GUEST COLUMN

Understanding Alfalfa Forage Quality Terminology

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Is it important to know alfalfa forage terminology? Can we gain anything on our farming operations by better understanding alfalfa forage terms or should we just focus on buying good seed, planting it, and reaping the harvest? Let's look at how understanding this terminology matters and how it can make a difference on your farm.

Understanding the meanings of alfalfa quality terms helps farmers better evaluate a forage's ability to produce a desired level of animal performance after it is consumed. The primary terms that can make a difference are protein, fiber, and total digestible nutrients, but there are others that also provide benefits.

Alfalfa Forage Quality

Forage quality measures the potential of a forage to produce a desired animal response. Forage quality can be influenced by its palatability, intake, digestibility, and ultimate nutrient content.

Harvest maturity is important in determining alfalfa forage quality. Leaves are higher in quality and digestibility than stems, and the proportion of leaves in alfalfa forage declines as plants mature. When alfalfa is in the vegetative growth stage, the proportion of leaves to stems is highest, which helps to maximize forage quality. Leaf yield increases up until first flower and remains unchanged afterwards. Stem yield continues to increase as alfalfa matures, but forage digestibility and quality decrease. Not only will the stems make up a greater proportion of the total yield as alfalfa matures, the digestibility of stem material declines with advancing maturity. The fiber content of the stems increases with advancing maturity, especially lignin content, which is the least digestible fraction of the fiber.

Harvesting and storage effects can also influence alfalfa forage quality. Leaf shatter, plant respiration, and leaching by rainfall during field drying of hay can reduce forage quality, even after cutting if not processed in a timely manner. Losses can also occur due to weathering and microbial activity during storage.

- **Dry Matter (DM) –** The portion (weight) of the forage other than water is DM, which is used in formulating rations. Hay with moisture content less than 10% can be lower in palatability, but more than 15% may indicate a risk of mold.
- **Crude Protein (CP) –** CP is an indicator of the forage's protein content, which is a mixture of true protein and non-protein nitrogen. CP content indicates the capacity of the feed to meet an animal's protein needs. Typical CP content in alfalfa ranges 18-25%. Alfalfa cut early or with a high percentage of leaves has a high CP content. Animals meet protein needs by breaking down plant and microbial (from the rumen) protein and reassembling it as animal protein. Other terms include rumen digestible protein (RDP) which is the portion of total protein that is degraded in the rumen, and rumen undegraded protein (RUP) which is the portion of the protein not degraded in the rumen. NDFCP is neutral detergent fiber crude protein.
- **Acid Detergent Fiber (ADF) –** ADF is the percentage of highly indigestible and slowly digestible material in a forage. This includes the cell wall portions of the alfalfa forage which are made up of cellulose and lignin. Lower ADF indicates a more digestible forage, and ADF values less than 35% are desirable for an alfalfa forage. ADF can be an indicator of the energy content of a forage and is used in digestibility calculations. Acid Detergent Lignin (ADL) analysis can be performed sequentially on ADF residue. Lignin is the major factor influencing the digestibility of plant cell wall material. As lignin increases, the digestibility, intake, and animal performance usually decrease. ADF values will be higher as lignin increases in a forage, or as alfalfa maturity increases.
- **Neutral Detergent Fiber (NDF) –** NDF is the percentage of cell walls or fiber in a forage that is digested in a specified time, comprised of the ADF fraction plus hemicelluloses. NDF values reflect the amount

of forage the animal can consume. They are inversely related to animal intake potential, with lower percentages indicating greater animal consumption. NDF content less than 45% is generally desirable for an alfalfa forage. Low NDF is better as long as there is a certain minimum fiber level in the ration to meet an animal's needs.

- **Neutral Detergent Fiber Digestibility (NDFD) –** NDFD is a newer term which is the percentage of the NDF digested by animals at a specified level of feed intake. NDFD is inversely related to animal intake and the energy that an animal can derive from a forage. This value can be used to rank alfalfa forages on potential fiber digestibility and in energy calculations.
- **Total Digestible Nutrients (TDN) –** TDN is an estimate of the digestible energy of a forage, representing digestible fiber, protein, lipid, and carbohydrate components. TDN in conjunction with CP and ADF can be instrumental in determining the overall quality and rations of the forage material when making feeding recommendations. Typical TDN values for alfalfa range 60-70%. Other net energy values often calculated from TDN values include:
  - Net Energy for Maintenance (NEm) – an estimate of the energy value of a forage used to keep an animal in equilibrium (neither gaining nor losing weight).
  - Net Energy of Lactation (NEl) – an estimate of the energy value of a forage used for maintenance plus milk production during lactation.
  - Net Energy for Gain (NEg) – an estimate of the energy value of a forage used for body weight gain above that required for maintenance.
  - Nonfibrous Carbohydrate (NFC) – an estimate of the rapidly available carbohydrates in a forage which are primarily starch and sugars.
  - Ash – a measure of the total mineral content in a forage. Values greater than 14% for legumes usually indicate soil contamination of forage.
- **Relative Feed Value (RFV) & Relative Forage Quality (RFQ) –** RFV and RFQ are similar terms estimating preharvest feed value based on energy and intake potential. RFQ was introduced by the University of Wisconsin to better estimate energy and intake. RFV uses NDF and ADF as predictors of forage quality – NDF is correlated with intake and ADF is correlated with digestibility. A rating of 150 is an indicator for quality dairy feed, 115-130 could be used for beef cattle, and 90-110 is still acceptable, but may require additional supplements.

Summary

Factors having the greatest impact on alfalfa forage quality are stage of maturity at harvest and the harvesting and storage techniques. Alfalfa leaves are higher in quality than stems, and young stems are higher in quality than old stems. The more mature and fibrous an alfalfa forage, the longer it can take to be digested and the less an animal may consume. The ultimate measure of forage quality is animal performance. Good animal performance results when animals consume forage high in nutrients and low in fiber.

Sources

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