PIONEER® BRAND SILAGE INOCULANTS

An increasing number of New Zealand farmers are applying inoculants to improve the quality of their silage. This technical insight provides detailed information on all aspects relating to silage inoculants.

Why use a silage inoculant

A quality silage inoculant will improve silage quality by delivering a faster, more efficient fermentation.

Silage making relies on the conversion of plant sugars to acid. The acid decreases the pH and preserves the forage.

The first step in the silage making process is to create oxygen-free (anaerobic) conditions through compacting and sealing the forage. Anaerobic (oxygen hating) bacteria are present in variable numbers on all plant material. Once oxygen-free conditions have been achieved, these bacteria begin to multiply and convert plant sugars to fermentation acids. As fermentation acid levels increase, the pH drops preserving the forage as silage.

There are a variety of naturally occurring bacteria present in silage and they produce a range of fermentation acids. Lactic fermentation is the most desirable because minimal energy is lost during the fermentation process and lactic acid produces palatable, high feed value silage.

Just as cows differ in their ability to produce milk from grass, different bacterial strains vary in their ability to produce lactic acid. The most desirable strains are those that can convert sugar to lactic acid with minimal energy and drymatter loss.

Pioneer® brand inoculants contain bacteria that have been specially selected to give a faster, more efficient fermentation. The bacterial strains in Pioneer® brand inoculants are unique and patented. They are supported by statistically significant data from trials conducted under controlled research conditions.

Pioneer brand inoculants can:

- Give a faster and more efficient fermentation
- Increase silage energy content (feed value).
- Decrease protein breakdown.
- Improve silage digestibility.
- Increase drymatter recovery.
- Reduce heating, spoilage, shrinkage and run-off.
- Lift palatability giving higher drymatter intakes.
- Give more milk or meat production per tonne of forage ensiled.
- Reduce silage heating and spoilage at feed-out time.
- Pioneer® brand inoculants are non-toxic, non-corrosive and are not genetically modified.

Inoculant quality

Quality silage inoculants will contain:

The right bacterial strains. The inoculant should contain strains that have been proven to improve silage quality.

The right numbers. The inoculant must contain live bacteria in the concentration that has been proven to give a positive result.

The right proportions. Most bacterial inoculants contain more than one strain. Some strains are more competitive and reproduce more quickly than others. Each strain must be present in the correct proportions to give the claimed performance advantage.

No contaminants. The inoculant must be produced under sterile conditions to ensure that other micro-organisms do not contaminate the inoculant.

Live bacteria. Live bacteria of the correct strains must be present in the right proportions right up to the time of application. While manufacturing quality control is critical, packaging is equally as important in ensuring that the product will work when you apply it. An article published in the Hoards Dairyman (25 April, 2003) titled “It’s Buyer Beware When Buying Microbials” stated “Be especially leery of products that don’t come in tightly-sealed, moisture-controlled, foil-wrapped packages or well-sealed plastic

containers. Bacterial products sold in stitched, paper bags have little chance of working."

Pioneer® brand inoculants are produced and packaged by a system that meets ISO9001:2015 quality standards to ensure you get the right numbers of the correct strains of live bacteria, in the right proportions in every bottle that is applied.

Choosing a silage inoculant

There are many silage additives on the New Zealand market. Ask yourself the following questions when choosing a silage inoculant or additive:

- Is the product supported by statistically significant data from trials conducted under controlled research conditions? Products should be supported by animal performance data as well as fermentation studies.
- Is there label information about the guaranteed counts in the package?
- Does the manufacturer of the product have quality control systems in place to ensure you get the correct strains of live bacteria in the correct numbers and proportions every time you buy the product?
- Does the composition of the product change over time?
- Does the company selling the product provide a technical network to back up their product and do they have extensive knowledge of silage making in New Zealand?

Pioneer® brand silage inoculants

Development and production of Pioneer® brand inoculants

Silage samples were collected from around the world and brought to a central laboratory and graded for quality. A small amount of material from each sample was cultured on a petri dish. Since bacterial colonies differ in size, colour and other aspects of form and structure, researchers use magnifying lenses and an electronic probe to count the number and type of colonies produced. The dominant strains were identified as Pioneer scientists found that they are the strains most likely to have a positive effect on the fermentation process.

The bacterial strains that had the potential to improve silage quality underwent nearly 50 separate tests. These told researchers how efficient the bacteria were at converting plant sugars into acid, whether the bacteria would thrive at different moisture levels, at varying temperatures and at different oxygen concentrations. Research also indicated whether the strains had any negative characteristics like the consumption of protein that should be retained for livestock production.

The test results were loaded into a computer that helped determine the most beneficial strains. These strains were then further evaluated for several factors including compatibility with other beneficial strains, genetic stability, rapid growth in the highly competitive environment of ensiled forage and the ability to be produced and processed, dried, stored and blended within the exclusive Pioneer production system.

