



Research

Evaluating Protein Content of Silage

“Using near infrared reflectance spectroscopy (NIRS) to determine digestible energy and rumen degradable intake protein (DIP) & rumen undegradable intake protein (UIP) fractions of cereal forages as affected by nitrogen-fertility & feedlot manure application”

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Research Institution: University of Alberta

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Objectives: To determine whether near infrared spectroscopy (NIRS) can be used to predict rumen degradable intake protein and bypass protein of greenfeed and silage from winter triticale, winter wheat, fall rye, spring-seeded barley and spring-seeded rye, and the effects of different nitrogen application rates on the protein content of these crops grown on irrigated and dryland.

Background: Proteins are required for many metabolic functions, play important structural roles (e.g. organs, ligaments and tendons) and are also a major component of muscle and milk. There are two major types of proteins in ruminant diets.

Rumen degradable protein is broken down into amino acids by rumen bacteria, protozoa and fungi. These amino acids are broken down further, and new amino acids are created by the rumen microorganisms. These are used to build microbial cell walls as the microbes reproduce. The microorganisms eventually enter the animal's digestive tract, are digested into amino acids, and absorbed. Because the rumen microbes break down the amino acids in the feed and re-create new microbial amino acids, the amino acid composition of the protein feed may not reflect the amino acids that are actually available to the animal.

Bypass or Rumen un-degradable protein: These proteins are not digested by microbes in the rumen, and pass directly into the animal's lower digestive tract. In this case, the amino acid composition of the protein feed is very similar to what the animal actually receives. This is more important with high performing feedlot or dairy animals, which can have very specific nutrient requirements.

Most ration analyses report total “crude protein” content of the feed. Analyses that differentiate between degradable intake and bypass proteins are much more expensive. NIRS involves shining an infrared light through a feed sample, and using the light spectrum to evaluate the nutrient content of the sample. It is rapid, non-destructive and only uses small amount of feed. These researchers are comparing NIRS results and lab chemistry analyses to actual protein digestibility in cattle. They plan to develop and test equations predicting rumen degradable vs. bypass protein content of different feeds, and are also looking at the effects of nitrogen fertilization on rumen degradable and bypass protein contents of dryland and irrigated forages. This project is scheduled to be completed in 2004.

Implications of the Research: Developing a rapid, accurate, economical NIRS-based test for protein quality may allow more precise diet formulations for cattle.