

Research shows: A Higher Milk Yield from EM-Silage treated Forage

EM-Silage Research Results

Feed innovation Services has researched the effect of EM-silage treated grass silage on the rumen fermentation of dairy cows. The in-vitro study showed a significant increase in the production of propionic acid, and a decrease in the production of acetic acid and of methane. The change in the VFA composition and the reduction of methane are beneficial to both the cow and the environment. **Especially the increase of available energy sources for milk and protein production from home-made silage makes it financially attractive to the dairy farmer.**

More energy, more milk

In many rations (especially with a high percentage of grass silage), calculated on the basis of Feed Efficiency, the number of glucogenic nutrients are limiting. The increase of propionic acid in the rumen provides more available energy for the cow to produce milk. Moreover less energy is lost because there is a reduction in methane production. **An increase in the production of propionic acid has a positive effect on milk and protein production.**

Less methane, cleaner environment

Hydrogen is produced during fermentation in the rumen and is largely discharged as methane via the cow's mouth.

During the production of acetic acid hydrogen is formed, while during the production of propionic acid hydrogen is absorbed. The shift in volatile fatty acids might explain the possible decline in methane production. **In this way dairy farming can make an important contribution to the reduction of greenhouse gases, which was agreed upon during the Kyoto Global Warming Climate Conference in December 1997.**

In Practice: EM-Silage as standard

The well-known positive effects of the use of EM-Silage on the ensiling process (see report no. 2165 ID-TNO) and the positive effect on rumen fermentation form an extra guarantee for the quality of the plant-animal system. With a bulk forage intake of 24 kg, the extra expense for applying EM-Silage amounts to approx. € 0.03 per cow per day. The calculation below shows an economic gain of € 0.35 per cow per day on the basis of 1 kg extra milk yield. **Considering the positive effects on silage and rumen fermentation and the favourable price/quality ratio, resulting in an immediate financial gain for the customer, EM-Silage is recommended as a standard silage additive.**

What does a higher level of propionic acid production mean to you?

Calculation of rumen model according to "Jan Dijkstra's" method

Example:

- Ration for a cow with a milk yield of 34 litres; 4.24% fat, 3.33 % protein, 4.50 % lactose, ratio optimised for Feed Efficiency.
- Intake cow : 22.3 kg d.d. / day (11.5 grass silage and 10.8 compound feed)

With such a ration this means:

- Absorption of propionic acid is 17,1 mol/day.
- By using EM-Silage the propionic acid production may increase to +10%; = 1.71 mol/day extra.
- 1.71 mol of propionic acid is equivalent to 2.61 MJ/day energy.
- On the basis of glucose and propionic acid as a limitation an increase of 0.5 – 1.5 kg/day might reasonably be expected.
- Assuming it will work out to an average of 1 kg this is tantamount to an economic gain of € 0.35 /cow/day.

So: A higher yield from your own bulk dairy forage!



