Grass Silage Trial: Ecosyl treated vs Untreated

Dr Mark Leggett | Dr Gopal Kedia | Sophie Bannister | Philip Jones

Trial Summary

Wilted grass at 32 % DM was treated with Ecosyl or left untreated and ensiled for 90 days.

Treating with Ecosyl resulted in a rapid lactic acid fermentation, lowering the silage pH and effectively controlling the activity of enterobacteria and clostridia.

Untreated silage fermented poorly, resulting in a high pH. The higher pH allowed enterobacteria and clostridia to thrive within the fermentation resulting in production of butyric acid and high DM losses, relative to the Ecosyl treated silage.

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Using the data from our trial, we can estimate some of the benefits of using Ecosyl:

	Untreated	Treated
Fresh matter clamped (T)	1000	1000
DM% in the clamp	**32%**	**32%**
DM in the clamp (T)	320	320
DM losses during ensilage	**10.1%**	**4.6%**
DM remaining in clamp after losses (T)	287.68	305.28
Extra DM from Ecosyl silage (T)	**17.60**	

Lower DM losses means more silage to feed

- A clamp containing 1000 T fresh matter at 32% DM will contain 320 T DM.
- Given the losses seen in this trial, there would be 17.6 T more DM to feed in the Ecosyl clamp compared with the untreated clamp.

	Untreated	Treated
Silage ME (MJ/kgDM)	**11.27**	**11.48**
Intake (kgDM/cow/day)[1]	11.6	12.0
ME intake/cow/day (MJ)	130.7	137.8
ME available for milk (MJ)[2]	55.7	62.8
Milk production (L/cow/day)[3]	10.5	11.8
Extra Milk from Ecosyl silage (L/cow/day)	**1.3**	

Using Ecosyl resulted in a higher energy silage yielding more milk

- In this study, Ecosyl silage could support the production of an additional 1.3 L of milk per cow per day compared with the untreated silage.

	Untreated	Treated
ME in the clamp (MJ)	3,242,154	3,504,614
Total milk potential (L/ whole clamp)	260,784	301,248
Extra milk from Ecosyl Silage (L/whole clamp)		**40,464**
Value of extra milk (£)		**£10,116**
Extra margin after the cost of Ecosyl		**£8,836**
Return on investment		**6.9 : 1**

Return on investment

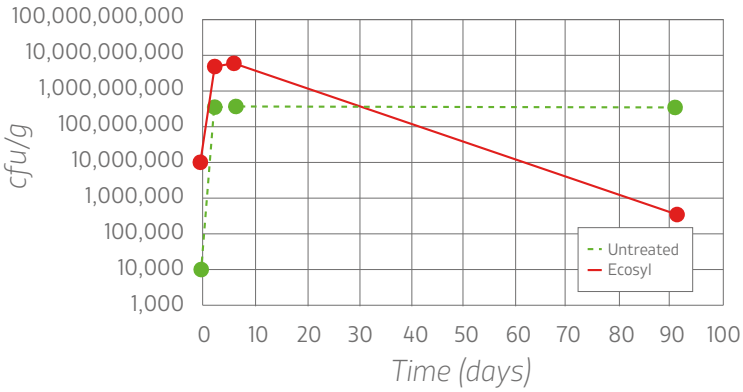
- Considering the energy present on a whole clamp basis, we can calculate potential milk yield from all the silage present.
- Given the improved DM retention and the higher ME, the Ecosyl treated silage holds the potential to support more than 40,000 L of additional milk compared to the untreated silage.
- With a milk price of 25 p and accounting for the price of the additive (£1.28 / T treated), this would equate to a profit of £8,836, a return on investment of 6.9 to 1.

[1]Independent research has demonstrated that, on average, Ecosyl increased silage intakes by 0.4 kg DM/cow/day.

[2]Typical Holstein/Friesian cows require 10% of their bodyweight plus 10 MJ of ME each day for maintenance. This means a 650kg cow requires (650 x 10 ÷ 100) + 10 = 75 MJ of ME/day for maintenace.

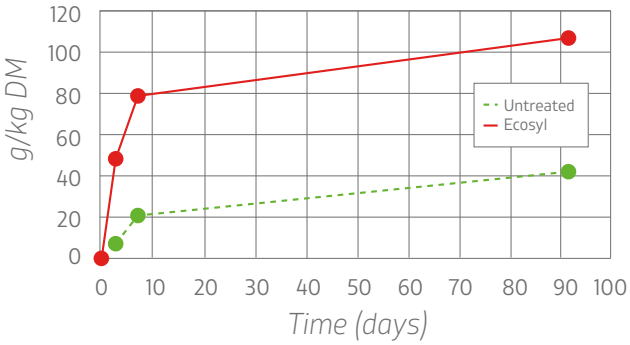
[3]Typical Holstein/Friesian cows producing milk at 4% fat and 3.3% protein require around 5.3 MJ of ME for every liter.

