



Interpreting Forage Analysis Reports for Beef Cows

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Analysis of forages, and using the resulting information to create a balanced ration is a critical component of nutritional management for any species of herbivore. The North Carolina Department of Agriculture and Consumer Services Farm Feed Testing Service provides producers with a detailed analysis that includes important nutritional components including dry matter (moisture), fiber, minerals, energy, nitrate, and important mycotoxins. This sheet is intended to give a brief description of the items that appear on the analysis report form to help you make an initial interpretation regarding your analysis results. More detailed interpretation and assistance with balancing rations can be obtained by contacting your livestock extension agent or by visiting the web site given at the end of the document.

The analysis sheet will have two columns of numbers. The first identified as “As Sampled Basis” and the second as “Dry Matter Basis”. The first item in the “As Sampled” column is % Dry Matter. **Other than % Dry Matter all interpretation of the analysis is based on the “Dry Matter Basis” column.** This is because dry matter level (moisture level) varies in each sample, and putting them on a dry basis makes the information easier to interpret.

Dry Matter %. The amount of dry matter in a feed is a key piece of information. Most analysis will be for hay, haylage, or silage, and dry matter % influences how stable a forage will be in storage. Dry matter of fresh forages sampled directly from pastures is of less importance. Dry forages including hay and crop residues should contain at least 80% dry matter or they will heat in storage which will result in damage to the nutritional value, and they will deteriorate over time due to mold growth. Spontaneous combustion (hay fires) is a real possibility with hay baled at less than 80% dry matter. Dry matter of higher than 85% is preferable for hay and other dry roughages for best results. Haylages made from forage crops ideally will contain from 35 to 65% dry matter in order to ferment properly. Chopped silage, such as corn silage, should ideally be between 30 and 40% dry matter.

INTERPRETATION OF ANALYSIS OF NUTRIENTS ON A DRY MATTER BASIS.

Crude Protein, %, Unavailable Protein, %, and Adjusted Crude Protein, %. Crude protein (CP) is one of the key nutrients in feeds. The typical dry cow needs 7.5% CP, and a lactating cow needs 11% CP. Any forage has a small level of the protein in a “bound” form which is normal and this is called “Unavailable Protein”. If the unavailable protein exceeds 10% of the total crude protein it means that the hay or haylage probably heated, resulting in some damage to the protein. Any bound protein exceeding 10% of the total is subtracted resulting in the “Adjusted Crude Protein”. Adjusted Crude Protein is the value that should be used to evaluate the forage and balance rations. In most forage this will be the same as the Total Crude Protein.

Acid Detergent Fiber, %. Acid detergent fiber (ADF) is the less digestible fiber portion of the forage. This value is used to calculate the energy values discussed below. The higher the ADF level, the lower the energy. An equation specific for each feed is used to calculate energy from ADF so it is important to fill in the proper feed type on the submission form. The animal species should also be given because different equations are used for different species.

Calcium and Phosphorus, %. Calcium (Ca) and Phosphorus (P) are important major minerals which are rarely deficient in forages. A dry cow requires 0.25% Ca and 0.16% P, while a lactating cow needs 0.31% Ca and 0.21% P. It is also important that the ratio between Ca and P is 1.5:1 (e.g. 0.3% Ca and 0.2% P) to 4:1 (e.g. 1% Ca and 0.25% P). When P level in the forage is higher than Ca, producers should seek a high calcium mineral supplement. Otherwise a standard mineral supplement should take care of Ca and P needs.

Sulfur, %. A dry or lactating cow only needs about 0.15% sulfur and it will rarely be lower than that. Occasionally sulfur will be elevated where poultry litter, municipal biosolids, or other high sulfur fertilizers are used. At levels

above 0.3% sulfur a higher level of copper may be needed in mineral supplements, and at greater than 0.4% sulfur other production problems might occur. If sulfur is higher than 0.4%, get advice before feeding the forage.

