

Ensuring your silage is fit for purpose

Trish Lewis, Consultant Nutritionist

The quality of the crop cut for silage is important, but everything you do from cutting to feeding out effects the quality of the silage that the cows consume.

Silage quality is made up of not just the nutritional quality of the crop when it is cut, but also the fermentation and hygienic quality. The fermentation can either be fast and efficient, producing large amounts of lactic acid with a low level of carbohydrate and protein losses, or slow and inefficient with considerable activity of spoilage organisms and high nutrient losses. There are a range of organisms and toxins which can be present in silage and can dramatically impair cow performance. *Listeria* are usually seen with soil contamination in higher pH silage, *clostridia* include those causing botulism which are sometimes found when animals have accidentally been ensiled with the crop. Some recent research studies and surveys have shown that mycotoxins are far more prevalent in silage than most people realise.

To make high quality silage, all three components must be good. If fermentation is poor, the silage will be poor quality regardless of how good the original crop was and how free of potential health challenges. This is illustrated by a trial comparing the intake of 3 grass silages, **A** made with high digestibility (young and leafy) ryegrass and good ensiling techniques, **B** with the same high quality ryegrass and poor ensiling techniques and **C** with low digestibility (more mature) ryegrass and good ensiling techniques. Looking at the table of analyses, silage B looks better than silage C.

However, when these 3 silages were fed to dairy cows, silage intake and performance were better for silage **C** than for silage **B**, particularly at a lower feed rate of grain. The importance of achieving a high DM intake has already been discussed, and this requires achieving a good silage fermentation.

A study from Kansas State University shows what happens when poor feed out management results in a small amount of spoilt material being included in the diet. The steers fed 100% well fermented silage had good rumen function and a whole diet digestibility in the rumen of 63% whilst for those fed 95% well fermented silage and 5% spoilage, digestibility of the whole diet was only 56%. There are chemicals produced by spoilage organisms which are believed to harm some rumen microbes and adversely affect both silage intake and silage digestibility.

The speed and efficiency of the fermentation doesn't just affect the quality and palatability of the silage, it also affects the amount of silage left to feed out. There will always be some losses of carbohydrate and protein, broken down to carbon dioxide and ammonia, but these can be as low as 10% in a well fermented silage or over 30% in a very poorly made silage.

To put some financial figures on the difference between well-made and poorly made silage, we will assume one farm has done a good job of making 500 tonnes DM of grass silage and the other has made a poor job of it. The well-made silage has the potential to produce \$88,000 more milk (at a \$4 payout) than the poorly made silage, in most cases for little extra cost but more attention to detail.

Silage making critical control points

There are 7 critical control points in the silage making process, and these are all within your control either directly or through contractor selection.

1. Cutting

Time of cutting has been covered in a previous paper. The height of the mower should be adjusted to avoid soil contamination, and can be raised higher to improve nutritional quality at the expense of tonnes of DM. The crop should be chopped short enough to achieve good compaction, which means a shorter chop for drier forage.

2. Wilting

Crops like grass and lucerne usually need to be wilted to achieve target DM% for ensiling. If a crop is ensiled too wet, silage liquor can leach out of the stack and this is a bad pollutant as well as a loss of valuable nutrients. Crops should not be over wilted as this makes good compaction harder to achieve. It is important to handle the crop carefully, both out in the paddock and at the stack site, to minimise the risk of soil contamination, especially in wet conditions.

3. Additives

Fermentation enhancing inoculants speed up fermentation and reduce DM losses, and can also reduce the risk of a poor fermentation when ensiling in adverse conditions. Preservative inoculants containing *Lactobacillus buchneri* can reduce mould growth and heating at feed out. Chemical preservatives are rarely used due to corrosion of farm machinery. Salt can be added to the top and shoulders of a stack before sheeting to reduce surface spoilage.

4. Compaction

Achieving good compaction is critical for reducing both fermentation and feed out losses. A survey of the compaction of lucerne silage stacks is summarised to show the reduction in DM losses with increasing silage density (compaction). Most NZ silage stacks would have a density of around 225 kgDM per cu m, with better compacted pits at 275 kgDM per cu m. If straight fingers can't penetrate in beyond the finger nails, and it is hard work to take a sample, the silage is well compacted.

5. Sealing

It is important to seal the stack well and cover with touching tyres as soon as possible after the stack is full. Research in Wales found that delaying covering until the next day can result in an extra 5% DM losses. There is new technology on its way including a plastic film that creates a better oxygen barrier when placed over the silage before sheeting with a heavier sheet. Sand filled bags can be used to weight the outer sheet down. Bales should have sufficient layers of good quality wrap that has been correctly applied.

Contractor selection

When contractors are used for some of the jobs above, selecting the best contractor for the job should be a carefully considered process, not a default one. Look for reliability, their ability (gear and personnel) to do the job, whether they have an inoculant applicator which will apply your chosen product effectively, the correct match of cutting rate to packing tractor weight, attention to detail and pride in job and cost (less important than the above!).

6. Pest control

All stored silage should be protected from vermin, bird and stock damage. Every 100 rats in cereal or maize silage will waste about 2.5 kgDM of silage (mainly grain) per day. If a cow had been fed that 2.5 kgDM of silage per day, she would have turned it into about 5 litres of milk per day. Two rats can in theory multiply into 15,000 rats in a year! Nets can be used to keep birds off and fences for youngstock should be erected before the damage is done, not after.

7. Feedout management

The stack face should be kept tight and tidy, with minimum loose spilt material at the base, to reduce aerobic spoilage - and avoid heating.

Silage Assessment

There are many benefits to learning how to assess silage including knowing how much there is to feed to improve the accuracy of feed budgeting, being able to assess the nutritional quality and likely intake of the silage and to validate analyses if done. This knowledge will aid in making decisions such as which silage to feed when, and what is needed to balance a diet containing that silage.

The amount in a silage stack or pit can be calculated by multiplying the average width by the average length (from half slope to half slope for stacks with sloping sides) and multiplying this by the average height to get the cubic metres. Multiply this by the assumed density (eg 225kgDM/cu m) and divide by 1000 to get total tonnes DM. Subtract (eg 5%) for spoilage.

Nutritional quality (energy and protein) can be estimated by observing leaf to stem ration and presence of seed heads for grass, and amount of kernels and quality of processing for maize. DM% can be estimated by squeezing a representative sample (dig back into the stack face) and using the table provided. Fermentation quality can be assessed by looking at, feeling and smelling the silage. pH paper can be used to assess the pH of silage. Average chop length can be checked. Look and smell for signs of mould and feel for heating (a by-product of mould and yeast growth).