RUMENCO

FORAGE ANALYSIS ADVISORY TOOL

A STEP BY STEP GUIDE TO UNDERSTANDING YOUR GRASS SILAGE ANALYSIS

Cattle and sheep are most productive when fed a diet according to their nutritional requirements, and whilst getting your silage tested is not essential, it is a very useful tool that can help with the formulation of a more economical and better-balanced ration. Even better, silage can be analysed relatively quickly and easily in a laboratory, with many feed companies offering the service for free, making it a win-win situation.

This guide will help you understand your grass silage analysis results in order to offer a starting point to maximising the potential of both your stock and your forage.

Dry Matter (DM) (expressed as %) shows the amount of feed material remaining after all the water has been removed.

Low DM silage (less than 200g/kg or 20% DM) may indicate a prolonged fermentation leading to high acids (and subsequent low pH) and excessive protein breakdown making the silage more likely to be unpalatable.

High DM (greater than 300g/kg or 30% in clamped silage), may lead to instability, yeast and mould problems.

Ash is a measure of the total mineral and trace element content of the silage.

High ash levels (above 100g/kg DM or 10% DM) may be an indication of soil contamination which has occurred during harvest and can lead to an increase in the risk of diseases such as listeriosis, botulism and 'silage eye'.

Intake Factor gives a measure of the likely intake of a silage based on a combination of other components, including DM, metabolisable energy, water soluble carbohydrates, lactic acid and ammonia nitrogen.

PROTEIN SUPPLY

Crude Protein (CP) gives an indication of the protein content of a silage, and can demonstrate how mature the grass was at the time of cutting. It does not give an indication of the quality of the protein supplied which can have a significant effect on animal performance.

A lower protein level (below 120g/kg DM or 12%) can be an indication of a mature and stemmy crop and depending on animal requirements may require additional supplementary feeds to balance any shortfalls.

A good level of protein (more than 150g/kg DM or 15%) indicates a very leafy young crop due to the fact that the protein content tends to be higher in the leaf than in the stem.

Excessively high levels of protein may be problematic – the extra protein cannot always be utilised efficiently, which is not only a waste but can also put extra strain on the liver to process it for excretion.

Ammonia N (as a proportion of total nitrogen) is formed by the breakdown of proteins during the ensiling and fermentation process.

The quicker the rate of fermentation, the lower the ammonia N value so it is an excellent indication of fermentation quality.

High ammonia N (above 150g/kg or 15%) indicates a poor or extended fermentation, leading to extensive protein breakdown, which can also make the silage very unpalatable.

Values below 50g/kg or 5% indicate an excellent fermentation.

Protein Degradability

MPE is the metabolisable protein supply where rumen energy is limiting. This is usually the limiting factor in most rations. The higher the value the better.

MPN is the metabolisable protein supply where rumen nitrogen is limiting.

MPB is the metabolisable protein supply from by-pass protein. The higher the level of this the better, especially for high yielding dairy cows.

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FERMENTATION QUALITY

pH is a measure of the acidity of the silage. In conjunction with the ammonia N content, pH is a key component in evaluating silage fermentation.

A pH of between 3.8 to 4.2 generally indicates that the silage is well preserved and will keep well.

A pH below 3.6 in silages are considered to be very acidic, which may cause rumen upsets and acidosis, with rations potentially requiring the addition of a buffering supplement.

A pH greater than 4.5 in silage may indicate poor or secondary fermentation and risk deterioration in store.

High dry matter silages can be satisfactory at a higher pH.

Lactic Acid is the principle fermentation acid produced during the ensiling process resulting from a good fermentation. Produced from lactic acid bacteria it is the main driver for the initial drop in pH and is responsible for pickling the crop. The faster that fermentation proceeds, the less dry matter and energy loss and the higher the lactic acid.

Lactic acid should comprise greater than 70% for efficient preservation, of the total volatile fatty acids (VFA). In addition, when silage is consumed, lactic acid is utilised by ruminants as an energy source.

Silages with a restricted fermentation will tend to have lower levels of lactic acid and higher levels of other acids such as acetic and butyric acid making them more unstable in storage.

Volatile Fatty Acids (VFA) (acetic, propionic and butyric acids) are the acids in the silage which are not lactic acid, therefore are less desirable for the fermentation and stability of the silage during storage and feed out.

