Plant and seaweed extracts to secure milk production persistency

Ruminants live in symbiosis with the micro-organisms hosted in their rumen. In this relationship, the animal provides the nutrients and the proper environment for bugs, while the micro-organisms provide the possibility to convert non-digestible dietary compounds into nutrients.

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While this symbiosis enables ruminants to take advantage of ingredients with theoretical low values, nutritional research has further explored fermentation mechanisms to possibly maximise the efficiency and the outcome of the symbiosis between the ruminants and the micro-organisms of the rumen, to improve the production of energy or protein, reduce the waste of nutrients and again improve feed efficiency.

The optimisation of rumen fermentation should first be achieved through diet formulation and management practices.

Nevertheless, when these strategies are implemented, additional benefits could be obtained by use of additives that can modulate rumen microbial fermentation.

In recent decades, various technologies and ingredients have been used to improve the efficiency of energy and N utilisation in the rumen but there is still room for new solutions that will allow the current level of production to be maintained without increasing costs.

A synergistic formulation with controlled release technology

Recently, a new technology was introduced to modulate the rumen microflora and support milk production during the full production of dairy cows and maximise the production persistency beyond the production peak. This new technology relies on the exclusive combination of key active ingredients:

- One 'phycogenic' or marine algae with high content in phloro-tannins.
- Three 'phytogenics' or plant extracts with high levels of essential oils.
- One source of protected urea for a slow release of nitrogen.

Furthermore, this feed additive is designed with a unique manufacturing process:

- A first outer-layer containing both coated phytogenics and phycogenics for a higher stability in feed and an immediate activity in the rumen.
- A second inner-layer made of protected urea for a slow and continuous release of nitrogen in the rumen, to support and maximise the production of protein.

The exclusive composition of this technology combined with its unique manufacturing process allow this technology to be an all-in-one solution with each particle containing all active ingredients for homogeneous distribution in the feed and consistent efficiency.

Modulating rumen metabolism to support performance

All active ingredients are protected and delivered to the rumen to act synergistically

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Fig. 1. Average dairy milk production.

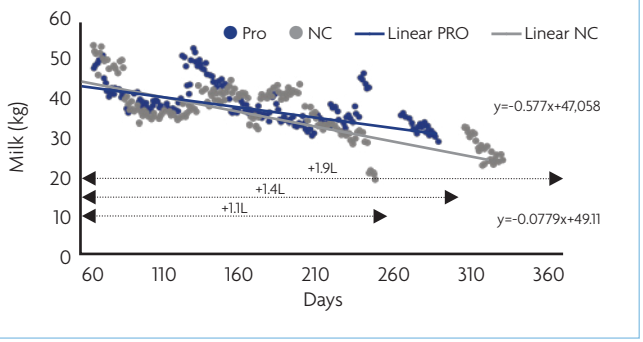
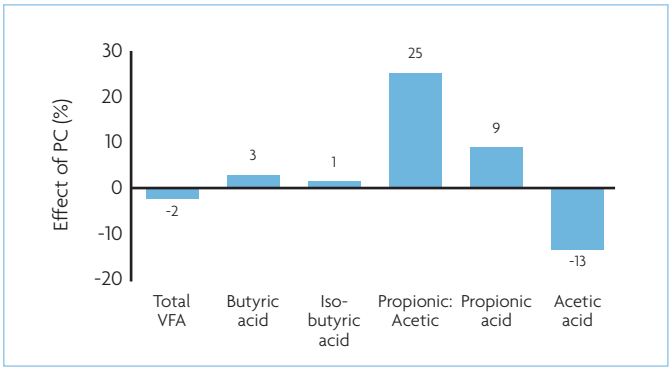


Fig. 2. Effect of PC on volatile fatty acid levels in the rumen (day 42).



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and modulate rumen functions to boost performance of dairy cows.

- The phytogenics and phycogenics, which are released first, will indirectly favour bacteria that optimise VFA production, and thus trigger an energy uplift.
- The inner core containing protected urea acts as a micro bolus to release nitrogen progressively, which together with the energy uplift will favour the production of innate microbial protein in the rumen.
- In the meantime, phytogenics and phycogenics control the detrimental microflora, i.e. inhibit protozoa and bacteria that are responsible for proteolysis and deamination.

With an uplift of energy, an increase of nitrogen available for the rumen micro-organisms, and a reduction of amino acid degradation, the three steps above consequently work synergistically to increase the total protein flow to the intestine and support milk production.

Finally, phytogenics are also acting on digestibility since specific phytogenics can increase digestive secretion. This enhanced digestibility will lead to a better digestion and absorption of nutrients and further support the milk production of dairy cows.

Securing and extending the milk production cycle

Several in-vivo trials have demonstrated the impact of this new technology, either 'on top' to boost milk production and extend milk production after the peak, or by reformulating the share of proteins in the diet to optimise profit.

The research has shown that animals benefit from this technology through a better support of their protein metabolism and through the modulation of the VFA profile production in the rumen.

In all trials, the new technology, based on exclusive metabolites and technology, was shown to contribute to higher milk production, with no dilution of fat and protein and a better feed efficiency.

In a new trial, the technology was tested at a Belgium dairy farm in March 2021. Cows were originally fed with a ration based on raw materials (no feed additives) with a 1:1 corn:grass silage, and with a crude protein level between 14.54-14.75% depending on milk production.

Two groups of cows were homogeneously split and either fed with standard diet (NC) or with this new technology (PC).

At day 60, cows in the NC group started with a slightly higher milk rate vs cows in the PC group. After the peak of lactation (›day 60), cows progressively produce less but cows in the PC group maintained a higher production rate per day than cows in the NC group.

With a longer lactation period, the effects of the technology were step by step more visible: cows from the PC group produce 1.1 litres more than the NC group from 60-250 days, 1.4 litres more from 60-280 days and, finally, 1.9 litres more from 60-330 days.

60-250 days	60-280 days	60-330 days
+ 1.1L	+ 1.4L	+1.9L

Table 1. Average additional milk production per day (PRO-NC) during lactation from 60-250, 60-280 or 60-330 days.

These results confirm outcomes from previous trials and the effect of the innovation to support milk production, and more specifically to increase the performance over the time and extend the production cycle of dairy cows.

Interestingly, the cows from the PC group, which had a higher milk production than cows from the control diet, also maintained their fat percentage and protein percentage, indicating no dilution of the milk. These results confirm the effects of PC treatment on protein metabolism and energy in the rumen.

As an example, the PC treatment showed an effect on VFA production, with an increase of the ratio of propionic:acetic acid, which represents a gain of energy for the cows.

This highlights the effect of the new product on ruminal microflora, to alleviate the fermentation pathways and optimise rumen efficiency.

A comprehensive tool to secure milk production

Considering its importance in cow production, it is not surprising that the rumen and its ecosystem have monopolised most nutritional research. Nevertheless, progress in research has unveiled opportunities for animal nutrition, to further understand and possibly alleviate the metabolism of the rumen, to improve feed efficiently and better take advantage of available diet compounds.

While various molecules or ingredients have been tested and are commonly used to support the production of dairy cows, the technology presented in this article relies on a quite unique approach, with a synergistic effect of its components, thanks to a simultaneous release of nitrogen and an uplift of energy.

This is the outcome of a transparent and exclusive formulation, in particular when it comes to phycogenics from algae, but also the outcome of the manufacturing process that enables the specific controlled release of ingredients in the rumen.

This innovation is now available on the market and can be used as a tool to support and extend milk production, while other ideas will be developed in the future to address more specifically different life stages of animals. ■