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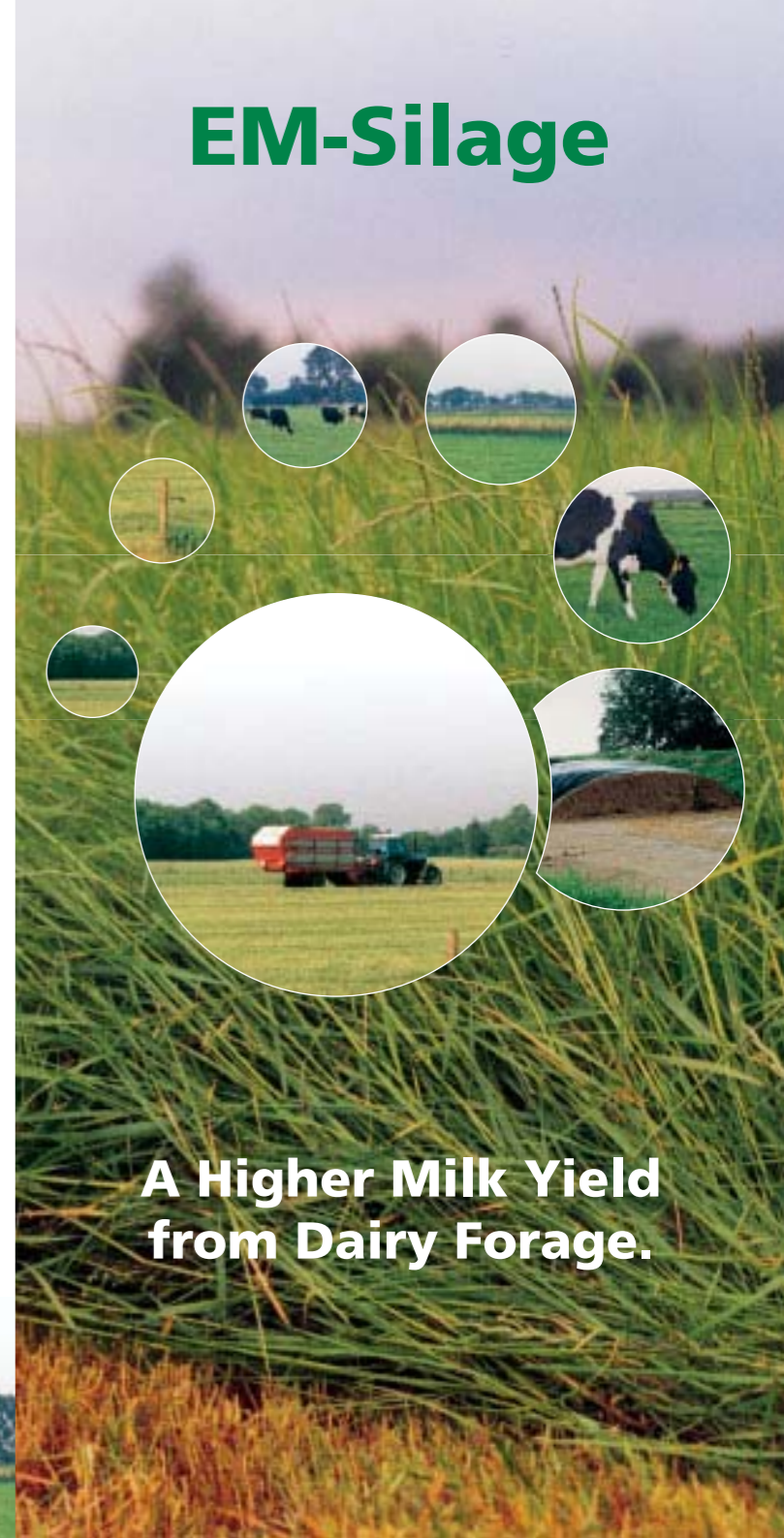
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Research Results

Parameter	Unit	Grassilage	
		Control (without EM)	+ EM additive
Hac	mmol/ g om	3,76	3,39*
Hpr	mmol/ g om	1,40	1,48*
Hibr	mmol/ g om	0,06	0,064
Hbr	mmol/ g om	0,52	0,57*
Hival	mmol/ g om	0,13	0,11
Hval	mmol/ g om	0,12	0,10
Hac	%	64,30	60,90*
Hpr	%	23,00	25,40*
Hbr	%	8,50	9,70*
Hac/Hpr		2,85	2,42*
OS degradation	%	87,00	85,00
NGR		3,33	3,02*
NH3	Mg/l	429,00	438,00
CH4 calculated	mmol/ g om	1,75	1,59*

* Difference between Control silage and EM-Silage treated silage is significant (*:p<0.01). Source: Feed Innovation Services April 2003

EM-Silage



A Higher Milk Yield from Dairy Forage.

EM-Silage, an efficient silage inoculant at a price you can afford!

In the Netherlands silage additives are mostly used if ensiling conditions are not ideal. People try to compensate for these poor conditions by using a silage additive. For additives based on acids and salts this might indeed be a good idea. These products will stabilise the silage in a very short time and no further losses will occur. Moreover, preservation will take place at a fast rate, inhibiting detrimental anaerobic micro-organisms and plant enzyme activity.

Additives based on bacteria and enzymes require an entirely different approach. Bacteria need nutrients in order to create stable silage. The more nutrients, the better. These nutrients consist mainly of sugars, proteins and starch. Bacteria feed on these products and produce in their excrements acids, vitamins, and antioxidants. These acids will ensure a decline of pH and are therefore instrumental in the preservation process and the vitamins and antioxidants increase the animals' stamina. This process can be compared with the technique of fermenting wine from grape juice.

Effect of weight losses

Effect of ensilage products EM-A (EMA) und EM-Silage (EMS) related to weight losses, pH and aerobic stability of grass silages in 1-kilo bags after two months of incubation. The numbers are average figures of duplicate incubations.

After two months of incubation			
	Control	EMS	EMA
Weight loss (g/kg)	39.0 ^a	25.8 ^b	23.9 ^b
pH	5.88 ^a	4.36 ^b	4.29 ^b
aerobic stability (hours)	60 ^a	>525 ^b	>525 ^b

Averages in a row with different superscript letter code are significantly different (p<0.05)

Source: ID Lelystad, report no. 2165
(A complete report is available on request from your dealer or from EM Agriton)

In order to be able to take advantage of this positive effect of EM it is advisable to use ensilage additives based on bacteria not only under poor conditions, but also under favourable conditions. Under such conditions many nutrients will be present so many antioxidants and vitamins can be produced.

