



Defining Analytical Constituents in Equine Feed Reports

Within the A&L Feed analytical packages, there are two which are specifically used for horses – F1H and F2H. F1H is a very basic package and won't be referenced beyond this point. F2H is a more complete package that contains more analytes used when assessing the quality of feed for horses.

It should be noted that both F1H and F2H are analysed completely by “wet” chemistry (versus NIR) and can therefore be used for the analysis of any type of feed or forage.

The reports contain two columns of values for each constituent – As Fed and Dry. The “As Fed” column represents values of the feed as it is presented to the horse. The “Dry” column represents analytical values of the feed when all the moisture has been removed. These values are more appropriate for comparing the quality of different forages, when searching tabulated values (which are usually recorded on dry matter basis) and when developing a ration for the animal.

The difference in weight of a sample, between the as received state and after being dried for approximately sixteen hours at $<60^{\circ}\text{C}$, represents the moisture content and the dry matter value is determined from this.

Crude Protein is calculated from the total nitrogen of the sample. Protein is assumed to be 16% nitrogen, therefore $\text{total nitrogen} \times 6.25 = \text{Crude Protein}$. The term crude is used because it does not distinguish between true protein and non-protein nitrogen.

Soluble Protein represents short chain amino acids, amines, amides and non-protein nitrogen. In ruminant diets, these artifacts aid in capturing carbohydrates in the rumen. Soluble protein is of little use to horses. In dry feed and dry forages, the soluble protein concentration is quite low.

ADF-Cp indicates the amount of protein associated or attached to the cell wall fibre. It is often correlated to unavailable protein. When hay crops are subjected to adverse drying conditions, ADF-Cp can be significantly high. For instance, if the crude protein of a sample is 10% (dry matter basis) and ADF-Cp is 2% (dry matter basis) this represents 20% of the crude protein. At values greater than 10%, an adjustment can be made to the crude protein value.

Acid Detergent Fibre measures the cellulose and lignin content of the feed sample or a portion of the plant cell wall in forages. Higher ADF values usually reduce the digestible dry matter. A portion of the energy derived from forages comes from the digestion of ADF, so less digestible ADF results in less energy being available to the animal. As plants mature, the ADF values increase, so cutting forages early is an easy way of increasing the available energy.

Neutral Detergent Fibre represents the entire plant cell wall (cellulose, hemicellulose and lignin). Again, as plants mature, the cell wall becomes thicker and less digestible. NDF is often associated with “fillability”.

FACT SHEET

A & L CANADA
LABORATORIES, INC.

2136 Jetstream Rd.
London, ON N5V 3P5

Phone: 519-457-2575
Fax: 519-457-2664
Aginfo@alcanada.com
www.alcanada.com

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High NDF forages restrict the animal from consuming as much. Since horses are subject to small meals compared to ruminants, having a forage that has a reasonable NDF value (45-50%) will allow more material to be consumed.

Total Digestible Nutrients is self explanatory. In equine nutrition, TDN has little use, but can be used to determine Digestible Energy. In most forage packages, TDN is determined for ruminants, and therefore overestimates equine DE. The Equine Digestible Energy reported on F2H report is calculated from protein, ADF, NDF, fat and ash.

The mineral values reported are totals in percent (macrominerals) or parts per million (microminerals). The mineral concentration can be a function of the fertility of the land on which the forage had been grown, of the plant maturity at harvest or of the type of feed. Calcium : phosphorus level of approximately 2:1 is desirable. Zinc : copper level of 3:1 is also desirable. Supplementing with a mineral block or liquid supplement may be necessary.

The value for crude fat results from an ether extraction on the feed or forage. Most forages contain less than three percent fat.

Ash is considered a non-nutritional artifact, since it does not contribute anything nutritionally to the animal. High ash content in a sample can be the result of dirt being picked up at cutting or harvesting.

Carbohydrates reported include starch, ethanol soluble carbohydrates (ESC) and water soluble carbohydrates (WSC or Total Sugar). These are often of interest to horse owners that have animals with metabolic disorders that are aggravated by high carbohydrate levels. Owners of these animals try to keep the NSC (non-structural carbohydrate) level below 10%. This can be challenging since forages or pasture make up most of the ration. A major function of these plants is the production of sugars. Turning horses out early and bringing them in from pasture can help. Cutting hay early and drying quickly can be an advantage as well.