The benefits of hydrolysed brewery yeast in dairy cows

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Yeast products are widely used in dairy cow diets and have been reported to improve milk production and feed efficiency. The most common yeast products fed to ruminants are live cells and their positive effects on milk production have mainly been demonstrated in early lactation. However, the animal responses have not been consistent.

There are many different factors that may have affected the responses but viability of the yeasts during feed processing and storage is the one that has caused most discussion among feed manufacturers. On the other hand, normal, inactivated feed yeast has not shown to have effects beyond its nutritive value.

Based on our research it seems that inactivated yeast has to be hydrolysed to make it functional in the rumen. The right kind of hydrolysis increases the amount of soluble components (mainly sugars) in the yeast which has correlated with the functional effects.

Trials have shown that the hydrolysed brewery yeast (Progut, Progut Rumen) has enhanced rumen fermentation providing more energy and protein for the cow. This has resulted in trials with higher milk yield and better feed utilisation during the whole lactation period. The hydrolysed yeast has also shown to be very stable in feed processing and storage.

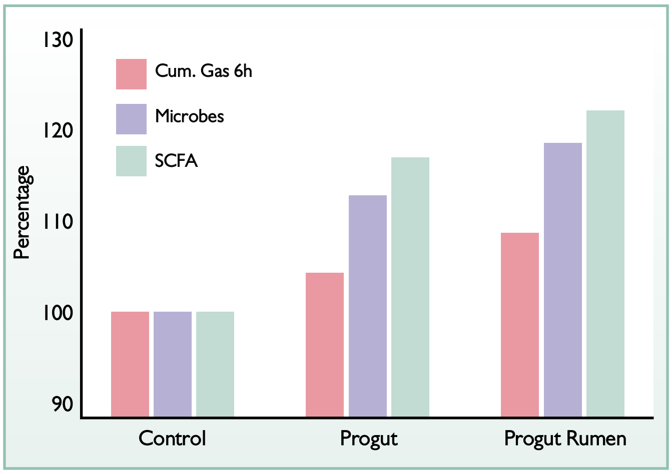


Fig. 1. The effect of hydrolysed brewery yeast products on rumen fermentation in vitro (Alimetrics Ltd, 2008).

Enhanced rumen responses

The importance of the hydrolysis was first seen in a rumen simulation trial conducted at Hannover Veterinary University in 2006. In this trial the hydrolysed brewery yeast Progut increased dose dependently the production of SCFA, acetate and propionate, while the effect of less hydrolysed yeast from the same raw material was negligible.

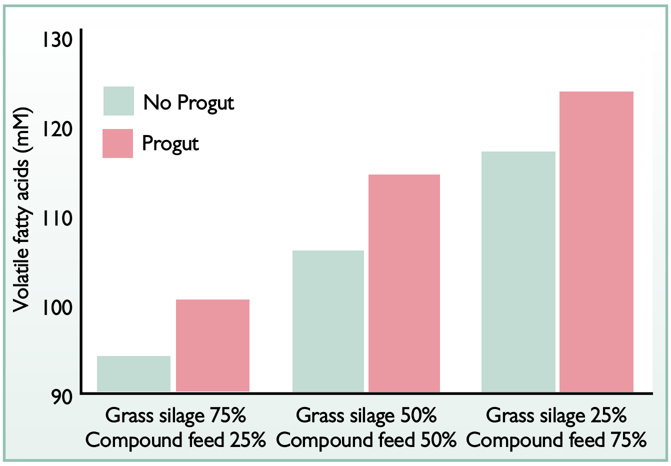
In 2008 Alimetrics Ltd tested the effect of Progut and more hydrolysed Progut Rumen on rumen fermentation in vitro. Progut increased significantly the number of rumen microbes and the production of SCFA but the effect of the more hydrolysed Progut Rumen was even more pronounced (Fig. 1).

In a rumen simulation trial at Alimetrics Ltd in 2006 the effect of the hydrolysed brewery yeast on rumen fermentation was similar with both grass and maize silage diets.

Their simulation study in 2007 showed that the effect of the hydrolysed yeast was similar in different silage to compound feed ratios. In this trial Progut significantly enhanced rumen fermentation rate, the production of volatile fatty acids and microbial biomass with all silage to compound feed ratios studied.

An increase in the volatile fatty acids production at a later stage of fermentation was mainly due to increased propionate production (Fig. 2).

Fig. 2. The effect of Progut on the production of VFA in vitro with different silage to compound feed ratios (Alimetrics Ltd, 2007).



Progut seemed to favour those microbes that had substrates and were metabolically most active.

In later stages of the simulation it enhanced the selenomonas group of bacteria, that are converting lactic acid to propionate, and cellulolytic bacteria with high silage diet.

Overall, the results indicate that the effect of the hydrolysed brewery yeast could be similar in different lactation phases.

Effects on performance

The effect of the hydrolysed brewery yeast on the performance of dairy cows has been studied in university and farm trials in different countries.

In a trial at the University of Helsinki Progut addition in the diet two weeks pre and eight weeks post calving increased the energy corrected milk yield (ECM) and feed efficiency (Table 1).

