The benefits and challenges of successful silage production

by Gordon Marley, Product Manager, Sil-All, UK.

All processes on the farm interact with one another, and only by fully understanding the process and challenges within a process do we maximise the efficiency of that process – be it milking, fertiliser application or making silage.

We make silage because it is the most efficient and cost effective manner to preserve the growing forage and feed our animals all year long.

The benefits are well known to every farmer:

- Cost effective feed supply.
- Consistency.
- Year round feed.
- Traceability.
- Known quality.

But what of the challenges? What are the issues and how do we mitigate them? Attention has focused over the past years (quite correctly) on the presence of air during ensiling, storage and feed out processes. Air, of course, is of immense importance to the final silage quality, but many other challenges have been side-lined through this focus on oxygen.

The silage process starts with grass selection and field preparation. You cannot make high quality silage from low quality pasture, and the older your pasture ley, the lower the starting digestibility, and the lower the actual proportion of 'true grass' within the ley. Research by The Grassland Research Institute of Hurley shows that a sown grass pasture will become 38% weeds within four years.

Unique formulation

Sil-All 4X4+, because of its unique bacterial formulation, will very efficiently ferment good quality grass leys, but, through the combination of bacterial drivers and enzymes, it will also efficiently drive the fermentation of older leys that are more difficult to ensile through the release of sugar by the enzymes and outcompeting of the higher level of naturally occurring recycling organisms.

A relatively common challenge when ensiling grass is residual nitrogen (fertiliser) in the plant. The residual nitrogen 'buffers' the effect of the fermentation, meaning that higher levels of lactic acid must be produced during the fermentation in order to achieve the same silage pH. This in turn means that the spoilage organisms survive longer on the ensiled forage, increase to higher numbers and increase the DM losses.

The production of the lactic acid by fermentation bacteria is a conversion of plant sugars to lactic acid. The speed of this conversion greatly affects the DM and feed losses.

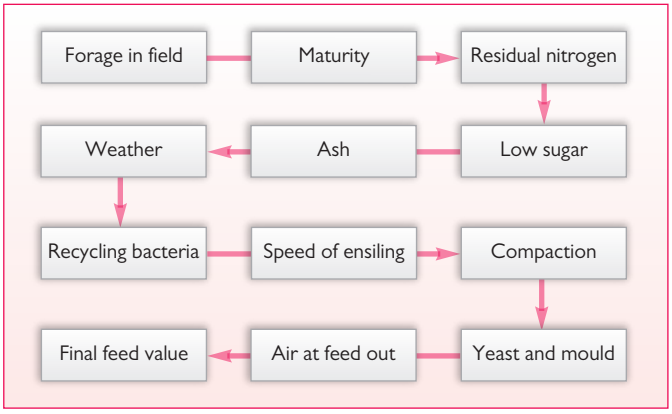

Fig. 1. The silage process.

There is a finite amount of sugar in the forage when harvested, and when wilting the sugar concentrates in the grass, but also reduces in total amount.

Sil-All 4X4+ enzymes release sugar for conversion to lactic acid. Under 'easy ensiling conditions' this extra sugar then becomes available for stimulation of rumen microbial protein production, but under challenging conditions (such as older leys, residual nitrogen, long wilted grass) the enzymes in the Sil-All formulation release sugar to drive the fermentation and produce the extra acid that is required to reach a low, stable pH.

Spoilage organisms

Soil can often be ensiled with the fresh grass (reflected by an ash content in excess of 10%). There is always a background content of spoilage bacteria, yeast and mould (which is generally at a higher level than the naturally occurring fermentation bacteria).

The dry matter (DM) and nutrient losses that occur through ensiling is because of these spoilage organisms, and when we ensile a degree of soil we dramatically increase the level of spoilage organisms, and dramatically increase the challenge of fermentation bacteria.

The Sil-All 4X4+ formulation is balanced to provide the most rapid fermentation, and the one million bacteria per gram of forage ensures that the spoilage organisms are rapidly outcompeted, minimising feed value losses.

Weather issues

The weather can always surprise us. We automatically think of weather issues as 'rain delays', which are an issue that leads to higher levels of spoilage organisms, lower sugar content and more challenging fermentations, but sometimes the weather can be almost 'too good', leading to very fast wilts and higher than expected/desired dry matter.

Compaction at ensiling.

