Heat stress: live yeast benefits performance and feeding behaviour

Heat stress is a common and growing concern in dairy production. It is no longer limited to just summer months or tropical regions and could be an issue for long periods in many regions.

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By monitoring the temperature and humidity level within the animals' environment (in the barn) – as well as assessing visible indicators such as rumination, locomotion or undigested grains in manure – producers can better anticipate heat stress issues and make the necessary adjustments before dairy production starts falling.

Live yeast, used as a rumen modifier, has proven its efficacy to help alleviate the negative effects of heat stress on dairy performance and rumen health.

A recent study credits the positive effects of the rumen specific yeast Saccharomyces cerevisiae CNCM I-1077 to benefit rumen pH, fermentation profiles and feeding behaviour under such challenging conditions. One of the numerous challenges of dairy production under hot and humid climates is decreased milk yields when cows are exposed to heat stress.

Milk fat/protein ratio is also an important indicator of heat stress level. Heat stress represents a real challenge for the rumen, leading to increased risk of Sub Acute Ruminal Acidosis (SARA). The compilation of more than 500 rumen efficiency audits indicates that in farm settings across many regions and farming systems, under heat stress conditions, 60% of farms present suboptimal rumen efficiency.

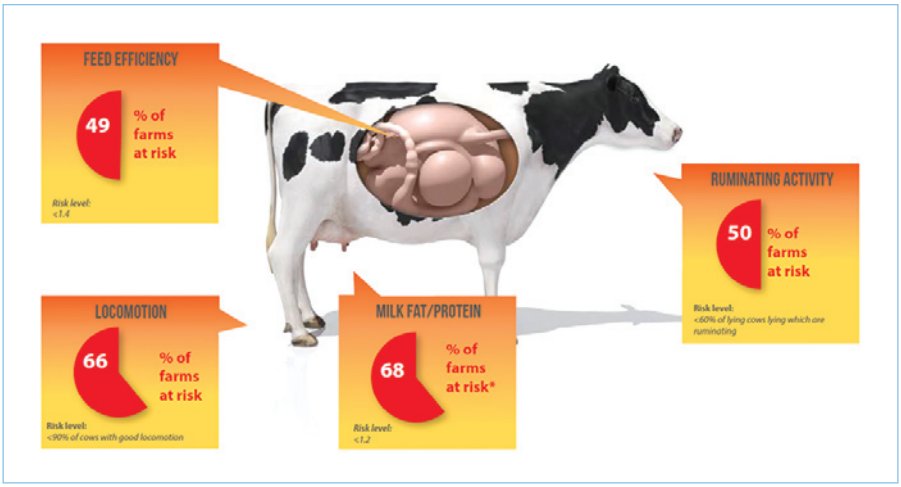


Fig. 1. How dairy farms perform under heat stress conditions according to four rumen efficiency indicators (compiled results from 506 audits, representing 68,500 dairy cows in 300 farms, from 28 countries. Lallemand internal database, 2020).

Rumen efficiency indicators linked to feeding behaviour are affected by heat stress, such as rumination activity. Other indicators include locomotion (lame animals can have high levels of histamine production and bacteria endotoxin release in the rumen, which is often linked to SARA) (Fig. 1).

Why use live yeast?

Nutritional strategies to preserve dairy performance under heat stress should focus on supporting nutrient utilisation by optimising diet digestion, while preserving rumen function.

In this context, the rumen specific yeast S. cerevisiae CNCM I-1077 – demonstrated to improve both nutrient digestion and rumen efficiency – has already been shown to effectively alleviate the toll of heat stress on dairy production and improve rumination behaviour in cows. S. cerevisiae CNCM I-

Fig. 2. Effect of live yeast supplementation on average chewing time of dairy cows (P<0.10).

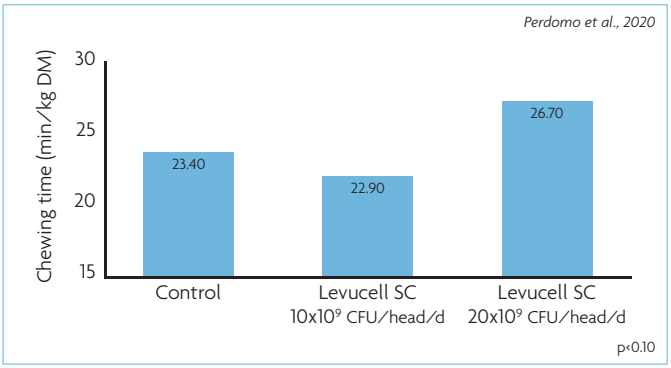
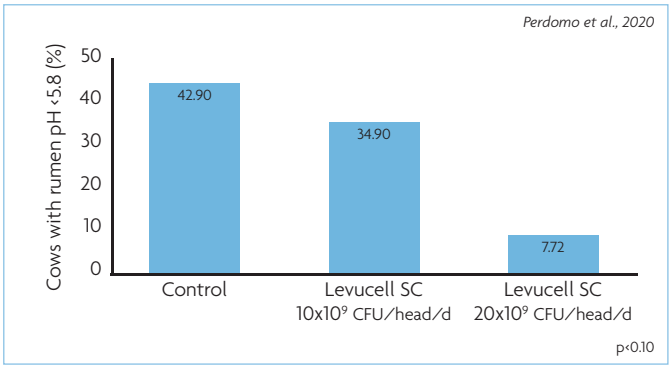


Fig. 3. Effect of live yeast supplementation on the percentage of dairy cows with a rumen pH below 5.8 (SARA risk) (P<0.05).



