

► Montana State University researchers conclude that cereal forage can provide an excellent source of winter feed for maintenance diets of pregnant cattle.



Annals—

Rx for Drought

If you aren't considering planting annual grain forages as part of your drought production strategy, you might be passing on your best possible option.

Story & photos by Ed Haag

The image of a rancher participating in activities associated with farming and planting cereal crops might be irksome to some old-timers and cowboy purists, but in an age when inflated feed costs are the norm and drought-induced feed shortages could spell financial disaster, Montana State University (MSU) Range Specialist Dennis Cash believes that it is no time to be picky.

"Around here cereals have saved a lot of peoples' bacon," he says. "We've had several years of drought, and the annual cereal forages were, by far, the best performers."

Cash notes that recent studies support his view

"At one of our research stations where we test cool-season grasses and alfalfa, we were

seeing these forages yielding about half a ton in the middle of this drought," he says. "Meanwhile, winter cereals that were grown on continuous re-crop were yielding 1½ to 2½ tons per acre."

The reason is simple, Cash says. Annuals can be strategically planted to make targeted use of the local moisture that is available. This is especially true with fall-planted, cool-season cereals like triticale and winter forage wheat that take full advantage of snow melt and early spring rains.

Plant survival strategy also plays an important part in helping us understand the conspicuous disparity between the yields produced by the perennials and the yields produced by the annuals when stressed by

drought. Perennial grasses and legumes will actually decrease their yields during a drought, choosing instead to store precious moisture and nutrients in their well-developed root systems in an effort to survive as a living plant beyond the immediate season. Annuals, which are genetically programmed not to live beyond one season, have their best chance of surviving as a species by producing as much biomass and seed as possible in the hopes that some of that seed will germinate in the next year.

For Cash, another real advantage that annual cereal grain forage has over perennial grasses and legumes in a drought is flexibility.

"For example, you can graze winter wheat acreage two or three weeks in the early spring to take the pressure off your native range," he says. "Then, if you get a little moisture the wheat grows back, and you can take almost a full hay crop off for your winter feeding."

These advantages haven't been ignored by Montana ranchers. U.S. Department of Agriculture (USDA) figures show a dramatic jump in cereal forage production from an average of 200,000 acres per year to 300,000 acres per year in the late 1990s when a persistent drought struck much of the state.

Proof in the pudding

Cash notes that several feeding trials have been conducted at MSU since 2000. In one of these trials, 600-pound (lb.) steers were fed a diet of 25 lb. of chopped cereal hay, 4-8 lb. of rolled barley, and 1 lb. of a concentrate containing minerals and Rumensin®.

Feed consumption, intake, digestibility and live weight gains were all measured throughout a 60-day period, with average daily gains (ADG) ranging from 2.5 lb. to 3.2 lb. per day. Cash adds that based on this animal performance, researchers at MSU are confident cereal forages can provide a reliable maintenance diet for overwintering pregnant beef cows.

Of the several cereals evaluated through 2003, barley typically proved to have better forage quality than other cereals.

Most recent feeding studies conducted by research staff at MSU and North Dakota State University (NDSU) have focused on new varieties of winter cereal forages specifically developed for Northern Great Plains states.

Traditionally, Montana ranchers have used spring-planted annual forages in their drought strategies. For the lower, warmer elevations, this has meant planting warm-season dryland crops such as Sudan grass, sorghum-Sudan grass hybrids and millet. In the higher, cooler elevations the forage annuals of choice have been cereals and other cool-season crops.

But, considering the advantages of the newly introduced winter cereal varieties, Cash believes that those traditional preferences are about to change.

"These winter cereals are consistently higher yielding and have better water use efficiency than spring cereals," he says, adding that they provide flexible management options for end point uses that include pasture, hay or grain.

Cash also notes that winter cereals offer ranchers the advantage of fall planting,

Table 1: Comparison of spring vs. winter cereals

Cereal crops available for dry hay:	Winter	Spring
	Winter wheat, winter triticale, spelt, awnless wheat or triticale	Barley, wheat, oat, triticale, emmer, hooded barley
Agronomics:		
Planting	Fall	Spring
Grazing	Late spring – summer	Summer
Haying	~July 1	~July 22
Production level:		
Dryland	<1.0-3.5 ton/acre	0.5-3.0 ton/acre
Irrigated	3-6 ton/acre	2.5-3.5 ton/acre
Nitrate toxicity risk:	Low	Moderate
Forage quality:		
Winter maintenance	Good	(Barley) Better
Gain	Good	(Barley) Better

thereby taking pressure off spring workloads.

New crops, new options

Between 2005 and 2007, a series of four state studies were conducted in several locations in Montana and North Dakota to evaluate animal performance and suitability of newly released winter cereal crops when compared to traditionally grown annual cereal forages.

In these trials, 80 crossbred steer calves (initial average body weight ranging from 630 lb. to 680 lb.) were fed once daily (8 a.m. to 9 a.m.), with *ad libitum* access to their roughage source, plus 6-8 lb. of rolled barley and 1 lb. of a 32% crude protein (CP) supplement containing Rumensin per

head per day. All rations had a target ADG of 2.6 lb. per day. Samples of all forages fed were sent to the lab for a full nutritional analysis.

