Ridin' Herd

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Using corn coproducts in beef cow diets

Corn coproducts appear to be a good fit as a protein or energy supplement in cow diets that are mostly forage.

Introduction

Corn coproducts can be used as either a protein or energy supplement for backgrounding or replacement heifer/cow diets. The energy value of distillers' grains is greater than that of corn, and the energy value of corn gluten feed is equal to or slightly higher than corn, depending on the amount of steep liquor added back to the gluten.

Both distillers' grains and corn gluten feed are good sources of protein. Corn gluten feed is high in degraded intake protein (DIP) and, therefore, is a good source of nitrogen (N) for rumen microbes to make their own protein. Distillers' grains are high in undegraded intake protein (UIP, or bypass protein).

Both gluten and distillers' grains are good sources of phosphorus (P). Although both feeds are high in sulfur (S), neither feed will be fed at 100% of the diet.

Distillers' grains and gluten have positive associative effects when fed with forages. When corn coproducts are fed as a supplement in high-forage diets, digestibility of the forage is not decreased and, therefore, overall diet intake is not compromised. In addition, corn coproducts generally alleviate acidosis.

Where they fit

Protein is the first limiting nutrient when cows in mid- to late gestation are fed low- to medium-quality hay or are grazing crop residues or dry, dormant range or pasture. Cows in late gestation, depending on what they are grazing, can be deficient in both protein and energy. First-calf heifers in mid- to late gestation grazing medium- to low-quality forage need both protein and energy supplementation.

In addition, after calving, when females are lactating and fed a medium-quality forage, corn coproducts fit well because they are high in both protein and energy. When grazed forage quality is low (winter range or crop residue) or quantity is limiting (drought), coproducts fit. I'll summarize some experiments for which grain coproducts were fed as a protein supplement, an energy supplement or both.

► Loy et al. (*2004 Nebraska Beef Cattle Report,* see Table 1) concluded that dry corn gluten feed decreases feed costs compared to conventional hay feeding when fed during the winter to developing heifers on a commercial Nebraska ranch in the Sandhills.

In this study, a treatment system was compared to the ranch's conventional management using more than 550 heifers in each treatment group across two years. The treatment system used only grazed winter forage and dry corn gluten feed supplementation compared to some winter grazing, with hay and protein supplementation.

Table 1: Weight, body condition and conception rates of heifers in two systems[1]

Item	Control	Treatment
	Year One	
Precalving BW change, lb.	100.0	98.3
Precalving BCS change	−0.16[a]	−0.08[b]
Postcalving BW change, lb.	−100.1	−98.3
Postcalving BCS change	0.16	0.28
	Year Two	
Precalving BW change, lb.	−5.1[a]	12.3[b]
Precalving BCS change	−0.75[a]	−0.48[b]
Postcalving BW change, lb.	2.82	0.04
Postcalving BCS change	−0.30[a]	−0.57[b]
Pregnancy rate, %[2]	96.1	96.4

[1]Control = winter grazing with hay and protein supplementation; Treatment = only winter grazing with dry corn gluten feed supplementation; BW = body weight; and BCS = body condition score. Data taken from Loy et al. (2004).

[2]Percentage pregnant with second calf.

[a,b]Unlike superscripts within a row differ (P<0.05).

By design, little differences were observed in developing heifer performance. The major implications were reduced costs ($6.71 per heifer) through the winter, while maintaining excellent performance and reproduction.

► An experiment was conducted with 120 crossbred heifers to determine the value of dry distillers' grains in high-forage diets and to evaluate the effect of supplementing daily compared to three times weekly (Loy et al., *2003 Nebraska Beef Cattle Report*). Heifers were fed grass hay "free choice" and supplemented with dry distillers' grain, dry-rolled corn, or dry-rolled corn with corn gluten meal.

Corn gluten meal is a high-protein feed that is much different than corn gluten feed. Supplements were fed at two levels and offered either daily or three times per week in equal proportions. Heifers supplemented daily ate more hay and gained faster [1.37 pounds (lb.) vs. 1.24 lb. per day], but were not more efficient than those supplemented on alternate days. The calculated net energy value for dry distillers' grains when fed in a forage diet was 27% greater than dry-rolled corn.

