Practical Hay Analysis

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In bovine practice, the application and understanding of forage analysis is considered to be an imperative component of any veterinarian practitioner, extension agent, nutritionist and cattle producer conversation when herd dietary management, cattle body condition and or production are in question.

Several forage and soil laboratories throughout the Unites States are able to provide a detailed breakdown of the most important nutritional values such as: dry matter, moisture, energy, crude protein, neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin, minerals, nitrate levels, and mycotoxins.

The components mentioned above are widely used to determine the quality of the forages. The dietary requirements vary with the stage of production and age of beef and dairy cattle. Thus, based on variability and availability of the forage and the population of cattle being fed, diets must be formulated and balanced accordingly. Concentrates, typically, are used to provide the energy and fat, per example, when certain forages are known to be deficient.

The use of a clean and thorough technique to collect the samples is crucial. Always take into consideration the current condition of the forage one is planning on sampling. Dirty, old, loaded with moisture, with dark spots, are most likely to be of poor quality and should not be fed to cattle. Encourage clients to separate the forages in lots, in other words, separate first cut from second, forages for bailing, and round versus square bales.

Sampling technique is well describe in a fact sheet published by the Alabama Cooperative Extension System, in which they describe the use of probes to collect forage samples. Probes are tubes, of at least ½ inch in diameter, on the end of a boring device, a drill with an adapter is often used for this purpose, which will collect core samples (middle of the bale). Samples taken using bare hands by just pulling is extremely discouraged, the contents collected are typically not accurate and not representative of the average quality throughout the bale.

The biggest question imposed by the producer is; how much or how many samples should I take? The collection of 10 to 12 samples per lot of hay, or 15-20% of the number of bales present should be a good representative number. Samples from the same lot, should be thoroughly mixed before sending to the forage laboratory.

The author encourages practitioners and cattle producers to contact their local extension agent and or the closest lab to enquire what tests are available, as this will vary from lab to lab. Examples of some parameters, and their definition, found in a typical laboratory analysis report are the following:

1. **Dry matter -** Amount of percent (%) moisture in the feed. This is important because nutrient requirements are based on DM. Reported as "dry matter" or "as fed".

   The amount of moisture aids in calculating what the forage is worth, storage needs and how much to feed per head per day. The amount of any forage that cattle consumes is influenced by the dry matter content.
2. **Crude Protein -** Protein is an important but variable nutrient supplied by forages. Protein is necessary for growth, milk production, and muscle development. In general terms, the younger more immature the plant, higher the protein levels. The crude protein value on a forage sample includes true protein and non-protein nitrogen compounds.
3. **Fiber -** Ruminants require fiber to stimulate rumen microbiota, promote saliva production (buffering the rumen with sodium bicarbonate) and overall health of the ruminant fore stomach. Diets deficient in fiber may lead to rumen acidosis, and severe metabolic deficiencies.
   a. NDF - includes all the cell wall material in the forage and is used to interpret maximum level of intake. Negatively correlates with dry matter intake (DMI). As NDF increases DMI decreases.
   b. ADF - negatively correlates with digestibility of forage. As ADF increases, forages become less digestible.

c. Lignin - it reflects the indigestible NDF. It is responsible for slowing the rate of feed passage. As lignin levels increase with plant maturity, digestibility drops, causing a decline in forage quality.

4. **Total Digestible Nutrient (TDN) –** It is the sum of the digestible fiber, protein, lipid, and carbohydrate components of the feed. This parameter can be used to estimate the energy available to the animal.
5. **Relative Forage Quality (RFQ) -** This value allows the producer to compare two or more forage samples for energy. Forage samples greater than 100 are considered satisfactory, however it is imperative to remember that, what is considered adequate for beef cattle may be inadequate for dairy and vice versa.
6. **Mycotoxins -** Typically forages are not analyzed for mycotoxins, unless requested. The author suggests this test for corn type forages. Feeds for cattle should contain less than 20 ppb of aflatoxin. Often producers combine the feed, creating a "dilution" effect, the author recommends caution in situations where heavy load of mold is present. Often it is better off to discard the feed then to have serious digestive and or neurological disease in the herd.

Suggestive Reading:

- Amy Radunz and Gene Schriefer. Hay Analysis Guide for Beef Cattle. UW Extension Wisconsin Beef Information Center © 2011. http://fyi.uwex.edu/wbic/
- Norwood J. Van Dyke and Paula M. Anderson. Interpreting a Forage Analysis. The Alabama Cooperative Extension System (Alabama A&M University and Auburn University). ANR-890, 1998.
- Matt Poore. Interpreting Forage Analysis Reports for Beef Cows. NC Cooperative Extension and Dept of Animal Science, NCSU