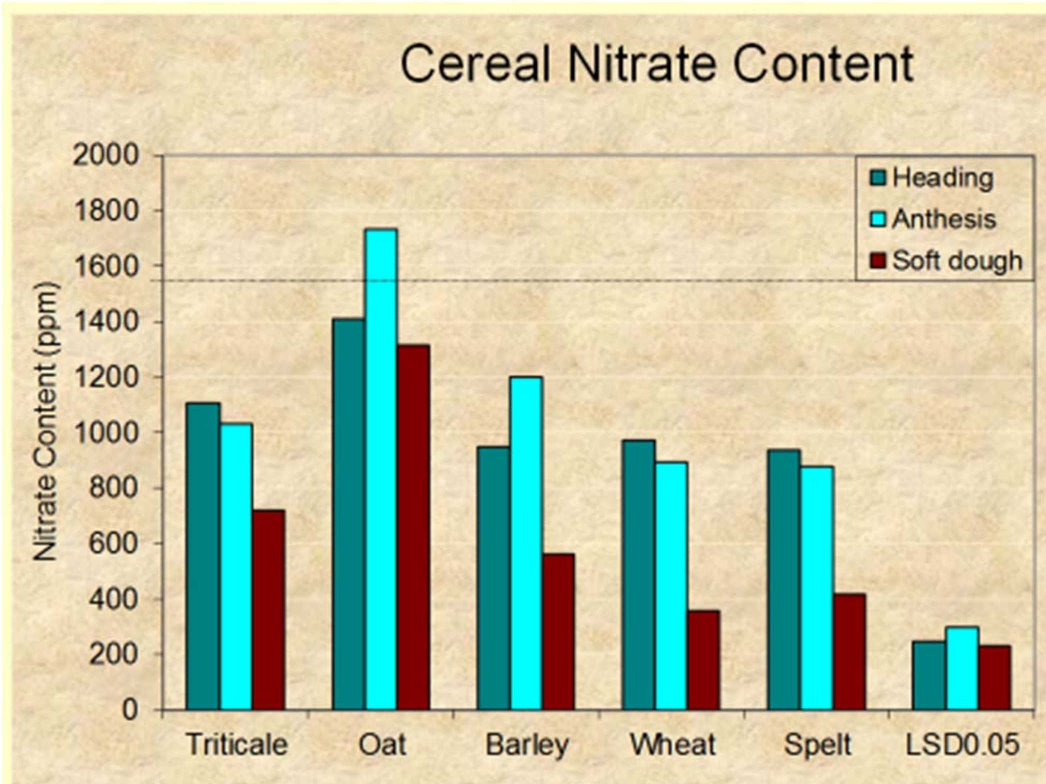
Harvest n date	NO3 ppm	Protein %	NDF %	ADF %	TDN %
24-May 18	2482 b	24.6 d	38.1 a	20.5 a	72.7 c
11-Jun 18	2165 b	16.1 c	45.5 b	23.4 b	70.4 b
24-Jun 18	1313 a	12.4 b	50.9 c	26.6 c	67.9 a
Heading 18	1196 a	11.3 a	52.7 c	27.3 c	67.3 a

Alfalfa 10%blm Std: 18 42 31 60

Nitrate Toxic level : 3000 ppm or 0.30%

Regression of whole plant nitrate levels in **ten cereal forage <u>selections</u>** regressed against environmental means for **<u>27 selection x nitrogen fertility level x plant maturity</u>** environments. Data used were expressed as nitrate-N in ppm. <u>All regressions are significant at the < 0.001 probability level.</u>

Species	Variety	R^2	MSE residual	Intercept	Slope
Barley	Haybet	0.894	22854	-37.1	0.899
Barley	Westford	0.757	99109	17.8	1.136
Oats	Celsia	0.822	115196	-87.3	1.490
Oats	Otana	0.852	85456	5.4	1.434
Spelt	Pierre Hucl	0.904	16922	-27.2	0.814
Spelt	348	0.717	111457	-48.3	1.09
Spr Wheat	McNeal	0.537	102595	138.7	0.705
Spr Wheat	Fortuna	0.836	42745	22.0	0.954
Triticale	Pronghorn	0.815	40155	-47.6	0.861
Triticale	Sunland	0.872	22589	-4.3	0.804


Cereal Nitrate Content
Nitrate Content (ppm)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Heading
Anthesis
Soft dough
Triticale
Oat
Barley
Wheat
Spelt
LSD0.05