It also decreased the weight loss of the cows. Calculated from the difference in the ECM yield and weight loss Progut addition improved the energy utilisation of the cows by 15.3MJ ME/day.

The energy value of the enhanced SCFA production by Progut addition

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Table 1. Trial at the University of Helsinki (Alimetrics Ltd, 2006).

1-8 weeks	Control	Progut
ECM yield (kg/d)	46.8	49.3
Feed efficiency ECM / DMI	2.15	2.29
DMI (kg/d)	21.9	21.9
Weight loss (kg/d)	- 0.643	- 0.553
Difference (MJ ME/d)		15.3
Energy value of extra SCFA in rumen simulation trial MJ		15.5

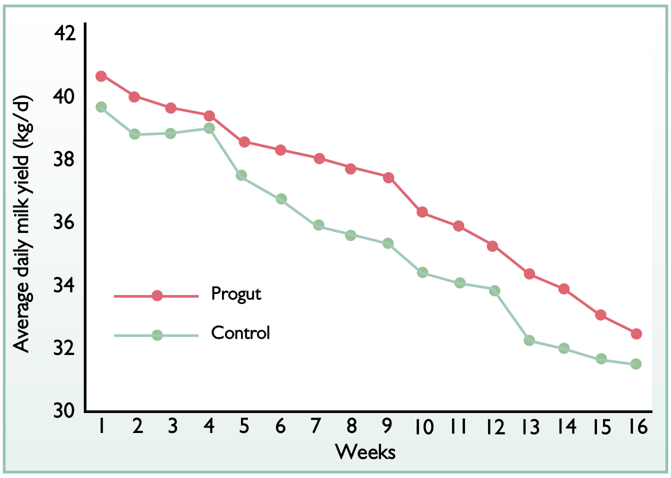

Fig. 3. The effect of Progut on milk yield in Swiss study (P. Savary, 2008).

MiM	Control	Progut	Difference
1	32.1	33.7	1.6
2	37.6	38.7	1.1
3	36.7	38.5	1.8
4	34.8	36.8	2.0
5	32.7	34.8	2.1
6	31.5	33.2	1.7
7	29.3	31.2	1.9
8	27.9	29	1.1
9	25.8	27.8	2.0
10	23.1	25.6	2.5
Average	31.2	32.9	1.8
305 day milk yield	9.501.4	10,046.8	545.4

Table 2. Results from Finnish farm study 2006-2007.

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in the rumen simulation trial was almost identical (15.5MJ/day).

In tests carried out at Finnish dairy farms in 2006-2007 test day milk records were collected from 22 farms before and after the introduction of hydrolysed brewery yeast in the diet. In total, the analysed data consisted of 5,846 milk yield observations from 714 cows.

Statistical analysis

The individual observations were grouped using months in milk as a factor. The number of calvings, farms and cows were included in the statistical analysis.

Progut was mixed either in a compound feed or in a half concentrate and the daily dose varied in different lactation phases from seven to 18g per cow – being on average about 10g.

In this survey Progut improved milk yield on average 545kg per cow per year calculated to 305 day lactation period (Table 2).

The difference in milk yield between control and Progut groups remained similar during the whole lactation period.

According to analyses of variance the effect on milk yield was statistically highly significant ($p<0.001$).

Progut increased the percentage fat ($p<0.05$) mainly in the end of the lactation period while the percentage protein remained almost the same.

In a Swiss study 32 cows were divided into pairs at the beginning of the trial based on days in milk, milk yield during a three month control period and number of calvings. The trial included early, mid and late lactation cows and the basic TMR feeding consisted of maize and grass silage and compound feed.

A separate compound feed with or without Progut addition (15g/cow/day) was fed throughout the trial period of 15 weeks.

The addition of Progut increased the milk yield during the whole trial period, on average 1.63kg/cow/day (Fig. 3).

Due to the variation in the milk yield the difference to the control was not statistically significant.

Analysis of blood samples showed that Progut addition tended to increase the content of glucose and to decrease the content of free fatty acids in the blood (Table 3). It also significantly decreased the content of β-hydroxybuturate (ketone body). Results from the blood analysis indicate better energy utilisation of the Progut fed cows.

Research clearly shows the importance of hydrolysis in increasing the functionality of the inactivated yeast in the rumen. As hydrolysed the brewery yeast has shown in trials to increase the production of microbial biomass and SCFA, thus providing more protein and energy for the cow.

In trials it has shown to be effective with different diets and to improve milk production, feed efficiency and energy utilisation both in early and late lactation. By optimising the hydrolysis process Progut Rumen has been developed specifically for use in ruminant feeds. ■

Table 3. The effect of Progut on blood parameters of dairy cows (P. Savary, 2008).

Weeks 1-15	Control	Progut	P value	Norm
Glucose (mmol/l)	2.54	2.65	0.09	>2.6
FFA (mEq/l)	0.11	0.08	0.13	<0.01
β-HB (µmol/l)	992	669	0.01	<900

References are available from the authors on request.