

What about Silage Inoculants?

Frank Mickan
Pasture and Fodder Conservation Specialist
DEDJTR, Victoria

“Silage inoculant are being more commonly used by farmers and contractors these days,” says Frank Mickan, Fodder and Pasture Conservation Specialist, DEPI, Ellinbank, Victoria. However, there still are many questions in farmers and contractors minds about these inoculants. “What are silage inoculants?” “How do they work?” “When should I use them?” “Will I make money if I use them?” “What are aerobic spoilage inhibitors?” Below are some answers but there are still some unknowns about these products.

What are inoculants? Inoculants are by far the biggest group of silage additives currently used in Australia. Bacterial inoculants are manufactured populations of certain strains of desirable lactic acid producing bacteria. These are essential to produce the sweet smelling highly palatable silages that we know. These “good guy” bacteria are the *Lactobacillus* and *Pediococcus* species.

When added to the harvested crop, these inoculants increase their own population to support the naturally-occurring good guys and may (but not always) help to out-compete the less desirable bacteria. Some inoculants also contain enzymes, some contain sugars and some now contain a strain that can slow down aerobic deterioration.

RESULTS: A quicker fermentation with less loss of energy, protein and dry matter in the silage, reduction in aerobic spoilage at feeding out from some later types now available, and if applied correctly in suitable situations, increased animal production.

It must be said that there are an increasing number of other products that also reach similar outcomes via different techniques or mechanisms and their attributes should be investigated.

How do inoculants work? Silage fermentation is influenced by naturally occurring micro-organisms, the amount of soluble or fermentable sugars available, the elimination of oxygen, silage dry matter content and the buffering capacity (it’s “resistance to becoming silage”) of the forage being ensiled. As the crop starts to ensile i.e. ferment, “good” bacteria (lactic acid producing bacteria) and “bad” bacteria (*Enterobacteria*, *clostridial* species) and yeasts and moulds compete for the plant sugars, their food, to enable reproduction and for survival. The greater the amount of oxygen present and/or the wetter the forage, the poorer the fermentation and, if made too dry, the greater the aerobic deterioration. Both result in dry matter and quality losses.

Bottom line: Wilting quickly, excluding as much air as possible, sealing the stack or bale quickly and airtight, all favour the “good” guys.

Will I profit from their use? Never a simple answer and responses in animal production is not always guaranteed. However, a rough rule of thumb is that for every \$1 spent the return should be at least \$3-\$5 back, sometimes higher. Note: This assumes that the inoculant has been applied at the correct rate, in the correct situation, is well mixed in the forage, has been stored correctly before and after mixing with water, (if in liquid form), that town water (fluoridated) has not killed the bacteria, etc.

USA research has convinced advisers of the merits of using inoculants and led to their recommendation of inoculant use in most situations. This supported by the latest research focussing on developing and selecting strains of bacteria that are more effective than those used in the past. Most inoculants now contain higher populations of the desirable bacterial strains. Some companies produce crop specific inoculants rather using a “one fits all” approach.

Recent research by Alan Kaiser and John Piltz at the Wagga Wagga Agricultural Institute has measured positive animal responses with inoculant treated silages (maize and sub clover) compared to untreated silages even though they found only minimal chemical differences between them. The extra production more than covered the cost of the inoculant

When should I use them? (Based on research to date) They are most suited to crops being made in good harvesting conditions. They are also very useful where a “wetter than desirable” crop needs to be ensiled quickly to beat incoming poor weather conditions. This may be a lightly wilted crop that has been on the ground for less than 2 – 3 days. It should still have reasonable levels of plant sugars remaining, a necessity for the inoculants to work.

Researchers and manufacturers still argue the merits or otherwise of inoculant use in the following scenario. For a crop that has been lying on the ground for several days, especially due to poor weather conditions, the plant sugars remaining will be partially or completely depleted. It is argued by some that using an inoculant in this situation is still worthwhile although the response will be low but may reduce further losses. Further research under Australian conditions is needed to clarify this particular situation. Alternative silage additives such as buffered acids, sulphur + amylase based product and others would do the job here.

Inoculants are sometimes more successful if crop specific inoculants are used, although not always endorsed by researchers and competitor companies. Research indicates that inoculants should apply at least 100,000 (1×10^5) colony forming units per gram of fresh forage of the desirable strain of bacteria. Others prefer to use one million (1×10^6) as the minimum number in pasture & legume silages and the 1×10^5 for cereals and maize, “silage friendly” crops. A colony forming unit is the production of a colony of bacteria from a single bacteria in the inoculant.

Store the new and unused inoculant in a cool, dry place and avoid leaving them in hot conditions. Mix and apply as stipulated by each manufacturer as each can have different requirements. Some products are actually “Home brewed” and require a set time and conditions for the batch to build up bacterial numbers to the number required. Freeze-dried products already have the required number of bacteria in the satchel along with a substrate for survival for a short time. Granules are a dry form of the inoculants containing the same type of bacteria.

Aerobic Spoilage Inhibitors

A new group of silage additives, called aerobic spoilage inhibitors, have come onto the market recently. These products are also designed to be applied at harvesting and require thorough mixing throughout the forage to work satisfactorily. These products restrict the activity of yeasts and aerobic bacteria that cause deterioration (heating and moulding) of silage of silage at opening and during feeding out.

The major group of these products are inoculants containing *Lactobacillus buchneri* 407888 on their own, but sometimes are mixed with other “traditional” inoculating bacteria. Other products do exist which claim to do the same job but are not based on bacteria at all. These products greatly delay the onset of heating and mould growth but not indefinitely! They are most useful in maize and whole-crop cereal silages. They are equally useful where other silages require several days to feed out across a face and heating/moulding often occurs and where silage is left in a TMR mixer overnight.

Remember, silage additives and especially inoculants, will not “fix up” a stuff up!