Lactic Acid Bacteria



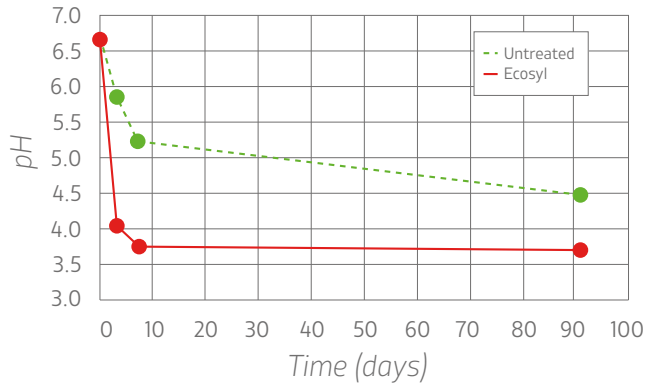
- **Lactic acid bacteria increase in number during the early stages of fermentation**
  - Ecosyl treated silage had higher lactic acid bacteria counts than the untreated silage and was dominated by the benificial MTD/1 bacteria

Lactic Acid



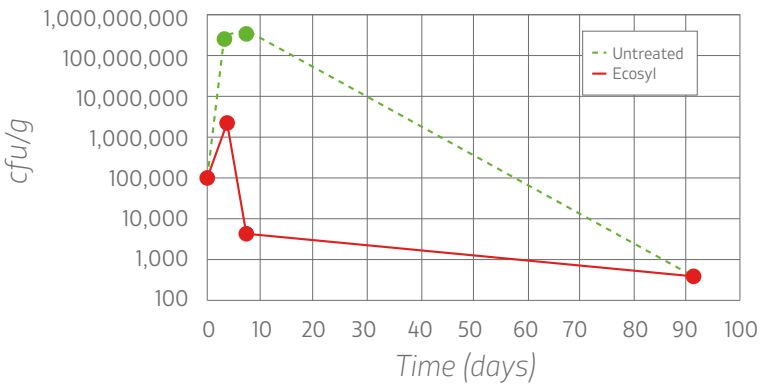
- **As lactic acid bacteria numbers increase, they generate lactic acid – the most important fermentation acid**
- **Other fermentation end products represent less efficient uses of plant nutrients**
  - The MTD/1 bacteria in Ecosyl treated silage consistently produced more lactic acid than the untreated silage

pH



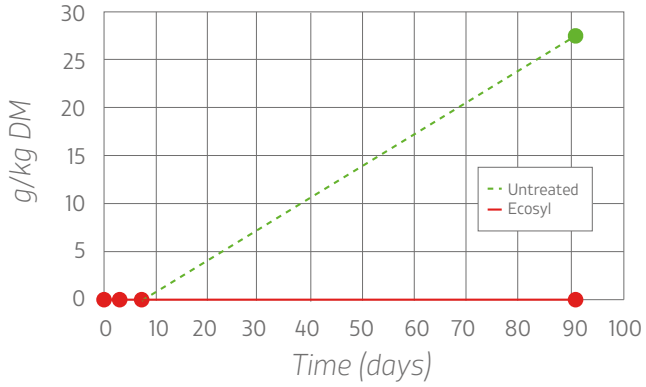
- **Lactic acid generated by lactic acid bacteria lowers the silage pH**
- **Rapid reduction of pH is vital for stabilising the silage**
  - Ecosyl treated silage was acidified more rapidly and more extensively than the untreated silage

Enterobacteria



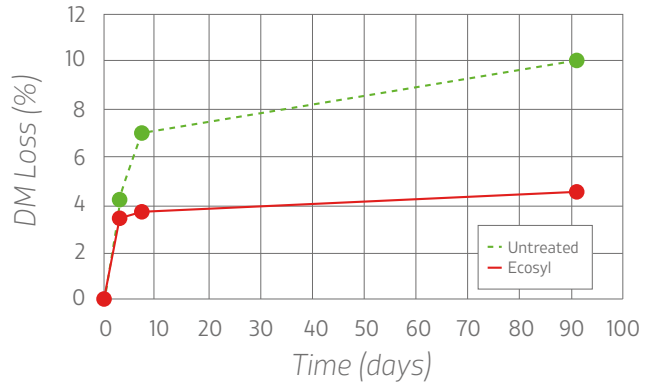
- **A low pH allows effective control of enterobacteria (commonly found in slurry)**
- **Enterobacteria in silage can produce acetic acid and ethanol resulting in DM and energy losses**
  - The rapid fermentation in Ecosyl silage resulted in more effective control of enterobacteria

