GLYCERIN AS A POTENTIAL FEED INGREDIENT FOR DAIRY CATTLE

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TAKE HOME MESSAGES

- Glycerin, or glycerol, is a byproduct of biodiesel production and contains essentially the same amount of energy as corn grain on a dry matter basis.
- Limited experimental evidence indicates that glycerol can be added at up to 10% of dietary dry matter in replacement for grains without impacting milk production or composition if economically favorable on an energy-equivalent basis.
- Purity of glycerin is variable and must be determined carefully, as contents of water, methanol, phosphorus, and potassium are high in less purified sources.
- Glycerol contributes desirable qualities to pelleted feeds.

INTRODUCTION

Glycerin, also referred to as glycerine, is a product of the processing of fats for the chemical industry and for biodiesel production. Its main component is glycerol, with varying amounts of water and other impurities. Supply of glycerin in the United States and worldwide is projected to grow over the next decade as government policies and incentives favor increased processing of plant oils for production of biodiesel fuels and as worldwide production of fats and oils continues to increase. Glycerin price may decrease because of this increased supply. Given projections that prices for corn and other cereals likely will continue to increase as ethanol production consumes more of the corn crop, glycerin might become attractive as a feed for dairy cattle.

NUTRITIONAL VALUE OF GLYCERIN

Glycerin is available from the biodiesel or chemical industries in many grades of purity and potential value of available sources must be assessed carefully. German researchers determined that the net energy (NE_L) value of glycerol (1.03 to 1.05 megacalories per pound dry matter) in sheep, steers, and dairy cows was equal to or greater than that of corn grain. Net energy values were approximately 13% lower in high-starch diets (about 0.90 megacalories per pound) than in lower-starch diets, which was attributable to decreased cell wall (NDF) digestibility caused by addition of glycerol to the higher-starch diets. Therefore, the economic value of energy from glycerin can be compared directly with that of corn grain after correcting for the glycerol content (analogous to the “dry matter” content of the glycerin) of the material. The water content of glycerin used in various scientific studies has ranged from a low of 1% to as much as 26.8%.

The German research showed that up to 10% of the dietary dry matter could be supplied by glycerol with no decreases in feed intake or alterations of performance in growing ruminants or lactating cows. Similarly, feeding experiments with growing chickens showed that 5% addition of glycerol did not affect growth or feed efficiency, but addition of 10% slightly decreased performance. It should be noted that no experiments are available in which glycerol was supplemented to high producing dairy cows during established lactation, so the effects in those cows are uncertain. Feeding glycerol increased water content of rumen digesta in the German studies, and has been reported to stimulate water intake in other species.

South Dakota researchers found that glycerol in diets for transition cows decreased dry matter intake before calving but not after calving. They found few benefits to dietary supplementation of glycerol, in contrast to research that showed increases in blood glucose when glycerol was administered by drench similar to propylene glycol. The difference likely results from the fact that most glycerol consumed in the diet is fermented in the rumen to propionate and butyrate. When larger volumes are administered as a bolus dose, however, some glycerol can be absorbed directly through the rumen epithelium. Glycerol absorbed from the rumen would be converted to glucose by the liver.

Other concerns with glycerin as a feedstuff are the contents of methanol and mineral salts. Methanol is used in biodiesel manufacture and less pure sources of glycerol may contain large amounts of methanol. For example, a low-purity source of glycerin tested by German researchers contained 26.7% methanol on a dry matter basis, and the glycerin used in the South Dakota study contained 1.3% methanol. While methanol may be detoxified in the rumen, methanol consumption from larger amounts of less pure glycerin sources may be excessive. Methanol would be even more detrimental for preruminant calves and other nonruminants.

The South Dakota study reported that glycerin contained 11.5% “salt”, but other sources have reported low sodium contents. The high “salt” content likely is contributed mainly by potassium salts and phosphates, because potassium content in the German research ranged from 2.2 to 2.3% of the dry matter and phosphorus from 1.05 to 2.36%. Contributions to mineral intake by glycerin might be a factor in dry matter intake and need to be accounted for in ration formulation. The high phosphorus content also is a concern in nutrient management plans.

GLYCERIN IN MANUFACTURED FEEDS

Large farms may be able to handle glycerin as a bulk liquid and incorporate it into total mixed rations. However, glycerin may work well in pelleted concentrates as well. An interesting set of evaluations of glycerol addition to pelleted feeds was made by German researchers. Glycerol was added in increasing amounts to a concentrate containing wheat, soybean meal, rapeseed meal, beet pulp, wheat bran, corn, and vitamin-mineral premix. The mixture then was pelleted and stored under different conditions for different amounts of time. As little as 5% glycerol added to the mixture was effective in preserving higher-moisture pellets as indicated by suppression of fungal growth. Other measures of pellet quality and integrity were unchanged or improved by glycerol addition. Pelleting mixures with less-pure glycerin resulted in little methanol detected in the pellets, probably because the heat generated in the pelleting process caused the methanol to volatilize. Consequently, the prospects for addition of glycerin to pelleted feed mixtures for dairy cattle seem promising. Although additional research is needed

to define amounts of glycerin that can be fed to dairy cattle during peak lactation, current evidence indicates that up to 10% glycerin can be added to replace corn grain in diets for dairy cows if economically favorable.