Lower values are desirable as they indicate a stable silage, higher total VFA levels tend to result from poor fermentation.

High VFA levels give a distinctive smell which is less palatable to animals and can restrict intakes. High levels can result from soil contamination, low DM, slow rate of fermentation (low sugar content of grass, poor consolidation of clamp) for example and indicates an unstable silage which may result in a secondary fermentation and spoilage.

Potential Acid Loading (PAL) is used in conjunction with Neutral Detergent Fibre (NDF) to estimate the amount of acid in the rumen.

Rumen Stability Value (RSV) A low RSV value may lead to reduced rumen pH and possible sub-acute ruminal acidosis (SARA) or even clinical acidosis.

ENERGY SUPPLY

'D' Value is the percentage of digestible organic matter in the dry matter of forage. It provides a useful indicator of the nutrients potentially available to the animal and is closely related to crop maturity at harvest and the metabolisable energy value.

A value of 60 and below would indicate a poor quality, late cut silage.

A value greater than 70 would indicate an excellent leafy silage.

Metabolisable Energy (ME) is the energy value of the silage available to the animal, and can be predicted from the 'D' value. It is expressed in megajoules (MJ) per kg of DM.

Young leafy grass will have the highest energy content, for example, first cut silage ensiled early in May could be greater than 11.2MJ ME/kg DM.

First cut stemmy silage ensiled in late June could be less than 10MJ ME/kg DM reflecting a mature crop.

Acid Detergent Fibre (ADF) is a measure of the cellulose and lignin (the "woodier" parts of the plant) in the cell wall. This fraction is likely to be digested very slowly or not at all.

ADF is a good indicator of digestibility and the ratio of ADF to NDF is indicative of the proportion of digestible fibre in the forage.

Neutral Detergent Fibre (NDF) is a measure of the insoluble cell wall fraction of the forage (total fibre content) some of which may be digested in the rumen. It consists of hemicellulose, cellulose and lignin and helps promote rumen function. The NDF levels in forage increase as the plant matures.

Too much (above 500g/kg or 50%) may slow fermentation and reduce intakes.

Too little (below 425g/kg or 42.5%) may lead to problems with sub-acute ruminal acidosis (SARA) or acidosis.

Sugar is a measure of the grass sugars remaining after fermentation into lactic acid.

The analysis of grass silage can be easily and quickly undertaken by most feed manufacturers and suppliers. Understanding this analysis can help balance diets on farm and predict performance, ensuring stock get the most from one of the key ration ingredients on farm.

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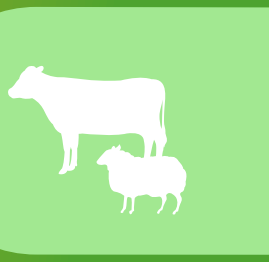

Table outlines the target values for each analysis for clamped grass silage along with the range of values that may be seen.

Analysis	Units	Range	Target value
Dry Matter	g/kg	150 - 500	280 – 350
Ash	g/kg DM	60 – 200	<80
Intake factor		70 – 130	90 – 110
PROTEIN SUPPLY			
Crude protein	g/kg DM	100 – 200	150 – 175
Ammonia N	g/kg N	20 – 300	<80
MPE	g/kg DM	85 – 100	
MPN	g/kg DM	95 – 110	
MPB	g/kg DM	30 – 40	
Protein degradability - sN	g/kg DM		~ 600
Protein degradability - aN	% total N	50 – 80	~ 680
Protein degradability - bN	% total N	15 – 30	~ 230
Protein degradability - cN		0.04 – 0.17	~ 0.07
FERMENTATION			
pH		3.5 – 5.5	3.8 – 4.4
Lactic acid	g/kg DM	20 – 200	80 – 120
VFA	g/kg DM	20 – 40	
Potential Acid Loading PAL	Meq/kg	900 - 1200	
Rumen Stability Value		200 - 300	
ENERGY SUPPLY			
D Value	%	55 – 75	>70
ME	MJ/kg DM	8.8 – 12.0	>11
ADF	g/kg DM	230 – 500	300 – 350
NDF	g/kg DM	500 – 650	500 – 550
Sugar	g/kg DM	0 – 60	20 – 40