Recommendations for Feeding Selected By-Product Feeds to Dairy Cattle[1]

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Introduction

In addition to lowering feed costs, commodity or by-product feeds can be used to increase the nutrient density of the diet. Some of these feeds provide rumen undegradable protein (RUP) and the amino acids methionine and lysine. Certain other by-product feeds serve as a substitute for roughage and can increase fiber in the diet. Because of their often unique nutrient composition, by-product feeds must be used as a component of a nutritionally balanced ration.

Using By-Product Feeds to Boost Nutrient Density

Whole cottonseed is an example of a by-product feed that is often fed to increase the nutrient density of the diet. The fat in whole cottonseed increases the energy density of the ration while providing a good source of crude protein and acid-detergent fiber. This allows the energy level and fiber in the diet to be increased without feeding excessive grain or causing problems with acidosis or low milk fat tests. Feeding fat in the form of whole cottonseed to increase energy density is also important during hot weather when dry matter intake decreases.

Using By-Product Feeds to Increase RUP in the Ration

By-product feeds are often included in the ration to increase the level of rumen undegradable protein. Dried brewers' grains and distillers' grains with solubles are good sources of RUP, although both are low in lysine. Blood meal is a good source of lysine, while corn gluten meal is a good source of methionine. Lysine and methionine are often limiting or co-limiting for milk protein synthesis. The ratio of lysine:methionine in the total diet should be about 3:1 when minimal requirements for each are met.

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Using By-Product Feeds to Substitute for Forage or Increase Fiber in the Ration

Cottonseed hulls are an example of a by-product feed that functions as an excellent forage substitute and increases the effective fiber level in the diet. An increase in dry matter intake (associative effect) is another benefit from feeding cottonseed hulls. As dry matter intake increases, milk production increases.

Using By-Product Feeds to Provide Phosphorus Supplementation

Corn gluten feed and wheat middlings are excellent sources of phosphorus and can eliminate the need to supplement inorganic phosphorous minerals.

Possible Nutritional Problems from Using By-Product Feeds

The unique nutritional value of by-product feeds may create nutritional problems if they are misused in a ration. Some possible problems include:

- palatability problems when using certain feeds (such as blood meal and corn gluten feed)
- mineral imbalances (such as when corn gluten feed or wheat middlings are fed without adjusting for their high phosphorus content)
- high moisture levels in the ration (such as when large amounts of wet brewers' grain are fed along with silage)
- lack of enough effective fiber in the ration (such as when soybean hulls are fed and the ADF level is not discounted)
- too much fat in the total ration dry matter (it should not exceed about 7 percent to avoid compromising fiber digestibility and rumen function)
- possible mycotoxin contamination
- poor availability and consistency of the commodity feeds
- handling and storage problems
- quality control questions
- milk production can sometimes be less when large amounts of a by-product feed or

combinations of such feeds are fed that result in palatability problems or nutrient imbalances. Economically, you should weigh such losses against feed cost savings to determine appropriate feeding choices.

Characteristics of Selected By-Product Feeds for Dairy Cattle

2001 National Research Council feed composition values on a dry basis are shown in parentheses.

CP=crude protein; TDN=total digestible nutrients, a measure of energy; and ADF=acid-detergent fiber

Whole cottonseed (23.5 percent CP, 77.2 percent TDN, 40.1 percent ADF) contains moderate levels of crude protein, but is high in energy (from fat) and fiber.

Feeding recommendation: 5 to 10 pounds per cow per day.

Cottonseed hulls (6.2 percent CP, 34.3 percent TDN, 64.9 percent ADF) are an excellent source of effective fiber and have the associative effect of increasing dry matter intake. They can be used as the main fiber component in a total mixed ration or to replace part of the forage.

Feeding recommendation: No limit but often included at 3 to 6 pounds per cow daily.