Butyric Acid



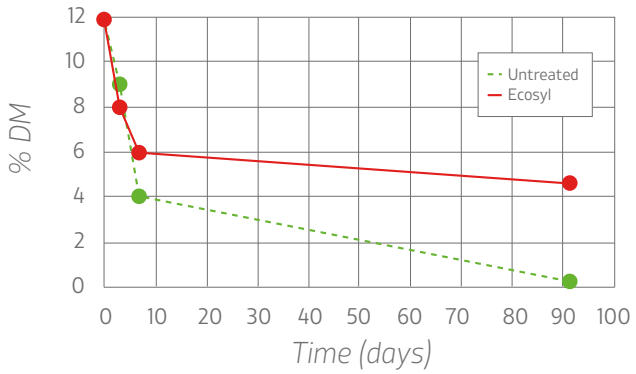
- **Low pH also effectively controls the activity of clostridia**
- **Clostridial activity, generally resulting from soil contamination, generates butyric acid**
- **Butyric acid fermentations result in high DM and energy losses**
  - No clostridial activity (butyric acid) was seen in Ecosyl silage

DM Loss



- **The activity of clostridia and enterobacteria in silage results in large DM losses**
  - Ecosyl controlled the fermentation process, effectively reducing DM losses

Sugars



- **Rapid fermentation results in greater sugar preservation.**
  - As well as preserving more of the silage DM, the rapid homofermentative fermentation from the MTD/1 bacteria in Ecosyl also preserved more sugar
  - The activity of undesirable bacteria in the untreated silage significantly reduced silage sugar content

Conclusion:

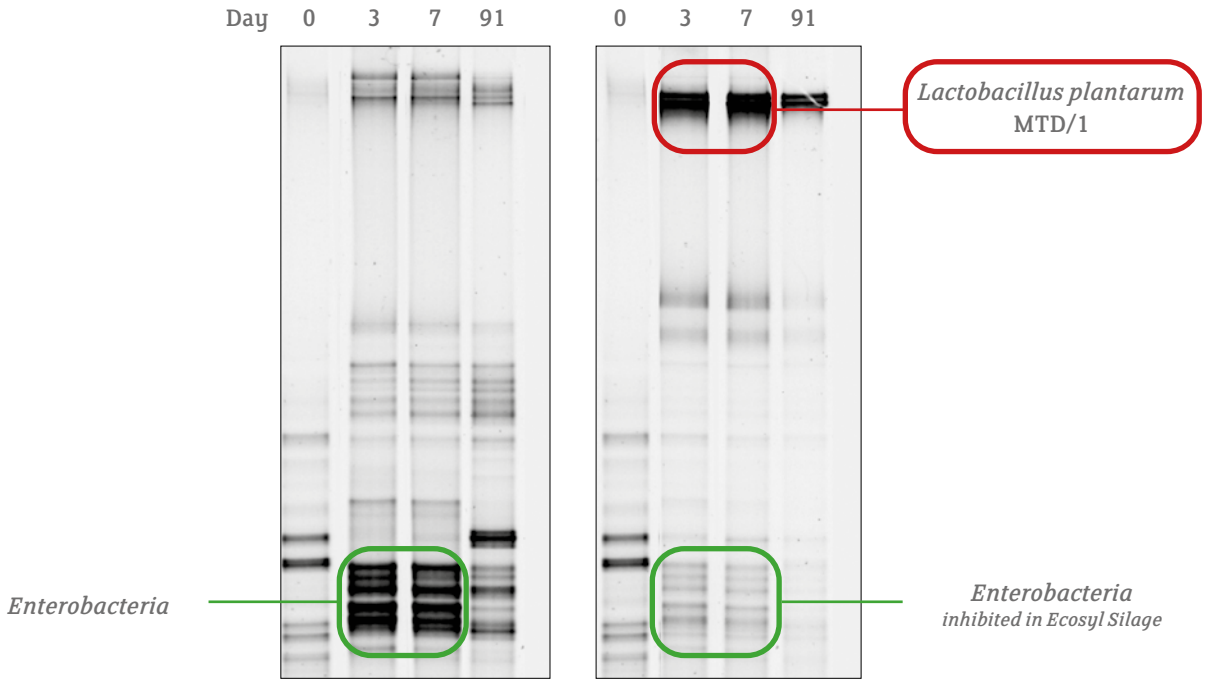
Treating with Ecosyl (MTD/1) rapidly dropped the pH and controlled spoilage organisms, resulting in reduced DM & sugar losses. This resulted in more of a higher quality silage to feed.

Bacterial DNA Profile

The image below shows a snap-shot of all bacteria present in the untreated or Ecosyl silage after 0, 3, 7 and 91 days ensiling. Each band represents the DNA of a different type of bacteria. **Darker bands** indicate more numerous bacteria, whereas ***fainter bands*** represent less numerous bacteria.

The fermentation in the Ecosyl silage was dominated by the beneficial bacteria *Lactobacillus plantarum* MTD/1 (**dark bands** shown in the red box below) which prevented the growth of bad bacteria (enterobacteria, commonly from slurry) (***faint bands*** green box below), preserving the silage sugars and DM.

Untreated silage did not contain the MTD/1 bacteria, meaning that the early stages of this fermentation were dominated by enterobacteria (**dark bands** shown in the green box below), resulting in high DM losses and lower sugar levels.



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