Better Returns Programme

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Cost effective use of silage additives

First and foremost silage additives are the 'icing on the cake' of silage making, they will not make a poor silage good but they can make a good silage excellent.

There is a large array of different additives on the market each making various claims, so here is a brief overview:

Inoculants – these can be split into two types:

i) **Homofermentative** – produce predominantly lactic acid from grass sugars and improve the speed of fermentation in the silo – these can reduce ammonia-N, acetic and butyric acids and improve true protein content, they contain bacteria such as *L.plantarum, Pediococci* and *Lactococci*. These can improve animal performance and reduce invisible silage losses (carbon dioxide and water) and in so doing should pay for themselves by giving you more silage to feed which would cover the inoculant cost.

ii) **Heterofermentative** – produce a mix of lactic and acetic acid, water and carbon dioxide from grass sugars. These can improve aerobic stability at feed-out but will not necessarily improve speed of fermentation, ammonia or butyric acid levels. They contain bacteria such as *L. buchneri, L. brevis* and *L.kefira*. They will increase acetic acid and invisible losses, but may improve aerobic stability.

In addition, some inoculants will contain both bacterial types shown above, with the target of improving both fermentation and stability – the jury is out on the efficacy of this approach!

Application rates of inoculants – To work properly there is a lot of evidence that shows that under UK conditions inoculants must apply **1 million bacteria for every gram of grass**.

This is because we need to consider the silage fermentation process as an obstacle race. When we apply one million bacteria per gram of grass, it is like having a head start and as we race to the fermentation finish line less obstacles appear in front of us and the race is quickly won. If we have a lower dose rate, then we have more obstacles to get over and as we race down the track more obstacles appear in front of us and the finish line is moved further away. The obstacles are undesirable microorganisms that take the sugar we need for fermentation making the race harder. The protein breakdown products such as ammonia put the finishing line back because these neutralize the acid being produced and so more acid is required before the fermentation is stable.

Enzymes – these are generally included with some inoculants. The evidence suggests that enzymes provide little benefit to the ensiling process, either in silo fermentation or ruminant utilization during feed-out, but the bacterial component of these additives can be very useful.

Acids are designed to inhibit microbial processes in the silo, but to do so they must be used at the recommended dose rate. Formic acid based additives will improve the silage preservation in the silo, but to improve aerobic stability an additive containing propionic or other acids is required, because formic acid will not inhibit the yeasts that cause the heating at feed-out.

Salts of Benzoic, Sorbate and Nitrite – these additives, like acids, inhibit microbial activity, Benzoate and Sorbate inhibit yeasts and moulds and so can improve aerobic stability, and they will often be applied in addition to the homofermentative inoculants. Products containing Nitrite will inhibit the enterobacteria and clostridia as well so products containing all three salts can improve preservation in the silo and at feed-out.

Note – no silage inoculant or acid additive can improve the crude protein content of your silage.

When to use an additive?

Interestingly the old concept of using a silage additive in adverse weather conditions is not necessarily true. Ideal crops with high sugar, good protein and digestibility have more nutrients to loose than over-mature, later cut crops. The evidence would suggest that using silage additives on these high quality crops, ensiled under ideal conditions, will provide a return on investment.

If the weather conditions or ground conditions make the ensiling process more challenging, then an additive can preserve the crop such that the preservation is controlled enough to produce a palatable silage, which may not have happened if no additive had been used.

Finally, where the crop is cut late, (either because of poor weather conditions or the contractor was delayed by 7-10 days), and the nutritional value is lower than ideal but the ensiling conditions are good, eg good drying weather and low risk of soil contamination, then the likely return on investment from using an additive becomes more questionable.

One more thing to consider is that during the fermentation process there are losses of carbon dioxide and water, which together can account for 5-10% of the silage. Additives can reduce these and often the silage additive will pay for itself by reducing these losses such that the value of additional silage at feed-out will more than cover the initial cost of the additive.

When ensiling legumes, be it red clover or lucerne, then a silage additive is absolutely essential because these crops are low in sugar, high in protein and natural buffering. This makes for a challenging fermentation, so additives that improve fermentation are essential. However, legumes are naturally more aerobically stable at feed-out. This means that good silage management should be sufficient to improve aerobic stability avoiding the need for an additive to reduce aerobic spoilage.