KELVIN CAVE LTD

# Technical Article

by Kelvin Cave Ltd

# New approach to silage preservation will reduce feed costs

**As every livestock farmer will be aware, the cost of bought in feed concentrates has escalated dramatically in the last 12 months. This increase, together with the high price of fertiliser and other inputs, has not been reflected in similar rises in farm-gate prices for milk and meat, and forecasts for the coming year do not suggest great changes are likely. Is there anything that can be done better to help reduce this financial gap?**

There probably is, but because it is something we have been doing year in and year out, it is all too easy to become complacent about how we can get the most out of the feedstuffs we grow on farm. For example, we often take silage for granted, and maybe don't give too much thought to how we can get more from it, and thereby reduce the cost of bought-in concentrates. This silage season it could really pay to think hard about making the best silage possible. This means looking at your silage making process from the crop in the field right through to feedout.

I will not go into great detail here about how to grow a good silage crop, as the preparations required are well understood; slurry applications no later than 8 weeks before cutting; fertiliser applications, 1st cut - 80 - 140 kg N / ha, subsequent cuts - 60 - 90 kg N / ha, consider NVZ rules; rolling to give a clean sward at the start of the growing season free of stones and moles. Grass will utilise nitrogen at the rate of 2 units per day in ideal growing conditions, it is well worth testing for nitrogen a couple of days before cutting, to ensure that there is no excess in the crop.

Cut at the optimum date to ensure high DOMD, protein and sugar and low nitrate levels. Use a mower conditioner and aim to leave stubble of between 2½" - 4" to avoid soil contamination and allow rapid re-growth. The objective should be to get the crop to at least 25% DM as quickly as possible with the minimum of tedding (to reduce soil contamination risk and save diesel). Wilting for longer than 24 hours will result in increasing nutrient losses in the field.

Once the crop is ready to pick up, the objective should be to get it into the silo as quickly as possible, filling using the 'Dorset Wedge' method, in thin layers, and with good compaction to exclude as much air as possible as quickly as possible. I know that every farmer knows this, but it is surprising how often we see badly filled, poorly consolidated clamps of silage. Get this bit wrong, and its 'downhill from here'! Giving the clamp a good roll when it is full is a total waste of time, money and diesel! It is far better to roll well throughout filling and get the clamp sealed quickly. Use new black plastic side sheets, ClampFilm vacuum sheet as the primary top sheet, followed by a new black (or white) top sheet well weighted down with silo covers and/or tyres. Silage is far too valuable to compromise by using second hand sheeting, which is almost certain to allow air into the clamp somewhere.

As can be seen from the chart in fig 1, the percentage of DM that can be lost throughout the silage process can typically amount to nearly 30% of the total DM. It is worth remembering that these losses are most likely to be from the most valuable DM components in terms of nutrient value, so attention to detail in order to minimise these losses will always pay.

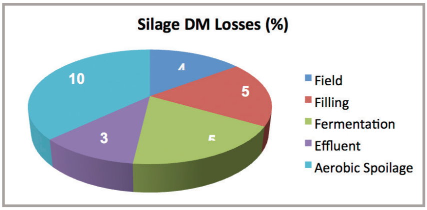

Fig 1

Having filled and sealed their clamp as efficiently as possible, many farmers will keep their fingers crossed in the hope that what comes out of the clamp is 'OK'. Is there anything else that could have been done to ensure that the silage is of the highest feed value possible when it reaches the stock? In order to answer this question we need to have some understanding of the microbiology of the crop, and how this influences the fermentation process.

On every gram of fresh forage there is a cocktail of microscopic bugs; aerobic bacteria, lactic acid bacteria, enterobacteria, yeasts, moulds, clostridia, bacilli, acetic acid bacteria and propionic bacteria. Without a lot of work in a laboratory it is not possible to know the makeup or concentration of this cocktail, but fig 2 gives an idea of the range of populations of organisms that are most important during the fermentation phase. Lactic acid bacteria can easily be outnumbered by the undesirable coliforms and clostridia. To understand why this is important we need to see what these different organisms do in the anaerobic conditions we have created in the clamp.

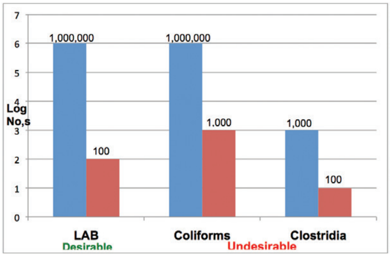

Fig 2

Good (homofermentative) lactic acid bacteria convert one molecule of either glucose or fructose (the most common sugars in grasses) into two molecules of lactic acid:-

$$1 \text{ glucose or fructose} \rightarrow 2 \text{ lactic acid}$$

Less desirable (heterofermentative) lactic acid bacteria have a more wasteful fermentation characteristic:-

$$\text{Glucose} \rightarrow \text{lactate} + \text{Ethanol} + CO_2 + \text{Water}$$

$$3 \text{ Fructose} \rightarrow \text{Lactate} + \text{Acetate} + 2 \text{ mannitol} + CO_2 + \text{Water}$$

$$\text{Glucose} + 2 \text{ Fructose} \rightarrow \text{Lactate} + \text{acetate} + 2 \text{ mannitol} + CO_2 + \text{water}$$

$CO_2$ obviously has no feed value, but it does represent a loss of valuable dry matter and, more importantly, energy. An acetic acid level of 55g/kg silage DM will have resulted in a loss of 10 tonnes of $CO_2$ from 250 tonnes of DM ensiled!!

