Ridin' Herd

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Understanding forage analysis

A forage analysis allows the livestock manager to determine if supplementation is necessary. Without this information, producers are guessing as to whether protein or energy is needed when — depending on the quality of the forage and stage of production that the female is in — neither protein nor energy may be needed. Many times it is incorrectly assumed that protein is needed, but only sometimes is that correct. Economical and more balanced rations can be formulated using nutrient concentrations determined from a feed analysis.

Using a forage analysis

The hay in Table 1 is 14.4% moisture and 85.6% dry matter (DM). For ration formulation you should always use the DM composition. The DM composition can be found by dividing the as-is value by the percent DM. For example:

19.8% CP as-is ÷ 0.856 = 23.2% CP on a DM basis

Near-infrared (NIR) analysis will measure heat-damaged protein. In this example, because the heat-damaged protein is not 10% or more of the crude protein (CP), the adjusted CP is the same as CP.

Available protein estimates are generally only reduced when heat-damaged (unavailable) protein accounts for greater than 10% of CP. If adjusted CP is different from CP percent, use adjusted CP when developing rations. The portion of protein that is damaged due to heating of the bale is not available for the animal to use.

As an example, let's assume you are supplementing late-gestation cows with a 38% protein cake. If you feed 2 pounds (lb.) per head, the amount of CP supplemented is 2 lb. per head × 0.38 CP = 0.76 lb. per head.

In another context, let's say the *Nutrient Requirements of Beef Cattle* (NRC) tables for nutrient requirements for beef cows indicate that one month after calving a 1,200-lb. cow with moderate milk production requires a diet that is about 10% CP. This same cow should have a DM intake (DMI) of about 27 lb. per day. If she is consuming low-quality forage that is only 5% CP, the question is, how much of this first-cutting alfalfa do you need to provide to meet her CP requirement? The calculations are determined as follows.

- ►27 lb. per day intake × 0.10 CP requirement = 2.7 lb. per day CP requirement
- ►27 lb. low-quality forage × 0.05 CP = 1.35 lb. per day CP from forage
- ►2.7 lb. per day CP required - 1.35 lb. per day CP from forage = 1.35 lb. per day CP needed from alfalfa
- ►1.35 lb. per day CP needed ÷ 0.232 CP in alfalfa = 5.8 lb. supplemental alfalfa per day on a DM basis to meet protein requirement
- ►5.8 lb. supplemental alfalfa per day to meet protein requirement ÷ 0.856 = 6.8 lb. per head per day supplemental alfalfa needed on an "as-fed" basis

Table 1: Client sample of first-cutting alfalfa

	Analysis	
	As-received basis	Dry-matter basis
Moisture, %	14.4	0.0
Dry matter, %	85.6	100.0
Crude protein, %	19.8	23.2
Heat-damaged protein, %	0.8	0.9
Adjusted crude protein, %	19.8	23.2
Digestible protein estimate, %	13.7	16.1
Acid detergent fiber, %	27.0	31.5
Neutral detergent fiber, %	31.1	36.4
TDN estimate, %	55.6	64.9
Relative feed value (RFV)	164.4	

The NIR analysis will also provide you with a digestible protein estimate. For this alfalfa it will look something like the 13.7% as-received, 16.1% on a DM basis. Do not use digestible protein for ration formulation for beef cattle.

The NIR analysis will provide two measures of fiber: acid detergent fiber (ADF) and neutral detergent fiber (NDF). For formulating beef cow rations, ADF and NDF are of limited usefulness. Instead, use total digestible nutrients (TDN), which is estimated from ADF but is easier to use.

ADF and NDF are used in determining relative feed value (RFV), which is used in the dairy industry in pricing alfalfa. ADF and NDF influence forage digestibility and, therefore, the amount or daily intake of a forage. The lower the ADF and NDF the lower the fiber component and the greater the intake. Also, the lower the ADF, the greater the TDN.

The hay in Table 1 is relatively high-quality hay with a high TDN value. In the protein example above we calculated that we should supplement 5.8 lb. of this hay to meet the protein requirements of our hypothetical cow. Remember, this cow calved one month ago, weighs 1,200 lb., and has moderate genetic potential for milk. At 27 lb. per day DM intake, she needs a diet that is about 58% TDN to meet her energy requirements. Will 5.8 lb. per day of this alfalfa meet her energy needs if the low-quality forage she consumes is only 50% TDN?

- ►27 lb. DM intake × 0.58 TDN required = 15.7 lb. per day TDN required
- ►22.2 lb. low-quality forage × 0.50 TDN = 11.1 lb. per day TDN from low-quality forage
- ►5.8 lb. alfalfa × 0.649 TDN = 3.75 lb. TDN from alfalfa
- ►11.1 lb. per day TDN from low-quality

forage + 3.75 lb. per day TDN from alfalfa = 14.85 lb. per day TDN

Therefore, we can see that this cow will lose some body condition even when fed supplemental alfalfa. A solution could be to increase the alfalfa by 1.4 lb. per head per day on a DM basis. This would bring the total for alfalfa to 7.1 lb. per head per day DM or 8.25 lb. per head per day on an as-fed basis. The cow would be consuming a little more than 29 lb. of DM per day, which is about 2.4% of her body weight. This amount of intake should not be a problem.

Again, do not use RFV for formulating rations; TDN is much more useful. Notice in the forage NIR analysis that nutrients are reported on both a DM and an as-received basis. Although RFV is recorded for all the forages, RFV is only pertinent for those forages that are alfalfa (alfalfa haylage, alfalfa hay).

Final thoughts

Forage testing and using a forage analysis to design rations for the cow herd will help you manage feed costs. In times when profit margins continue to shrink, pushing the pencil to reduce annual cow costs is critical.

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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.*