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Silage
The Ensiling Phase

Silage quality is a term that has, and continues to, change. The definition of silage quality is now including animal performance parameters as well as primary laboratory testing for energy, protein, fibre digestibility etc. With more common use of silage inoculants, silage has attracted significant research efforts to establish greater predictability of its capacity to be converted to milk, meat or fibre. The primary feed test has proven to be variable, to quite inaccurate in this sense.

Fermentation testing has enabled us to predict intakes better, because it essentially tells us how palatable the silage is – lactic acid content. This obviously is the first indicator of silage's capacity to be value-added into human food or fibre, and of course, its on-farm cost effectiveness as a stock feed.

Fermentation is a complex organic and chemical process in which a multitude of outcomes can occur. Wine makers learnt sometime ago of these possible variations and possibly led the way to developing aids and additives to ensure a quality end product. Essentially, they learnt to control fermentation to avoid costly failures. Silage inoculants are an application of this same principle: eliminate or minimise risk! The risk of poor or undesirable fermentations.

My goal in this article is not to lecture on good silage making proceedures, most farmers know these principles even if they are not well applied, but to discuss factors effecting animal performance from diets containing silage . The ensiling phase has profound implications on animal performance aspects.

The feeding value of silage is a combination of preharvest quality with additional variations imposed at harvest and due to fermentation quality. Perennial grasses are characterised by higher fibre levels than legumes, and hence have lower voluntary intakes. Enhancing intake potential through lactic acid production is very desirable apart from lactic acid being ten times stronger than other fermentation acids so causes a very rapid pH decline and minimises other nutrient degradation from long fermentation time. This is the goal of quality silage inoculants containing lactic acid bacteria.

Simultaneous goals of high yield, high forage quality, and optimum fermentation and preservation often conflict. Maturity in grass is an important factor as lignification exerts both chemical and physical limits on cell-wall carbohydrate digestion. Not to mention leaf to stem ratio. Maturity reduces available sugars, yet studies have shown lactic acid bateria added via inoculants were of greater influence on fermentation than negative impacts of maturity.

Advancing maturity is negatively correlated to protein. Quality inoculants have been demonstrated in extensive trial work to retain more protein and improve efficiency of rumen N utilization. Protein degradation during fermentation is also of significance; quality lactic acid bacterial inoculants by lowering pH rapidly minimise this problem too.

Wilting time is critical to nutrient loss. Maturity extends wilting time; but in practice, and verified by many silage tests I've done, overdrying is probably of greater significance. Ideal moisture content for excellent fermentation is around 65%. By far the vast majority of samples taken are closer to 50%. This not just increases nutrient loss, but inhibits fermentation as well. There is clear correlation between moisture content and lactic acid content which largely determines silage pH and preservation quality. Again, the addition of lactic acid bacteria via inoculant can positively influence this situation.

A large number of animal production trials in both dairy and beef over many countries and research institutions have repeatedly demonstrated significant production increases in silage treated with quality lactic acid producing bacterial inoculants. The culmination of inoculated silage traits is proposed to be the driver. Although not fully understood or explained, the following list are believed to be the main contributors: better fermentation – both lactic acid content and its rapid pH drop inhibiting less desirable fermentation end products. Higher digestibility increasing energy metabolisation, more intact protein and lower biogenic amines from protein degradation, and reduced entobacterial endotoxins. Improved rumen nitrogen utilization through restriction of conversion to less desirable nitrogen compounds.

The critical issue with fermentation is the time taken from ensiling to a stable pH of 4.5 or less. At this pH fermentation ceases, and all further degradation of dry matter or the growth of undesirable micro-organisms ceases. Dry matter recovery is significantly higher with rapid fermentation enhanced by lactic acid bacterial inoculants.

My hope and dream is that one day standing pasture will attract the same level of research interrogation for its capacity for conversion to milk, meat or fibre. I am convinced from numerous observations that pasture varies significantly in chemical composition, nutrients of variable digestive qualities, the end products they produce in the rumen and their effect on rumen biology, external plant microflora and their ruminal influences.

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