



Did your silage undergo a good or poor fermentation?

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Most farmers and contractors know about the nutritional aspects of silage as derived from the silage analyses carried out by various feed testing laboratories. Their reports tell us about the dry matter and moisture content, digestibility, metabolisable energy, crude protein and neutral and acid detergent fibre levels of the sample sent in for testing. Some labs provide even more data, often requiring a nutritionist to help decipher the reports.

Once the feeding quality of the silage is known decisions can then be made such as how much to feed, whether the rations needs to alter according to the reported nutritive characteristics, how much moisture is in the silage, how much to charge when selling silage, etc.

However, on too many occasions, farmers have offered cattle medium to high quality silage containing no obvious signs of mould to find that their animals have not eaten it until the following day or worse still, have turned their noses up at it completely!

What's going on here? Most likely the silage in question has undergone a poor fermentation, resulting in poor palatability, ie. not inviting to the animal's taste buds.

Poor fermentation can arise from many causes such as forages ensiled with low plant sugar levels, those harvested while too wet (Figure 1), wilted too long, stacks which were poorly rolled and/or poorly sealed, bales left unwrapped for too long, harvested forage containing soil or effluent, etc. These silages will usually have an unpleasant odour such as a sour, vinegar or rancid butter smell. Silage nutritive value also decreases in the above scenarios.

The fermentation aspect is not reported in most feed test analyses. Two extra tests which can indicate the fermentation quality of your silage have been around for several years. This test will tell you how well your silage has fermented (or ensiled). There will be extra cost as these are individual tests carried out using manual labour on the fresh sample.

The two tests are the pH (acidity) and Ammonia Nitrogen as a percentage of Total Nitrogen (NH₃-N) content tests. For most laboratories, they must be specifically requested on the input form, as it is not done via the quick and efficient Near InfraRed Spectroscopy (NIRS) equipment used on the dried sample. These two tests can assist farmers and animal nutritionists in making better silage feeding decisions or to help them solve intake problems.

Testing for Silage pH

This relatively inexpensive test is most accurate in silages with dry matter contents below approximately 35%, so is not as accurate for baled silage. A low silage pH indicates that the fermentation process was dominated by the desirable lactic acid bacteria. High pH results when the fermentation is dominated by undesirable bacteria

and indicates the silage has lost dry matter and energy during an inefficient ensiling process. This poorer fermentation will also result in the production of organic compounds which causes the palatability issues for animals.

Table 1 indicates the maximum desired pH of silages over a range of DM contents to ensure a good fermentation.

Table 1. Desired pH levels over a range dry matter contents

Silage DM content (%) *	Possibility of poor fermentation if pH exceeds:	
	Grasses	Legumes (& Tropical Grasses)
15	4.10	4.20
20	4.20	4.30
25	4.35	4.50
30	4.50	4.70
35	4.65	4.80

* Silage pH is not a reliable test for silages with a DM content above 35%.

Testing for Ammonia-Nitrogen (Ammonia-N)

Ammonia-N ($\text{NH}_3\text{-N}$) of the total nitrogen measured is a reliable indicator of silage fermentation quality although at relatively higher cost. An $\text{NH}_3\text{-N}$ level of less than 10% of total nitrogen indicates a good fermentation and under about 5%, very well fermented silages. Poorly fermented silages have high $\text{NH}_3\text{-N}$ levels and the true protein of the plants has suffered extensive degradation into undesirable non-protein nitrogen compounds such as free amino acids, peptides and even ammonia during the ensiling process.

Table 2 indicates the fermentation quality as related to the level of ammonia-N in the fresh silage sample. The animal intake of well-preserved silages, with a low ammonia-N content (<5% of total N), will be similar to that of the parent crop or pasture.

Table 2. Fermentation quality of silage as indicated by ammonia-N content

Ammonia-N (% of total N)	Quality of Silage Fermentation
<5	Excellent
5 – 10	Good
10 – 15	Moderate
>15	Poor

As ammonia-N levels exceed about 10%, silage becomes increasingly less palatable and animal intake decrease substantially. Ammonia-N contents up to 50% (of total N) have been recorded in very poorly preserved silages.

Please note that in recent years several laboratories have aligned with very good USA feed testing laboratories. These relationships have enabled the Australian labs to produce much more sophisticated silage analyses including profiles and measurements of desirable and undesirable organic acids produced during the ensiling process.



Figure 1. Moisture squeezed from over wet silage (under 30% DM)



Figure 2. Effluent oozing from over wet bunker silage