Consecutive-day weights on individual animals were obtained at 0, 1 and 2 months for calculations of gain, ADG and feed conversion.

A second segment of the project involved a backgrounding trial with 180 weaned heifers. Their initial average body weight was 619 lb. These animals were divided into four pens. During a 45-day period, animals from each pen were fed a different roughage source in isocaloric diets targeting 1.8 lb. ADG. The diets consisted of a total mixed ration (TMR) of 20 lb. of chopped hay (or

CONTINUED ON PAGE 74



45 lb. silage), 6 lb. of wheat midds, and a supplement containing Rumensin and minerals.

Final weights were recorded after a 45-day period.

While not a replicated study, notes in the project synopsis point out that this segment of the project was significant, because it was conducted in a commercial real-world setting.

Project researchers calculated, from the data collected, that all the animals involved in the study, both steers and heifers, had ADGs ranging from 1.94 lb. to 3.34 lb. per head.

Conclusions drawn from the results indicated that, in all cases, the cereal forages provided good basal nutrient levels to assemble backgrounding rations. Barley forage had higher levels of CP and energy than the winter cereals, but these differences

were not always statistically significant.

The second segment of the project that involved heifers was scheduled to run 60 days but was terminated after 45 days due to differential growth from the treatments. No

statistical comparisons could be calculated in this trial, but the gains were similar to those in the research trials.

The nutritional analysis on the cereal forages harvested at the milk to soft dough stages of grain development in these trials had 10.3% to 15.3% CP and 65% to 91% digestibility, varying among growth stages and crops.

Researchers determined

from the data generated by the feeding trials that winter cereal forages were competitive with barley and other spring cereals in backgrounding rations. They also concluded that cereal forages, under the right circumstances, could provide an excellent

source of winter feed for maintenance diets of pregnant cattle.

Nitrate toxicity is a risk

While most of the study data was positive, some of the annual cereals in the project showed significantly high levels of nitrogen (N). This was particularly true for some varieties of spring-planted barleys.

Research shows that drought conditions can exacerbate the situation in cereal forages.

Cash warns that nitrate (NO_3^-) concentrations higher than 0.5% or 5,000 parts per million (ppm) [or 1,130 ppm nitrate-N ($\text{NO}_3\text{-N}$)] should not be fed to pregnant ruminants and should be limited to half or less of the ration for other livestock.

Nitrogen toxicity is known to cause pregnant cows to abort and in some severe cases will cause death in otherwise healthy animals. It is estimated by Montana Extension Services that approximately 40% of the Montana cereal hay (worth \$12 million annually) harvested had nitrate levels too high to feed to pregnant beef cattle.

"The key strategy for all producers who periodically need emergency forages is 'drought anticipation' with proper planning and execution of an annual forage program."

— Dennis Cash

Cash notes that the preliminary test results on forages examined in the project indicated that while winter cereal hays tended to have slightly lower animal performance than their barley counterparts, the winter cereal nitrate hazard levels were substantially lower than were some of the highest-performing barley forages.

He recommends testing all cereal forages for nitrogen concentrations prior to feeding.

Tips on growing cereal forages

For Cash, one significant advantage to cereal forage production is that no special equipment is needed for harvesting. Planting, on the other hand, does require a seeder. It should be noted that in most ranching communities there are individuals with the right equipment who will custom-seed at a reasonable price. Those who would rather attempt it themselves can often rent conventional drills or air seeders from the local conservation district.

If one is spring-seeding forage cereals, Cash recommends planting as early as possible to capitalize on moisture conditions. He also notes that planting early ensures a

Table 2: Performance in three backgrounding trials

NDSU 60-day ADG (lb.), Nov. 2005-Jan. 2006			
Barley hay 2.78	Barley silage 3.21	Oat hay 2.63	Willow Creek WW 2.50
MSU 66-day ADG (lb.), Nov. 2005-Jan. 2006			
Haybet hay 2.84	Hays hay 2.81	Willow Creek WW silage 2.38	Willow Creek WW hay 2.50
Producer trial in central Montana, 45-day ADG (lb.), Dec. 2005-Feb. 2006			
Koldtana triticale 2.33	Windrift triticale silage 1.94	Windrift triticale hay 2.02	Willow Creek WW hay 2.57

competitive crop and allows for timely harvest prior to most weed seed production.

Seeding rates with most forage cereals are 1 to 1½ bushels (bu.) per acre under dryland conditions. Irrigated cereal forage production can offer higher yields with higher seeding rates. Recommendations of 50% to 70% over grain seeding rates are not uncommon for irrigated sites.

Cash notes that cereal forages should be

harvested at the water to milk stage of grain development. He adds that this is usually the best time to optimize yield and quality.

Finally, recent research shows that winter cereals typically yield more than spring cereals and reach the ideal harvest stage 10–21 days ahead of spring-planted cereals at the same location.

AJ