► Thirty heifers grazing smooth bromegrass were individually supplemented with 0, 1.0, 2.1, 3.1 or 4.2 lb. per head per day of dry distillers' grains [dry-matter (DM) basis] for 84 days to determine effects of dry distillers' grains supplementation on average daily gain (ADG) and forage intake and to determine the value of dry distillers' grains in grazing enterprises (MacDonald et al., *2004 Nebraska Beef Cattle Report*). Forage intake was estimated using the 1996 National Research Council (NRC) model.

Supplementation of dry distillers' grains resulted in a linear increase in ADG and decreased estimated forage intake. In this experiment, forage was substituted or was replaced in the diet with distillers' grains.

Dry distillers' grains may be an attractive supplement in grazing situations when forage prices are high

or forage supply is limited. More research in this area is currently under way.

► Data indicate that steer calves weaned in the fall supplemented with 5.0 to 6.0 lb. per head per day of corn gluten feed on a DM basis while grazing cornstalks will gain between 1.5 and 1.9 lb. per head per day. Minerals and vitamins were offered free choice.

If corn coproducts are fed, make sure there is adequate calcium (Ca) in the diet because of the high phosphorus content.

Nutrient considerations

A growing concern among U.S. livestock feeding industries is phosphorus management. As indicated earlier, coproducts of the corn milling industries are generally high in phosphorus. The average phosphorus content in dry distillers' grains is about 0.89% on a DM basis.

High levels of phosphorus may be useful in supplementing cattle grazing forages or fed forage diets that contain less than 0.20% phosphorus (NRC, 1996). For example, the NRC (1996) indicates a phosphorus requirement of 20 grams (g) per day for pregnant heifers in late gestation. Supplementing dry distillers' grains at 5.1 lb. (DM basis) per head per day would supply that phosphorus need, in addition to energy and protein.

In a grazing situation, depending on the forage and level of intake, if 75% of the phosphorus requirement were obtained from forage, only 1.1 lb. of dry distillers' grains would be needed to meet phosphorus requirements. This would eliminate the need for inorganic phosphorus supplementation, which often is the most expensive ingredient in commercial mineral mixes.

Management of excess phosphorus found in coproducts is an issue that warrants further consideration in the feedlot, but may be an asset in a cow-calf grazing situation.

Distillers' grains and corn gluten feed are relatively high in sulfur. Our current recommendation is to maintain total dietary sulfur at or below 0.4% of the diet DM. In most beef cow diets, sulfur is not a concern. When feeding corn coproducts like distillers' grains and gluten feed, it is important to spread it out so all animals have an opportunity to consume the supplement. The sulfur content of distillers' and gluten feed is between 0.4% and 0.47%. If total intake, forage plus supplement, is not limited, usually these corn coproducts would make up 10% to 30% of the diet.

In limit-fed, high-grain diets using corn coproducts in drought situations, pay close attention to total sulfur content of the ration. Also, care must be taken in situations where the sulfur content of the water is high and corn coproducts are used as a supplement. It is total sulfur intake that needs to be accounted for.

There is research being conducted using supplements containing mostly distillers' grains for gestating cows grazing cornstalk residue. Because of genetic improvements in corn hybrids and the efficiency of combines at harvest, less corn is left in the fields for cattle that graze cornstalk residue. In a typical cornfield after harvest, the first 20 to 30 days that cows are grazing cornstalks, no supplementation other than salt and mineral is needed. After that, especially for mature cows in mid- to late gestation, data would suggest protein supplementation is needed. Corn coproduct-based supplements appear to work well in these situations.

Fat in the diet can have a negative effect on forage fiber digestion. Distillers' grains are between 10% and 12% fat. Total fat content of the diet should not exceed 5% of the diet on a DM basis. This is usually not a problem when distillers' grains are supplemented at between 10% and 30% of the cow's total diet on a DM basis.