Magnesium, Sodium, and Potassium, %. Magnesium (Mg), Sodium (Na), and Potassium (K) are three more major minerals that should be considered. Dry cows need about 0.12% Mg, 0.08% Na, and 0.6% K, while lactating cows need 0.2% Mg, 0.1% Na, and 0.7% K. Forages will usually be near the requirement for Mg, nearly always below the requirement for Na (salt), and almost never below requirement for K. Sometimes potassium is high enough to cause health problems because it interferes with magnesium resulting in grass tetany. This is usually a concern if the potassium level is above 3%. Grass tetany is very easily controlled by using a high magnesium mineral supplement (10 to 14% magnesium) during the time a cow is in early lactation and through the end of the spring of the year. If potassium levels are expected to be consistently above 2% in forages, then producers may consider using a high magnesium mineral supplement all year long.

Copper, Iron, Manganese, and Zinc, ppm. These are 4 important “trace minerals” that are reported as parts per million (ppm) rather than %. Copper is of critical importance and almost always deficient in forages in our state. Cows need from 10 to 15 ppm copper in their diet in normal situations, and perhaps more if there are other interfering minerals present such as sulfur, iron, and molybdenum. Iron is almost never low in forages in NC, with the cow requirement only being 50 ppm. Sometimes iron is elevated and levels over 1000 ppm are a concern. Sometimes this elevated level indicates soil contamination which is not a great problem, but sometimes it is because of a high level of iron in the plant tissue which can cause interference with copper absorption. Manganese requirement is about 40 ppm and it is almost never deficient in forages in NC. Zinc requirement is 30 ppm and it is often marginal or deficient in our forages in NC.

A good quality free-choice mineral supplement will meet the trace mineral needs. These supplements will provide the major minerals (including salt, calcium, phosphorus, and magnesium in a “High Mag” supplement) and the trace minerals. The recommended level of trace minerals in mineral supplements formulated for 4 oz/head daily is 1300 ppm copper, 1800 ppm manganese, 2600 ppm zinc, and 26 ppm selenium. Producers should look at their mineral supplement tag and make sure trace mineral levels are adequate. The one important trace mineral commonly deficient, but not analyzed for in the NCDA and CS program is selenium (due to a very high cost of the analysis), so it should be supplemented at the recommended level in all cases. It is important to note that red trace mineralized salt, or other “salt block” products are generally not an adequate mineral supplement for producing livestock.

Nitrate ion, %. Nitrate poisoning is a real concern that livestock producers should be aware of. High nitrate levels might occur whenever forage species are used that accumulate nitrate (such as sudan x sorghum hybrids), when nitrogen fertilization level is high, or during drought. Animals adapt slowly to nitrate, but if unadapted animals are challenged with it they might either abort, or they might die. Below 0.25% nitrate is safe for all animals. Nitrate levels above 0.5% are a major concern for unadapted animals, and levels above 1% are considered very dangerous. If your nitrate level is high consult our guide on using high nitrate forages at: <http://www.ces.ncsu.edu/disaster/drought>.

Net Energy (lactation), Mcal/lb and TDN, %. Net energy and TDN are two measures of energy content of the forage. We usually use TDN to balance rations for beef cows. A dry cow needs about 52% TDN, and a lactating cow needs about 60% TDN.

Aflatoxin. Forages are generally not analyzed for mycotoxins, but in some situations you may have requested this analysis, especially for corn type forages (silages, stalks, etc.). Feeds for beef cattle should contain less than 20 ppb aflatoxin. If the level is higher than that in the forage in question, it may be fed in combination with other feeds containing low levels of aflatoxin. A guide to mycotoxins is also available at <http://www.ces.ncsu.edu/disaster/drought>.

Other analyses. Ash, %, NDF, % and NSC, % will also be run upon request. These values are important in some situations. An ash level of over 5% is probably due to soil contamination. This usually does not cause problems, but soil dilutes out the important nutrients. Neutral detergent fiber (NDF) includes all the cell wall material in the forage and is important in some situations to interpret maximum level of intake. Non structural carbohydrates (NSC, %) includes sugars, starches, and other soluble carbohydrates. This value may be important for some species, but usually not for beef cattle.