Ridin' Herd

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What's a supplement to do?

When determining supplementation programs for cattle consuming low-quality forages, it is important to understand how different feeds might react with each other when fed together. Some feeds complement one another and would have a "positive associative" effect when fed together. Some feeds, on the other hand, when fed together don't complement one another and, therefore, would have a "negative associative" effect. Some feeds may not feed well together because some component(s) of the ration is not balanced such that the diet can be well-utilized by the animal. Supplements are usually fed in small amounts to meet a deficiency in the diet, but they may also be fed to enhance the utilization of other components of the diet.

Supplementation considerations

A supplement that would have a positive effect on a low-quality forage would exhibit the following characteristics:

1. It would increase intake of the forage.
2. It would increase digestibility of the forage.
3. It would reduce the amount of time that the forage stays in the rumen of the animal.

Table 1: Effect of supplementing cottonseed meal on ruminal retention time and intake of prairie hay

	None	1.75 lb. per head per day	% change
Rumen retention time, hrs.	74.9	56.5	-32%
Hay intake, % of body wt.	1.69	2.15	+27%

Example of positive associative effect.

Source: Oklahoma State University.

With the wide array of supplements that are marketed, the different methods of feeding, and the differences in price and ingredients, choosing a supplement can be difficult. A good understanding of the principles of nutrition and digestion by beef cattle, the quality of the forage to be supplemented, the supplement composition, and associative effects that the supplement has on the forage will aid in determining the supplement that will provide the most benefit.

In beef cow diets, one of the major objectives is how to best use medium- to low-quality forages. In formulating diets for beef cattle, many times associative effects of feeds are ignored, and it is assumed that each feed will contribute the amount of nutrients without interfering with other feeds.

For example, formulating a diet for a female in late gestation using 25 pounds (lb.) of hay containing 90% dry matter (DM), 45% total digestible nutrients (TDN) and 5% protein, and 4 lb. of corn containing 88% DM, 90% TDN and 10% protein would result in feeding 26 lb. of DM, 13.3 lb. of TDN and 1.5 lb. of protein.

The problem with this approach is that on paper it looks like a pretty good diet, but often we forget that this combination of low-quality hay and corn has the potential to alter organisms in the rumen, and utilization of the diet may not be optimal to meet the nutrient needs of the animal.

In actuality, with the above diet, the amount of energy generated from the diet is reduced because of the way the low-quality forage and corn interact with the microbes in the rumen. It may have been more effective to supplement a couple of pounds from a protein source, which would enhance rumen microbial activity increasing digestibility of the hay and resulting in an increase in forage intake.

Interaction of two or more feeds

is called associative effect. These effects can either be positive, negative or neutral, resulting in improved, decreased or no effect on utilization of the overall diet.

Associative effects of feeds

To understand associative effects, it is essential to understand the chemical makeup of the different portions of the diets and how these portions are acted on by the ruminal microorganisms.

The primary energy source in diets of ruminant animals consists of carbohydrates. All feeds contain both structural carbohydrates and nonstructural carbohydrates. Structural carbohydrates, measured as neutral detergent fiber (NDF), function in the plant to give support, while nonstructural carbohydrates are used for plant metabolism.

It is very important to understand the difference between these two types of carbohydrates and how they are metabolized by the microorganisms in the rumen. Structural carbohydrates are primarily cellulose and hemicellulose and make up a large portion of the carbohydrates fraction of forages and other roughage. For beef cows, the digestion of structural carbohydrates is conducted in the rumen by the microorganisms (cellulose digesters), and depending on the complexity of the chemical bonding, usually the rate at which they are digested is fairly slow. Few, if any, of these compounds would be available to the animal without the aid of the microorganisms.

Nonstructural carbohydrates are composed of starches, sugars and other simple carbohydrates. In beef cows, these compounds are also digested by the microorganisms (starch digesters) in the rumen. The rate of digestion of these compounds is much faster than for structural carbohydrates, and the percentage that is digested is higher than with structural carbohydrates. Grains are high in nonstructural carbohydrates.

Knowing forage maturity is important when considering associative effects of feeds. As forages mature, the percentage of structural carbohydrates increases with a corresponding decrease in the nonstructural carbohydrates. The digestibility of the structural carbohydrates also decreases as forages mature.

In studies conducted at the University of Wyoming using native meadow forages harvested at two different maturities, the digestibility of the structural carbohydrates was 45% in the late-cut or mature forage compared to 60% in the early-cut forage.

Examples of associative effects

Protein supplementation of low-quality, low-protein forages results in a positive associative effect. In Table 1, the prairie hay used was less than 5% crude protein. When the ration was supplemented with 1.75 lb. of cottonseed meal, retention time of the forage was reduced 32%, which resulted in an increase in feed intake of 27%. Because hay intake was increased, the animal has a better chance of meeting the protein and energy requirement without supplementing other feeds.

Maybe a better example is supplementing a young beef cow entering late gestation grazing dormant native range with distillers' grains (DGs). The dormant range is deficient in both protein and energy. Distillers' grain is a good source of protein and energy, and the fiber component is readily digestible. Supplementing distillers' to meet the TDN deficiency does not have a negative effect on forage digestion.

Final thought

Not all feeds when fed together like each other. It is really important to understand interactions between feedstuffs when feeding forages. An important concept when feeding beef cows is to get the greatest utilization of the forage component of the diet. In addition, a well-thought-out supplementation strategy, when needed, increases profit potential of the enterprise.