The strains were then field evaluated. Forage inoculated with the test strains was packed into small silos using a hydraulic press. The fermentation process was monitored for acid production, rate of pH reduction, final pH level, aerobic stability (resistance to heating and moulding) and influence on drymatter recovery. Strains that showed a beneficial effect on forage quality were then formulated into an inoculant.

Finally, inoculated silage was compared to an untreated control in animal feeding trials conducted at Pioneer's Livestock Nutrition Centre. Animal performance including growth rate and feed conversion efficiency were measured. If the inoculant gave a positive result it was sent to independent research organisations where it was trialled and proven. Once this was completed, the new inoculant was ready to be produced for commercial sale.

Choosing the right Pioneer® brand silage inoculant

Pioneer offers a comprehensive range of crop specific inoculant products as well as Pioneer® brand 1174 which is a multi-purpose inoculant suitable for use on all types of silage.

Pioneer® brand 1132, 1127, 11H50 and 1174 give a faster, more efficient fermentation reducing drymatter and quality losses during storage.

Pioneer® brand 11C33RR and 11CFT are revolutionary crop-specific products that help improve silage quality and drymatter recovery. These products contain a patented strain of *Lactobacillus buchneri* which reduces silage heating and spoilage at feed-out time.

The product options are summarised in the table below:

Silage type	Improved fermentation	Improved fermentation & better aerobic stability
Pasture	1127, 1174	-
Maize	1132, 1174	11C33RR, 11CFT
Lucerne	11H50, 1174	-
Cereal	1174	-
Sorghum – sundan grass	1174	-
Other (including crop residues and by-products)	1174	-

Pioneer® brand 1132 and 1174 inoculants – maize silage

Pioneer and independent research results show that when used on maize silage 1132 improves drymatter recovery by an average of 2.4%*.

Studies with dairy cows have shown that improved silage quality and increased drymatter recovery resulting from the use of 1132, increases milk production and milk return per tonne of maize ensiled when compared with an untreated control. Studies with beef animals have shown that improved silage quality and increased drymatter recovery resulting from the use of 1132, increase beef production by 12.2 kg more liveweight gain per wet tonne of maize silage ensiled, compared with untreated maize silage*.

Pioneer® brand 1127 inoculant – pasture silage

Independent research results show that when used on pasture silage 1127 improves drymatter recovery by more than 2.9%*, equivalent to an extra hectare of pasture for every 35 hectares of pasture harvested. Improved silage quality results from more efficient fermentation and an average 33% reduction in ammonia nitrogen breakdown*. This means a higher proportion of protein in the silage stays in a form that the animal can use more efficiently. Animal performance trials have demonstrated an extra 30 litres of milk or 81g higher average daily beef liveweight gain per wet tonne of 1127 treated pasture silage ensiled, compared with untreated silage*.

*Trial data available on request

Pioneer® brand inoculant pack sizes

Pack size	1132	11C33RR	1127	1174	11H50	11CFT
Small bottle (treats 50 wet tonnes)	✓	✓	✓	✓	✓	✓
Large bottle (treats 250 wet tonnes)	✓	✓	✓	✓	✓	✓

Storage of Pioneer® brand inoculant

Store all Pioneer® brand inoculants in a cool dry place.

1132, 1127, 1174 and 11H50 are stable at room temperature (less than 24°C) for three years from production. 11C33RR and 11CFT are stable for two years from production.

Storage of mixed Pioneer® brand inoculants

The table below shows the stability of mixed Pioneer® brand inoculants (i.e when water has been added to the bottle).

	All products except 11C33RR and 11CFT	11C33RR and 11CFT
Not refrigerated	3 days	2 days
In refrigerator at night	7 days	5 days
Frozen	1 year	

Defrost at room temperature or tepid water. DO NOT DEFROST IN THE MICROWAVE.

Application rates

Appli-Pro®

Appli-Pro® is a revolutionary advanced inoculant application system designed and calibrated especially for Pioneer® brand inoculants. Appli-Pro® is an accurate application system that uses less water than conventional spray systems. Pioneer® brand inoculants for the Appli-Pro® system are available in bottles that treat either 50 or 250 wet tonnes of forage.

Water soluble

All Appli-Pro® inoculants are suitable for use in

standard tank systems. Once mixed with tank water, Pioneer® brand inoculants should be used within 72 hours.

Application methods

There are a number of alternative methods by which you can apply inoculant to your forage.

Forage harvester
Pioneer® brand inoculants can be applied to the forage via the forage harvester. If you are using a contractor, ask if they can apply Pioneer® brand inoculant as they harvest your crop.

At the stack
Pioneer® brand inoculants can be applied at the stack using any farm spray unit provided that the pressure in the unit does not exceed 210 kPa (30 p.s.i.). If you are using a sprayer that has previously held any chemical, wash the whole unit (tank, hoses and nozzles) thoroughly with a detergent solution and then rinse at least three times with clean water.

If you are dealing with small quantities of silage, Pioneer® brand inoculants can be successfully applied over each load using a watering can.

For more information visit www.pioneer.co.nz