The coliforms (enterococci) cause even more loss and as we have seen their population can be as high, or higher than the good lactic acid bacteria:-

$$1 \text{ glucose} \rightarrow 1 \text{ acetic} + 1 \text{ formic} + 1\ CO_2 + H_2O$$

and/or

$$1 \text{ glucose} \rightarrow 1 \text{ ethanol} + 2{:}3 \text{ butanediol} + 1\ CO_2 + H_2O$$

Finally we have the two types of clostridia, those that degrade sugars and those that break down protein:-

Saccarolytic Clostridia

$$1\text{glucose or } 2 \text{ lactic acid} \rightarrow 1 \text{ butyric acid} + 2\ CO_2 + 2\ H_2O$$

Proteolytic Clostridia

$$\text{Amino acids or amides} \rightarrow NH_3 + CO_2 + H_2O$$

From all of the above it is quite clear that there is a high risk of valuable nutrient loss if we rely on the natural ‘wild’ bugs to provide our fermentation. There are three courses of action which can be taken to reduce this possibility. The first is to ‘flood’ the crop with a culture of desirable (homofermentative) lactic acid bacteria, in order to outnumber and out-compete the undesirables. This can result in a rapid drop in pH and a better retention of sugars and protein. However, it is likely to produce silage that is not aerobically stable, because the fermentation creates an environment ideal for the spoilage yeasts and moulds that are also present on the silage. These organisms will become active as soon as the clamp is opened and air reaches them.

The second is to inoculate with heterofermentative bacteria. The most common species used, lactobacillus buchneri, produces a fermentation as detailed above. Although this is wasteful of dry matter, the argument by those that advocate its use is that it can give improved aerobic stability because some of its fermentation products control spoilage yeasts and moulds. Unfortunately, it cannot be relied upon to work under all conditions, and overall losses can be greater than when using no treatment at all. (Danner et al 2003).

Probably the most reliable way to minimise all the losses associated with fermentation and aerobic spoilage is to reduce the numbers of harmful organisms to a minimum. This can now be achieved using Safesil, a special blend of food grade preservatives which eradicates and controls all the major spoilage organisms. As can be seen from the graphs below, (D.Davies 2009) Safesil minimises ethanol levels, demonstrating its ability to control enterococci etc. across a range of dry matters (fig 3), and reduces yeast and mould numbers to very low levels (fig 4).

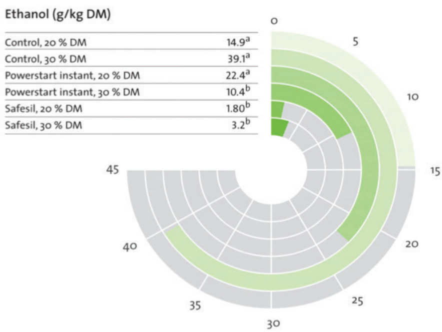


Fig 3

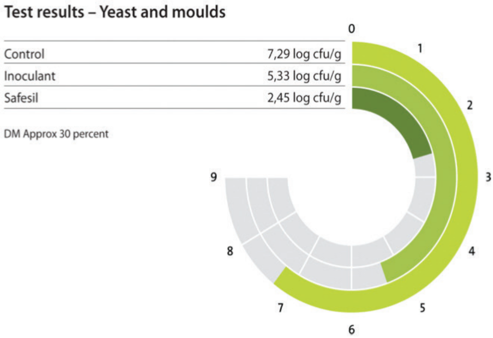


Fig 4

Because of its action against undesirable fermentation bacteria only homofermentative lactic acid bacteria present on the crop are left, and as a result less sugar is used to produce an excellent lactic fermentation (fig 5). This gives the additional benefit of reducing DM loss during fermentation to a very low level when compared to no treatment or treatment with a biological inoculant (fig 6).

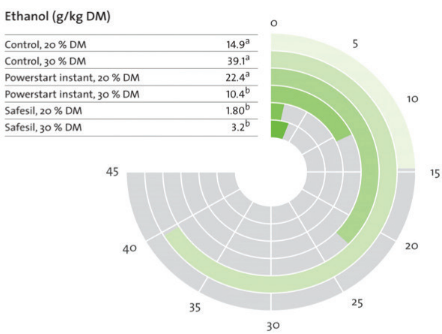


Fig 5

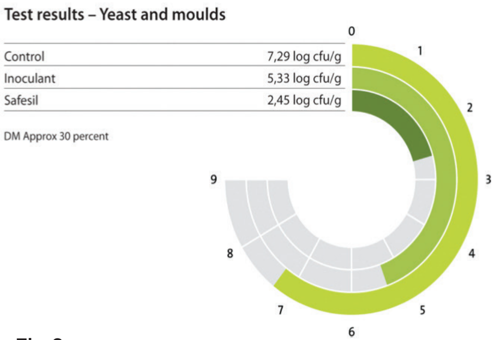


Fig 6

In trials and on farm Safesil has the proven ability to promote superb aerobic stability across a wide range of dry matters and on all silage crops from grass to wholecrop to maize (fig 7). Since aerobic instability, which is indicated by heating silage, is the single biggest cause of nutrient loss in silage on all farms, Safesil should be considered as the preservative of choice, giving a high level of return on investment.

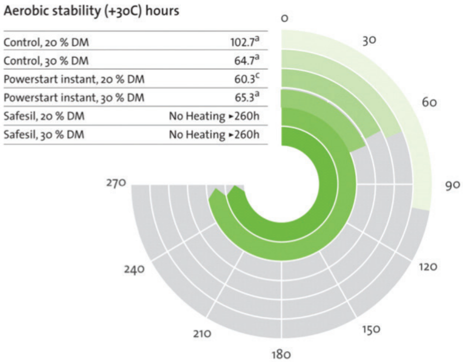


Fig 7

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