Handling corn coproducts

Handling and storing grain coproducts can be a challenge for some cow-calf producers. The cheapest form of corn gluten feed or distillers' grains is the wet form and

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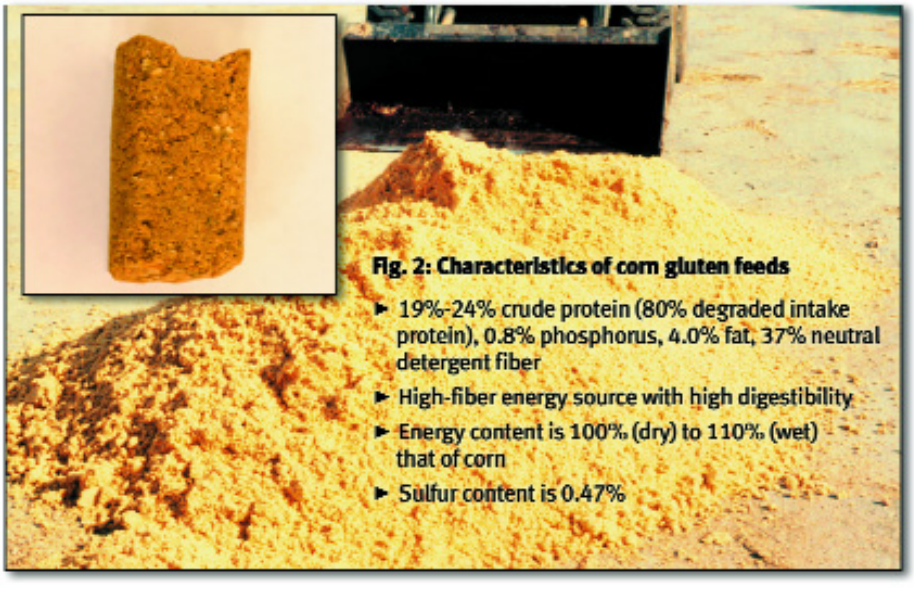

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probably poses the most problem for cow-calf producers from a feeding and storage standpoint. The wet feed will probably keep for about a week in the summer. In the winter, when it is cooler, it will store for 10-14 days.

Storage of wet corn gluten feed in airtight bags seems to work well. Because of the higher moisture content of wet distillers' grain, it has not stored well in a bag. The fat content of distillers' grain means that it may go rancid in a short period of time in the summer when in the wet form. A producer would also need the equipment to feed the wet product.

The dry corn grain coproduct is more expensive than the wet, but it may better fit cow-calf producers from a storage, handling and feeding standpoint. These feeds store on a concrete slab and can be fed out of a cake feeder.

Both distillers' grains and gluten can be pelleted or cubed, but not without challenges. Some of the early efforts to make corn coproducts into a cube resulted in a soft cube with many fines. Because of the fat content of distillers' grains, it was not easy to make into a cube. With the incorporation of other feeds and binders, the feed industry has produced acceptable pellets that are 75%-80% corn coproduct and cubes that are 55%-65% corn coproduct.

Paradigm shift

We may have to rethink our recommendations when using corn

coproducts in supplementation strategies, especially when supplements are composed of high amounts of distillers' grains. In some supplementation strategies, a supplement containing high amounts of distillers' grains could be used as an energy supplement and, because of the high protein content of distillers' grains, protein might be overfed.

Overfeeding protein is usually not recommended because protein is expensive and any excess protein ingested by the cow is used as energy. In some supplementation scenarios using corn coproducts, overfeeding to get the needed energy in the diet may mean that protein is overfed, but this may be the most economical strategy.

Summary

Corn coproducts can be used as a protein or energy supplement in cow diets. These products, when fed in high-forage diets, do not have a negative effect on how the overall diet is utilized by the animal. Because of the unique energy and protein profiles of corn coproducts, it may be economical to overfeed one nutrient to meet the requirement of another nutrient.

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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.*