A great disadvantage of applying ensilage products under favourable conditions has been the initial expense, in spite of the fact that such treatment will be more profitable in the end. The expense can be more easily computed than the gain. The appearance of EM-Silage has mostly solved this problem because with a cost price of only approx. € 1.50 per ton silage it is fairly easy to calculate that the gain will considerably exceed the initial expense.

What is EM-Silage?

EM-Silage is a cultured bacterial inoculant, which contrary to many other bacterial inoculants, contains not only lactic acid bacteria but also yeasts, actinomycetes, photosynthetic bacteria and fermentative moulds. The idea of using effective micro-organisms (EM) in agriculture was developed by Professor Dr. Teruo Higa of the Ryukyus University in Okinawa, Japan. EM-Silage is a ready made product, which only has to be diluted with water

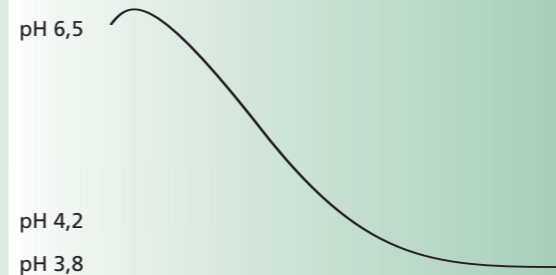
How does EM work?

The lactic acid bacteria present ferment some of the sugars into lactic acid causing a decline in pH which results in a more stable silage (less perishable).

The other bacteria and moulds cause under anaerobic circumstances (as inside a closed silo) a type of pre-fermentation resulting in the release of antioxidants and vitamins. Nutrients that are difficult to digest will be converted which will make the intake and digestion of those nutrients easier and faster for the cow. This will increase the milk yield of the cow. The odour and palatability of the silage will also change, which will be highly appreciated by the cow. A very important point is that substances will be formed inhibiting heating in the silage, which means there will be less risk of overheating once the silo is opened.

EM-Silage as ensilage improver

Effective microorganisms convert sugars into acids



Values of the acid level (pH) in time in perfectly fermented silage.

How is EM-Silage applied?

In order to get a good distribution of the EM-Silage in the silage EM-Silage is diluted at a ratio of 2 litres of EM-silage to 100 litres of water. After stirring, 4 litres of this mixture per ton of silage will be inoculated into or sprayed over the silage. This much water only serves as a carrier in order to distribute EM-Silage in a proper way. If it is possible to get a good distribution with less water there is no objection against it. But we don't recommend a dosage of lower than 2 litres of EM-Silage per 50 litres of water and inoculating at least 2 litres of this mixture per ton of silage.

The packages of EM-silage

EM-Silage is delivered in 1-litre plastic bottles or in a 20-litre Bag-in-Box packaging. This Bag-in-Box consists of a cardboard box lined with a plastic bag. After exposure to outside air EM-Silage can only be kept for a few days before deteriorating. By delivering a Bag-in-Box package with a draw-off tap we will enable the customer to siphon off any desired quantity while preventing oxygen from entering. In this way the remaining amount of EM-Silage can be kept for a longer period. This 20-litre package has been especially introduced for agricultural contracting firms and is suitable for 250 tons of silage.

Effect on ensilage characteristics after 2 months

Effect of silage additives EM-A (EMA) and EM-Silage (EMS) on ensilage characteristics of grass silages in 1-litre preserving bottles after 6 days and 2 months of incubation. The figures are averages of duplicate incubations.

After 2 months of incubation

	Control	EMS	EMA
Dry matter (g/kg)	451	440	436
Weight loss (g/kg)	11.5 ^a	24.0 ^b	21.2 ^b
pH	5.11 ^a	4.42 ^b	4.36 ^b
yeasts (log/cfu/g)	2.15	<2	<2
yeasts (log/cfu/g)	<2	<2	<2
lactic acid (g/kg dm)	41.9	79.3	82.2
acetic acid (g/gk dm)	7.6	36.2	39.2
ethanol (g/gk dm)	11.2	17.7	11.7
1,2 propanediol (g/gk dm)	0	10.0	9.0
2,3 butanediol (g/gk dm)	0.3	0.3	0.3
propionic acid (g/gk dm)	2.2	2.4	2.7
1 propanediol (g/gk dm)	0	2.3	2.9
ammonia (g/gk dm)	2.5	3.5	3.6

Averages in a row with different superscript letter code and the same incubation time are significantly different (p<0.05)

Source: ID Lelystad, report no. 2165
(A complete report is available on request from your dealer or EM-Agriton)

Shelf life of EM-Silage

The shelf life of EM-Silage after production is 1 year only in air-tight packages. Diluted in water EM-Silage is perishable after 24 hours.

