COMPOUND FEED TESTING

Introduction

Routine Feed Quality tests for fresh forage or fermented forage (as silage) are carried out using Near Infra Red Spectroscopy (*NIRS*) techniques, using prediction models derived in-house.

Compound feeds by definition are made from many different components and therefore *NIRS* models to predict feed quality values are more challenging. For this reason, conventional “wet-chemistry” methods are usually carried out on these sample types.

Hill Laboratories use of sophisticated statistical modelling means that we can now offer *NIRS* measurement for a wide range of these more varied sample types (as grain ingredients or mixed meals and pellets). Prediction statistics are generated for each test so that the “goodness” of the prediction can be assessed. The less reliable tests are then 'code-swapped' to the wet chemistry reference method.

Customers are offered the option to request our standard NIRS protocol or select for full wet chemistry methods.

Scope

Hill Laboratories has a suite of tests that are available for compound feed samples providing these samples are made from plant-based components e.g. cereal-based pellets, meals and some by-products. Grain samples will also fit into this scope.

Samples must be able to be dried and ground through the laboratory routine procedures, so liquid samples and high-sugar by-products together with lactose-containing samples are excluded.

Samples based on Palm Kernel Expeller (PKE) or Copra Meal are also excluded from the Compound Feed profile (listed below) as the pepsin-cellulase Digestibility (DOMD) method is not valid for these matrices. Structural carbohydrates present in PKE and copra meal are resistant to the enzymes used in the method, underestimating values for DOMD and the subsequent calculated Metabolisable Energy (ME). Individual tests may be requested for PKE and Copra Meal e.g. Dry Matter, Crude Protein, ADF, NDF and Crude Fat (Oil).

Compound Feed Profile [CpdFeed]

Includes the following tests:

- Dry Matter
- Crude Protein
- Soluble Sugars
- Starch
- Crude Fat
- Ash
- Acid Detergent fibre
- Neutral Detergent Fibre
- Digestibility (DOMD)
- Metabolisable Energy (ME)

Results are generally presented as a vertical grid, as typical “medium” values are not relevant for these often complex matrices. Grain samples may be shown as a histogram report using “medium” values as stated in New Zealand references.

Results for feed tests on these sample types may take 7 to 10 days to complete if wet chemistry methods are applied.

Calculations for ME

Metabolisable Energy(ME) can only be measured directly using carefully designed animal feeding trials. In these experiments, measurements of feed intake, wastes excreted, liveweight changes, and heat evolved are combined to calculate the total energy produced through digestion and metabolism of the feed.

Research has shown a strong relationship between the *in-vivo* digestibility of a feed (i.e. the proportion of the feed assimilated by the animal) and its ME value, and conversion equations have been derived relating the two. Feed digestibility can also be measured in the laboratory using synthetic enzymes to emulate the digestion process within the animal. This *in-vitro* digestibility can be converted to an *in-vivo* digestibility by calibration against standard materials used in animal feeding trials.

There are some limitations with this approach.

- The laboratory *in-vitro* digestibility measurement mimics the feed digestion that might be achieved by animals, but it cannot take account of factors such as palatability, animal species and condition, dietary balance, etc.
- The standard materials used to convert *in-vitro* digestibility results to *in-vivo* values are a source of inconsistency in results, with some laboratories still using in-house proprietary standards.
- Components in some feed materials may not be effectively digested by synthetic enzymes, leading to an under-estimation of feed digestibility (and hence ME).
- The laboratory ME reported value is a theoretical value of the feed sample analysed. The actual energy available to the animal will be dependent on all other feeds in the diet and a variety of physiological factors.

The measurement of digestibility/ME at Hill Laboratories:

Hill Laboratories has adopted the procedure developed by the Australian Fodder Industry Association (AFIA), which uses a pepsin-cellulase digestion method to give an Organic Matter Digestibility (OMD%) measure. The *in-vitro* OMD% result obtained form this method is adjusted to predict an *in-vivo* OMD% value using a linear regression that is based on a series of samples with reported *in-vivo* results from Lincoln University. Digestibility results are reported on a dry weight basis as DOMD%. ME is then derived from the DOMD% of feed samples by published calculation and is also reported on a dry weight basis.

The default calculation is:

ME = 0.16xDOMD% [Ref 1]

but where the measured Crude Fat is greater than 5%DM then the calculation adopted is:

ME = (0.14 x DOMD%) + (0.25 x CFat%DM). [Ref 2]

The AFIA digestibility test requires 5 days to complete.

Note that feeds based with palm kernel expeller, copra meal, animal products and liquid feeds are excluded from this DOMD and ME method.

The laboratory can also report a calculated value for Digestible Energy (DE) for Horse feed only, using an equation referenced to Kentucky Equine Research, USA. [Ref 3]

DE (MJ/kgDM) = 0.004185 x (2118 + 12.18CP% - 9.37ADF% - 3.83Hemicellulose + 47.148CFat% + 20..35NSC% - 26.3Ash%)

Note:

All on dry matter basis

Hemicellulose = NDF% - ADF%

NSC = 100 - (CP + Ash + CFat + NDF)]

A Compound Feed Horse profile (CpdFeedHorse) is offered to provide this.

At this time the laboratory does not hold equations for DE for other monogastric animals.

Test options

Profile Name	Lab Code	List price (excl GST)	
		NIRS with codeswap	Wet Chemistry
Compound Feed	CpdFeed	$127.50	$255
Compound Feed + Minerals (N,P,S,K,Mg,Ca,Na,Mn,Zn,Cu,Fe,B, Mo,Co,Se)	CpdFeed, BP,MS	$230.50	$358
Additional tests			
Individual minerals	Specify element on form	Variable	
Mycotoxins, Melamine	Please contact the laboratory for advice (Food & Bioanalytical Division)		

Mineral Additives

Concentrated mineral additives can cause contamination in the laboratory. Hill Laboratories do not currently offer a test service for these high nutrient-level materials (powders). If concentrates have been added to the meal or pelleted sample submitted for feed quality and mineral tests, please advise the laboratory of expected levels to ensure cross-contamination is avoided and appropriate dilutions can be done for the analysis.

Sampling

A feed sample kit including two sealable bags, general sampling instructions, analysis request form and courier bag are available from the laboratory. The sample type/components should be detailed on the analysis request form to ensure appropriate tests are carried out.

About 500g – 1kg of sample is needed, particularly where mycotoxin or other tests are required. For accurate dry matter results a sealed bag is necessary.

Samples should be sent to the laboratory as soon as collected or should be stored overnight in a cool dark place if this is not possible.

Tick the appropriate boxes on the request form to ensure you receive the desired analyses.

Contact Details

For further information about any of the above tests please contact an Agriculture Client Service Manager.

References

1. AFRC (1993) *Energy and Protein Requirements of Ruminants.* An advisory manual prepare by the AFRC Technical Committee on Responses to Nutrients. CAB INTERNATIONAL, Wallingford, UK. p43

2. Pers. Comm. Mayson Kay, Lincoln University, 2007

3. Pagan, Joe D., Measuring the Digestible Energy Content of Horse Feeds. *Advances in Equine Nutrition* Vol 1. (1992-97). Kentucky Equine Research Inc., Versailles, Kentucky, USA.