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Replacing Soybean Meal in Dairy Rations

Date of publication : 7/16/2008

Source : University of Minnesota Dairy Extension

A call came in the other day about feed costs. This producer's costs had increased like everyone else's, but he was wondering about substitutions for soybean meal in the lactating cow ration. The August crop report had just come out and the concern was that the low soybean yield estimate would cause protein prices to increase. Just the month before, he had experienced a big increase in animal protein prices.

To answer his question, our discussion focused on three things. First, the protein level in the lactating cow diet; second, on the need to balance rumen degradable protein (**RDP**) and rumen undegradable protein (**RUP**) sources in the diet; and, finally, on cost of alternative protein sources. Soybean meal (**SBM**) is an excellent protein source for dairy cows having a good balance of amino acids and being a source of both RDP (65% of CP) and RUP (35%). A substitute source must consider these nutritional aspects as well as price or losses in cow performance may cost more than savings in protein cost.

Current research and field practices indicate that with the correct balance of RDP and RUP in the diet, the crude protein (**CP**) percentage of lactating cow diets could be lower than we previously had been balancing for. Several studies now indicate we can achieve good milk production and milk components with diets of 17% CP when balanced for RDP, RUP and amino acids. Balancing for amino acids requires a formulation program that models rumen digestion of feedstuffs and matches amino acid availability from feeds and microbial protein with the animal's requirement. Feeding the lowest possible protein diet without loss in milk or milk protein production will not only lower feed cost, but improve efficiency of protein utilization reducing

nitrogen excretion in manure. A goal for most dairies should be a 17 to 17.5% dietary CP in early lactation and then decreasing to about 14% CP in late lactation.

The general guideline for RDP and RUP in diets is that 65% of the CP should be degradable (RDP) and 35% of the CP undegradable (RUP). For a diet containing 17% CP, dry matter basis, this means 11% of the diet dry matter is RDP and about 6% is RUP. For top milk and milk component production, lactating cow diets require the RUP or bypass proteins have a good balance of amino acids. Blood meal, fish meal, roasted soybeans or specially processed rumen protected soybean meals are good RUP sources. Feeding rumen protected amino acids also contributes to RUP and balances out the amino acid profile available for absorption post-ruminally.

Below is a guide to protein sources and their feeding amounts:

High RDP sources (60 to 100% of the CP is RDP) that can substitute for all or significant amounts of SBM:

Canola meal – 36% CP.

Linseed meal – 34% CP.

Raw soybeans – 36 to 38% CP. Feeding amount limited to 5 lb/cow/day because of fat level.

Sunflower meal – 28 to 34% CP. Palatability can be a problem. Limit amounts to 3 lb/cow/day or no more than 50% replacement for SBM.

Urea – 287% CP. Limit amounts to 0.25 lb/cow/day. Best fed with high corn silage rations and rumen digestible carbohydrates.

Moderate RDP sources (40 to 60% of the CP as RDP) generally can be substituted for up to 50% of the SBM fed. The exception is with all haylage rations where higher

amounts can be fed.

Brewers grains (dry) – 22% CP. Low protein content limits usage to 5 lb/cow/day.

Corn gluten feed – 22% CP. Can be fed up to 5 lb/cow/day. Amino acid balance is not as good as

SBM so feed with some SBM or equivalent product.

Distillers grains – 26 to 28% CP. Good palatable feed, but amino acid balance and fat level limit usage

to about 5 lb/cow/day in most rations. A 50:50 distillers grain/SBM mix makes an excellent palatable protein mix.

Malt sprouts – 25% CP. Dusty feed with low energy. Limit to 2 lb/cow/day.

Heated, or processed SBM or heated soybeans – 38 to 42% CP. All good sources of protein. Cost

will be higher than SBM. Could be only source of supplemental protein in all haylage ration.

Low RDP sources (< 40% of the CP as RDP). These are high RUP or “bypass” protein sources. These sources should not be the only protein supplement and should be fed in combination with SBM or other high RDP sources.

Blood meal – 80% CP. Excellent amino acid balance. Feeding limit is about 0.5 lb/cow/day.

Corn gluten meal – 60% CP. Good source of methionine, but low in lysine. Feeding limit is about 1 lb/cow/day.

Feather meal – 76% CP. Not very palatable and protein availability is variable. Maximum feeding

amount is 1 lb/cow/day.

Fish meal – 60% CP. Excellent amino acid balance, but oil content limits feeding amount to less than 1 lb/cow/day. Palatability may be a problem.

Meat and bone meal (Porcine only) – 45% protein. Good protein source with high phosphorus amounts. Limit feeding amount to less than 1.5 lb/cow/day.

A quick way to compare prices for high RDP protein sources that can directly replace SBM is to calculate the cost per lb of protein. For example: 44% CP SBM at \$250/ton = 880 lb of protein (2000 x 0.44) for \$250 or cost/lb of protein is ($\$250/880 \text{ lb}$) = \$0.28/lb protein. If canola meal, for example, was less than \$200 per ton, it would be a better buy than SBM (canola meal at 36% protein or 720 lb/ton x \$0.28/lb protein = \$202.60/ton).

This quick pricing method is acceptable when feeds are similar in RDP or RUP and energy, but doesn't work well in comparing blood meal to soybean meal for example. The RUP value of these two feeds is considerably different. High RUP sources will almost always cost more than high RDP sources. In addition, the amino acid composition of the RUP should be considered in pricing the source. Your nutritionist, through formulation of rations on RDP, RUP and/or amino acids, can help you arrive at cost effective protein supplementation in your dairy ration.

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