Vet Call

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Proper use of starch, fiber and protein in winter rations

Winter feed constitutes a major portion of the cost of cow-calf production. The base ingredient in winter rations is usually standing, dormant forage or hay. Heifers, first-calf heifers and thin cows that need to gain body condition often have energy requirements that exceed that supplied by dormant forage or hay alone. In those instances, a supplement must be offered that primarily supplies protein or energy, depending on the nutrient makeup of the base forage. Understanding the interaction among starch, fiber and protein in the rumen allows us to determine the most appropriate supplement.

Microorganisms in the rumen, predominantly bacteria, convert feedstuffs into nutrients. Some rumen microbes are able to digest fiber carbohydrates that are indigestible by nonruminants. In addition, other rumen microbes utilize starch, which is available for use by all animals. Fiber-digesting bacteria, which are important to forage-fed ruminants, are relatively slow-growing and are easily killed if the rumen becomes acidic.

In contrast, starch-digesting bacteria are important to grain-fed ruminants. They compete vigorously for the nutrients in the rumen and reproduce rapidly when starch is available. Starch-digesting bacteria have a much greater tolerance for low rumen pH than do fiber-digesting bacteria.

Associative effects are interactions among nutrients in the rumen such that one nutrient or feedstuff affects the utilization of another nutrient via influences on rumen microbial populations. A positive associative effect occurs when one nutrient increases the digestibility or utilization of another nutrient. A negative associative effect occurs when one nutrient is present in the rumen in sufficient quantities to decrease the digestibility of another nutrient.

Positive associative effect

Cattle fed a forage-based diet (pasture or hay) that is deficient in protein [<7% crude protein (CP)] could have a positive associative effect when fed a protein supplement. This positive effect is due to adding a nutrient, protein, that is deficient in the forage and is required by fiber-digesting bacteria for reproduction. By increasing the number of fiber-digesting bacteria in the rumen, forage digestibility is increased, and energy yield from the diet is improved. Cattle consuming low-quality forages should be supplemented with rumen-digestible protein to supply the rumen bacteria with needed nitrogen and amino acids.

However, producers should realize that if the forage has adequate protein content, additional protein will not improve digestibility or energy yield. A typical 1,100-pound (lb.) cow of average producing ability will need only 1.5-1.7 lb. of CP during the middle part of gestation. Feeding a roughage of fair quality (8%-10% CP) during this period should meet both energy and protein requirements, and feeding a protein supplement is not necessary. In contrast, after a cow calves, her requirement for protein increases greatly. A 1,100-lb. cow producing 20 lb. of milk requires 3 lb. of CP daily.

The money you spend for forage analysis will more than be repaid when you know if and when you need to supplement protein.

Before you select a protein supplement, forages should be analyzed for protein content. Evaluate hay from different cuttings and from different fields separately so you know the nutritional values of each forage before you feed it. Use this information to decide which hay to feed to mid-gestation cows (the lowest-quality hay), which to feed to first-calf heifers in mid-gestation (medium quality) and which to feed to all females pre- and post-calving (the highest-quality hay). It is unfortunate, but true, that one cannot determine hay quality by looking at it. The money you spend for forage analysis will more than be repaid when you know if and when you need to supplement protein.

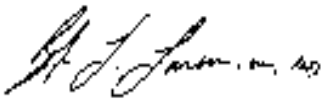
Negative associative effect

Cattle fed a forage-based diet could have a negative associative effect when fed a supplement high in starch. This decrease is due to a shift in the population of rumen microbes from a population dominated by fiber digesters to a population dominated by starch digesters. As stated earlier, the starch-digesting bacteria can reproduce rapidly when starch is available. In addition, during rapid growth, starch-digesting bacteria produce increasing levels of lactic acid, which lowers the rumen pH and increases their competitive advantage over fiber-digesting bacteria. With fewer fiber-digesting bacteria available, both forage digestibility and energy yield decrease.

Because corn and other grains are readily available and often are an inexpensive energy supplement, producers should use these feeds, when the price is appropriate, up to the level where they have a negative effect on fiber digestion. The cutoff for starch supplementation of low-quality forages is about 0.28% of the cow's body weight for corn dry matter (3.5 lb. of corn as fed for a 1,100-lb. cow). For moderate weight gain, a simple diet of forage and less than 3.5 lb. of corn often will be sufficient.

If more gain is required than can be supplied with a starch-based feed, such as corn, without a negative associative effect, producers can choose to use a fiber-based feed that has a higher energy content than the base forage. Many byproduct feeds provide energy in the form of highly digestible fiber. Because the energy is in the same form as that in the forage, high levels can be fed without decreasing forage digestibility. Byproduct feeds that provide energy in the form of highly digestible fiber include corn gluten feed, dried distiller's grains, soybean hulls and wheat middlings.

Properly selecting the type and amount of supplement that complements your base forage will ensure that your cows calve in adequate body condition and that your winter feeding bills are optimized.



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