This is an issue because many silage inoculants only contain single strains of fermentation bacteria, and

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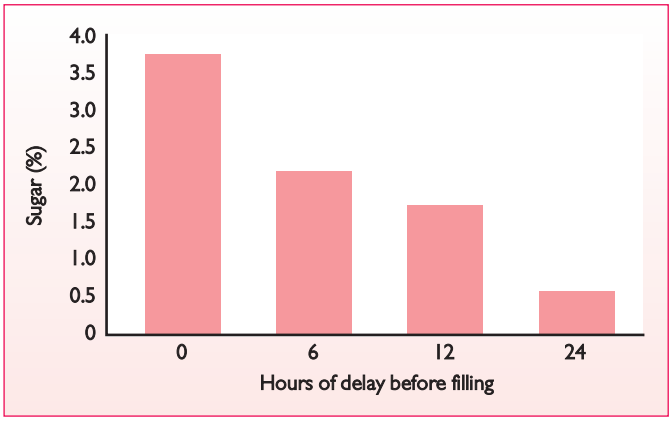
Fig. 2. Effect of delayed filling on water soluble carbohydrate (WSC) and dry matter loss in corn silage (Hirsch and Kung, University of Delaware, unpublished data).



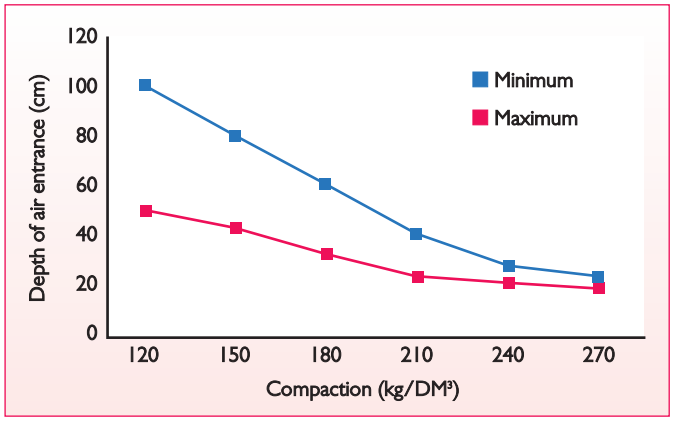


Fig. 3. Compaction in relation to air penetration (Ruppel 1992).

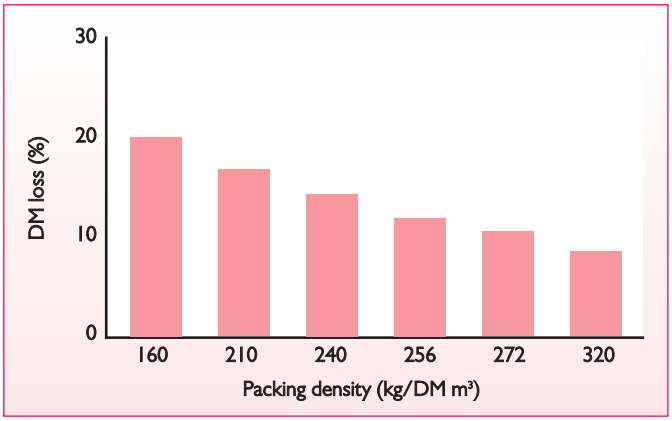


Fig. 4. Packaging density related to DM loss (Losand 2003).

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many of these will be less effective/ineffective at dry matters in excess of 40%.

The Sil-All 4X4+ formulation has been developed to ensure that it will work over the widest possible dry matter range (16-65% Dry Matter), with the bacterial ratios carefully defined to ensure the fermentation is always driven as rapidly as possible.

As with the discussion of ensiling air, a rapid speed of ensiling has been highlighted as a desirable practice. Collecting the grass quickly, ensiling quickly and sheeting minimises the field losses, but an eye must be kept on the speed of harvest – large self-propelled foragers are capable of working at up to 300T/hr.

The speed at which the grass is ensiled must be synchronised with the ability of the farm to spread the forage in thin layers and adequately compact.

Packing density is directly related to DM loss but also to the speed of fermentation, growth of spoilage organisms and the stability of the silage at feed out.

There are two types of yeast that are present on forage, with only the 'acid loving' yeast surviving through the fermentation.

The better the practical conditions (as discussed here), the lower the final concentration of these yeast.

Rapid fermentation

Sil-All 4X4+ drives the fermentation rapidly which minimises the yeast growth within the bunker, but unlike other silage inoculants, it contains Propionibacterium acidipropionici which converts some of the lactic acid to propionic acid (the most effective acid at killing yeast and mould).

Irrespective of the compaction that is achieved, air will always penetrate behind the face of the bunker. The better the compaction the less the air will penetrate into the face – but the effect cumulatively allows the yeast numbers to increase with time which ultimately leads the silage to start heating.

Sil-All 4X4+ is the only product on the market that targets the yeast and spoilage organisms under all ensiling conditions, always improving the fermentation, maintaining maximal levels of nutrients and DM, inhibiting the spoilage organisms through the rapidity of the fermentation and then aiding the silage stability by reducing yeast numbers through storage. ■