Added lysine can fortify soybean meal

*The lysine content of mechanical extracted soybean meal can be improved through the use of gums technology.

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Increased milk production requires adequate levels of amino acids delivered to the duodenum in a digestible form.

In many rations for lactating dairy cows, the first limiting amino acid is lysine. A process for fortifying mechanically extracted, high-bypass soybean meal with rumen-protected lysine has been developed. This new product can help lactating dairy cows meet their dietary lysine requirement.

Why is this important?

There is no single source of rumen undegradable protein (RUP) that provides an ideal balance of amino acids to match the amino acids required for milk production.

Some feedstuffs that are low in both crude protein and in lysine are commonly included in rations, such as corn silage, corn grain and corn byproducts (National Research Council, 2001). Other feedstuffs, such as the various blood meals, have higher crude protein and lysine concentrations but are variable in rumen degradability and intestinal digestibility (Stern, 2007).

In order to meet the lysine requirement and, at the same time, accommodate the drawbacks of these ingredients, rations are often formulated to contain higher crude protein and lysine concentrations but are variable in rumen degradability and intestinal digestibility.

This leads to two other problems. First, ration cost increases and income over feed cost falls because higher protein ingredients tend to be more expensive than lower protein ingredients. Second, excess crude protein is associated with increased breedings per conception, increased incidence of mastitis and increased cost of reproduction.

Rectified

As with other vegetable protein sources, mechanical extracted, high-bypass soybean meal supplies RUP that is low in lysine relative to the lysine requirement for milk production. When that ingredient is fortified with rumen-protected lysine, it supplies RUP that is a better match with the cow’s amino acid requirements. That makes it possible to formulate a ration to meet the lysine requirement at a lower crude protein level.

The new process is based on patented technology (U.S. Patent No. 7,297,356) for applying fresh soy gums onto a feedstuff. In this case, the feedstuff is mechanical extracted soybean meal (MESG). A rumen-protected lysine product is inserted into fresh soy gums. The gums/lysine mix is then applied onto the mechanical extracted soybean meal (MESG+L).

Rumen kinetics

Two in vitro studies at Sapienza Analytica LLC evaluated the rumen kinetics of MESG and MESG+L. The Ohio State University offers a program called Sesame that evaluates feedstuffs in terms of the value of their nutrients.

These technologies benefit milk producers and milk consumers. They make it possible to formulate rations that meet cow’s amino acid requirements at a lower crude protein content. That results in the likelihood of improved efficiency of nitrogen utilization, reduced milk urea nitrogen, improved health and reproduction and increased income over feed cost.

Plasma lysine

Gums technology is known to increase RUP. In a study at West Virginia University, a total mixed ration containing MESG had more RUP than diets with mechanical extracted high bypass soybean meal without gums.

In the first study at South Dakota State University measured plasma lysine in lactating dairy cows fed either MESG or MESG+L. Eight lactating Holsteins were fed a base ration that was adequate in lysine and protein during a pre-trial phase. During the seven-day plasma trial, four of the cows were fed the base ration top-dressed with MESG. The other four cows were fed the base ration top-dressed with MESG+L. Blood samples were drawn on the last day of the trial.

MESG+L increased plasma lysine levels in lactating Holsteins significantly (P < 0.03) compared with MESG (Figures 1 and 2).

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hours was also not different for MESG and MESG-L and averaged 74.5%.

In the second study, both products were incubated for 50 hours in dacron bags. Dry matter disappearance curves were fitted using the JMP statistical software program. RUP was calculated based on the A and B fractions and determined using the nonlinear modeling function of JMP. RUP was calculated at an assumed passage rate of 6% per hour.

Rumen undegraded dry matter at 8 hours for MESG and MESG-L was not different and averaged 73.6% at 8 hours (Figure 5). This was similar to the value of 74.9% in the first Sapienza study.

These three studies showed:
(1) The added lysine and the native lysine have similar rates of rumen bypass and intestinal digestibility, and
(2) The added lysine is absorbed into the plasma of lactating dairy cows.

Conclusion
New technology makes it possible to fortify MESG with rumen-protected lysine. The rumen-protected lysine is inserted into fresh soy gums. The gums and lysine mix are applied onto the soybean meal using patented technology. The process results in improved nutritional value of the RUP in this product. That can lead to ration formulation, cow health and milk production benefits.

References
Stern, M.D. 2007. Significance of Intestinal Digestion of Dietary Protein. 18th annual Colorado Dairy Nutrition Conference.
3. Rumen undegraded lysine in MESG and MESG fortified with rumen-protected lysine

![Graph showing 3. Rumen undegraded lysine in MESG and MESG fortified with rumen-protected lysine]

4. Intestinal digestibility of rumen undegraded lysine in MESG and MESG+L

![Graph showing 4. Intestinal digestibility of rumen undegraded lysine in MESG and MESG+L]

5. Rumen undegraded dry matter

![Graph showing 5. Rumen undegraded dry matter]