Corn gluten feed (23.8 percent CP, 74.1 percent TDN, 12.1 percent ADF) can be used to provide both crude protein and energy in a ration. However, the protein found in corn

gluten feed is very degradable in the rumen, and is deficient in lysine. Therefore, a source of rumen undegradable protein that is also a good source of lysine may need to be fed. The calcium level (0.07 percent) in corn gluten feed is low, while the phosphorus level (1.0 percent) is high. Therefore, be sure to balance the diet for calcium and phosphorus when feeding corn gluten feed and to balance the ration to maintain the calcium:phosphorus ratio above 1:1. Palatability can be a problem, so include it gradually.

Feeding recommendation: 5 to 10 pounds per cow per day, with less for the high-producing herd.

Corn gluten meal (65.0 percent CP, 84.4 percent TDN, 8.2 percent ADF) is an excellent source of bypass methionine.

Feeding recommendation: Include in the ration as a source of rumen undegradable methionine to provide a ratio of about 3:1 lysine:methionine in the total diet.

Blood meal (batch dried) (95.5 percent CP, 65.9 percent TDN) is an excellent source of bypass lysine. Palatability can be a problem.

Feeding recommendation: Include in the ration as a source of rumen undegradable lysine to provide a ratio of about 3:1 lysine: methionine in the total diet. Generally limit to 1 to 1.25 pounds per cow per day.

Hominy feed (11.9 percent CP, 83.1 percent TDN, 6.2 percent ADF) can be fed to replace the corn grain in the ration. Fat levels can vary, affecting energy value, and high fat hominy feed can turn rancid in storage during hot weather.

Feeding recommendation: No limit when fed as part of a balanced ration.

Soybean hulls (13.9 percent CP, 67.3 percent TDN, 44.6 percent ADF*) can be fed as a source of energy and protein. *However, when formulating rations using soybean hulls, discount the ADF value to 10 percent or lower because the fiber is not effective fiber and will not help maintain proper rumen function or milk fat tests.

Feeding recommendation: 4 to 10 pounds per cow per day.

Cottonseed meal (solvent, 41 percent CP) (44.9 percent CP, 66.4 percent TDN, 19.9 percent ADF) can be fed as a source of crude protein. The protein in cottonseed meal is less degradable in the rumen than that in soybean meal. Cottonseed meal can be fed along with whole cottonseed without problems from gossypol toxicity, as long as total cotton products do not exceed 12 to 14 lb/cow daily.

Feeding recommendation: Use to replace soybean meal as a source of protein in the ration as economics dictate.

Dried brewers' grains (29.2 percent CP, 71.3 percent TDN, 22.2 percent ADF) can be fed as a source of protein and energy. Dried brewers' grains are also a good source of rumen undegradable protein, but the protein is low in lysine.

Feeding recommendation: 8 to 10 pounds per cow per day.

Wet brewers' grains (28.4 percent CP, 71.6 percent TDN, 23.1 percent ADF) have similar values as dried brewers' grains but contain much more moisture. Watch ration moisture level since wet brewers' grains may be 20 to 35 percent dry matter.

Feeding recommendation: Up to 30 pounds per cow per day.

Distillers' dried grains with solubles (29.7 percent CP, 79.5 percent TDN, 19.7 percent ADF) can be fed as a source of protein and energy. They are also a good source of rumen undegradable protein, but the protein is low in lysine. Palatability can be a problem, and excess feeding levels can reduce fat test.

Feeding recommendation: Up to 10 pounds per cow per day.

Wheat middlings (18.5 percent CP, 73.3 percent TDN, 12.1 percent ADF) are palatable and are a good source of crude protein and energy but are high in phosphorus (1.02 percent).

Feeding recommendation: 6 to 15 pounds per cow per day.

Dried citrus pulp (6.9 percent CP, 79.8 percent TDN, 22.2 percent ADF) is a palatable feed that is high in calcium (1.92 percent) and energy but low in crude protein.

Feeding recommendation: 5 to 8 pounds per cow per day.

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