



Ridin' Herd

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Testing forages for quality makes cents

Forages are the primary energy source for beef cows. From a forage standpoint, as plants mature, fiber increases. Fiber is less digestible than other plant parts, and fiber digestibility declines as plants mature. These factors cause the concentration of energy in plants to decline as maturity advances. In addition, as plants mature, the increase in fiber and bulkiness reduces the amount of the forage an animal can consume.

Analysis needed

As the plant matures, acid detergent fiber (ADF) and natural detergent fiber (NDF) increase. ADF and NDF are usually measured in a near infrared reflectance (NIR) forage analysis. Protein concentration also declines as plants mature. When designing diets using harvested feeds, many rations are balanced using average values, and these "book values" often result in over- or underfeeding certain nutrients. More economical and better-balanced rations can be formulated using nutrient concentrations determined from feed analysis.

Do sampling right

Each sample must represent only one "lot" of forage. A "lot" of forage consists of forage harvested from one field at the same cutting and maturity. All forage from the same lot should be similar for type of plant(s), field (soil type), cutting date, maturity and variety. Variation in any of these characteristics can cause substantial differences in the nutrient value of the forage.

Forage-testing laboratories will not accept a "grab" sample of a baled forage. Sample baled hay after curing (usually 17-21 days after baling), using a core sampler or probe. Such an instrument is essential for collecting a representative sample. For large round and square bales, the probe should penetrate at least 18 inches (in.) into the bale and have an internal diameter of at least $\frac{3}{8}$ in. If the probe is 18 in. long or longer, 15 large round bales should be adequate if the lot size is 30-40 bales.

Collect one sample from each bale by coring straight in from the center of the end of square bales and from the wrapped

circumference of round bales. Place the entire sample into a plastic bag and seal tightly.

For loose or compressed haystacks, use

a hay probe at least 24 in. long to collect 15 or more samples from each lot. Sample loose haystacks from the top and from the side of the stack. Compressed loaf stacks require six sampling locations: top front, top middle, top rear, lower front side, lower middle side and lower rear side.

Label the sample bag with your name, address, lot identification (ID) and type of material. Most testing labs provide a description sheet to report this information and to request the desired tests. Place samples in polyethylene freezer bags, squeeze the air out of the bag and seal tightly. If you are sending a sample of silage, double-bag silage samples for extra protection. Use extra caution if subdividing a large hay sample because subsampling dry hay can result in loss of fines and leaves. Freeze samples containing greater than 15% moisture until shipping; store dry samples in a cool location.

Most forages are analyzed using NIR spectroscopy. NIR is a rapid, reliable, low-cost, computerized method to analyze feeds for their nutrient content. It uses near infrared light rather than chemicals to identify important compounds and measure their amount in a sample.

Feeds can be analyzed in less than 15 minutes using NIR, compared to hours or days for chemical methods. This rapid turnaround and the resulting cost savings in labor make NIR an attractive method of analysis. Because the NIR method uses a "library" to compare the reflectance collected for the sample to the reflectance

spectra collected for a known sample in its library, it is very important to label the sample correctly (alfalfa, cool-season grass hay, millet, corn silage, etc.) so the computer knows what library to use.

NIR does not do a good job of measuring minerals, although it does a decent job measuring calcium (Ca) and phosphorus (P), likely because these minerals are tied closely to organic matter. If you need a mineral analysis, consider using the chemical method.

What nutrients should producers with cows analyze forages for?

Dry matter. Percent dry matter (DM) is the percentage of feed that is not water. In contrast, moisture is a measure of the amount of water in the feed on an "as is" or "as fed" basis. It is important because moisture dilutes the concentration of all nutrients.

This is an important number because beef cow diets are formulated on a DM basis, then using the DM percentage are converted to the amount of feed needed to be fed. As an example, if the diet calls for grass hay to be fed at 25 lb. per head per day, and the hay is 15% moisture (therefore 85% DM), you would need to feed each cow 29.5 pounds (lb.) per head per day ($25 \text{ lb.} \div 0.85$) to account for the water in the hay.

Percent crude protein. Percent crude protein (CP) measures nitrogen concentration. However, CP will measure both true protein and nonprotein nitrogen because the actual measurement is %N.

The new metabolizable protein (MP) system that was introduced in the 1996 *Nutrient Requirements for Beef Cattle* incorporates degraded intake protein (DIP) and undegraded intake protein (UIP, or bypass protein). The DIP and UIP percentages must total 100% of the protein and are normally expressed as a fraction of the CP. So if the DIP of a forage is 70%, then UIP is 30%. If the CP of that same forage is 10%, then DIP is 70% of DM ($10\% \times 0.70 = 7\% \text{ DIP}$) and the UIP is 30% ($10\% \times 0.3 = 3\% \text{ UIP}$). Because NIR does not measure DIP and UIP, use book values from the 1996 NRC. If the CP and adjusted crude protein numbers are not the same, it indicates that there has been some heat damage in the

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forage. Use the ACP value in developing diets for this feed.

Total digestible nutrients (TDN).

TDN represents the total of the digestible components of crude fiber, protein, fat ($\times 2.25$) and nitrogen-free extract in the diet. This value is calculated from ADF in the NIR analysis. TDN is still used to calculate beef cow rations where the diet is primarily forage.

Relative feed value (RFV) combines digestibility (ADF) and intake (NDF) into one number for a quick, easy, effective way

to evaluate the quality of alfalfa and/or haylages. It is used primarily with legume or legume/grass forages. RFV is most valuable for formulating diets for dairy cows and not really useful in balancing diets for beef cattle. RFV provides an index to rank a forage according to its digestible energy intake potential. RFV also has been used widely in hay marketing, but is not used in developing cow diets.

Final thoughts

Continue to explore opportunities to reduce cow costs. Testing forages for quality will allow you to know the quality of the

forages in the stack yard. In addition, if you know the nutrient needs of the cattle you are feeding, you may or may not need additional feeds or supplements to meet the requirements.



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Editor's Note: "Ridin' Herd" is a monthly column written by Rick Rasby, professor of animal science at the University of Nebraska. The column focuses on beef nutrition and its effects on performance and profitability.