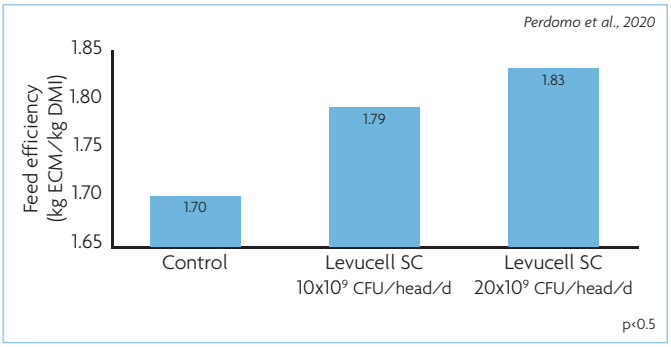


Fig. 4. Effect of live yeast supplementation on dairy cow feed efficiency (P<0.05).

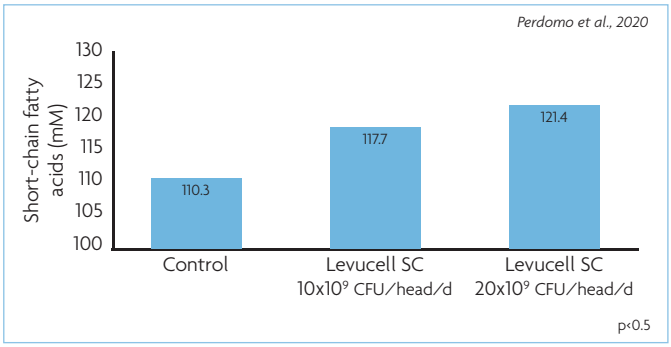


Fig. 5. Effect of live yeast supplementation on SCFA level in rumen fluid (P<0.05).

1077 acts as a rumen modifier. It works by improving the overall rumen environment and function through the control of rumen pH. S. cerevisiae CNCM I-1077 also helps improve animal performance through enhanced fibre degradation.

A recent publication from the University of Florida further demonstrates the live yeast benefits on rumen fermentation profiles and feeding behaviour during heat stress, two parameters which are intimately linked. This is translated into better feed efficiency.

Improved rumen efficiency

The experiment was conducted on lactating Holstein cows fed 40% corn silage, 10% alfalfa hay and concentrate, with 240g/day of sodium bicarbonate. The average daily temperature-humidity index (THI) during the trial was 81 and the lowest point was 75, which is still equivalent to high heat stress conditions. The cows received either no supplement (Control), or S. cerevisiae CNCM I-1077 (Levucell SC) at two different doses: either 10x10^9 CFU/cow/day, or 20x10^9 CFU/cow/day, which is the recommended dose for stressful conditions.

The live yeast supplement led to improved feeding behaviour as shown by:

- Increased chewing activity at the higher dose (Fig. 2).
- Improved rumination behaviour with reduced time between rumination bouts.

Overall, the longer time spent chewing and ruminating had a positive impact on rumen function and helped maintain rumen health. Chewing and ruminating can contribute to increased saliva production, hence the higher buffer effect, as translated into improved rumen pH (+0.34 pH units on average with the higher dose) and reduced risks of SARA (Fig. 3).

This is shown by reduced levels of an inflammation biomarker in the live yeast groups, serum Amyloid A, which is secreted by the liver during inflammatory episodes.

As a result, dairy performance was improved with the supplementation of S. cerevisiae CNCM I-1077 without impairing milk solids (no dilution effect):

- Feed efficiency is improved with the live yeast supplement (Fig. 4), with a higher effect of the higher dose: 7.6% increase of feed efficiency, equivalent to +130g energy-corrected milk/Kg DMI, as compared to the control.
- Energy-corrected milk is increased by 0.9kg/cow/day for the standard dose and 2kg cow/day for the higher dose, as compared to the control.

The authors of the study explained that the improvement in feed efficiency is likely related to improved digestion of fibre, protein, and organic matter.

Indeed, both total tract dry matter (DM) digestibility and fibre (NDF) digestibility are increased with the live yeast supplement.

As a result of the greater fibre digestibility and rumen fermentation, short chain fatty acids (SCFA) production is improved (Fig. 5). This results in higher diet net energy content.

The authors link this improvement to the direct effects of the live yeast on rumen microbial metabolism that favoured a more stable ruminal environment.

In addition, the changes in feeding behaviour with reduced eating rate and increased chewing time per unit of DM and NDF consumed should also favour optimised digestion with reduced acidosis risk.

Conclusion

In conclusion, the study by the University of Florida confirms previous trials showing that under challenging conditions the rumen specific live yeast improves rumen conditions and feeding behaviour.

Here, the scientists went further than looking at performance only and looked at blood biomarker and ruminal fermentation profiles.

These outcomes show that under a context of challenged fermentation due to heat stress, S. cerevisiae CNCM I-1077 still increases feed digestibility through higher fibre degradation (total tract NDF), which results in higher nutrients and energy extraction from the diet.

Benefits for the producers are two-fold: reduced SARA risk and higher ROI due to the improved milk yield.

Benefits are greater with the higher inclusion rate (20x10^{9}CFU/cow/day), which is the recommended dose for stressful conditions, such as heat stress. ■

References are available from the author on request

PRACTICAL RECOMMENDATIONS:

Some simple adaptation measures can be put in place for the herd when the hot months are in sight:

- Check the flow of water tanks, as water supply can be limiting. As temperatures increase, water consumption also rises.
- Check sodium intake. Also check potassium intake.
- Ventilate the building as best as possible by creating a draught. Low openings for refreshing animals are very useful.
- Provide some shade.
- Concentrate the ration to limit the effects of feed intake reduction.
- Implement an early insect repellent strategy. Flies cause a decrease in rumination.
- Feed live yeast in reinforced doses as soon as the ambient temperature increases.
- Ensuring an adequate level of antioxidant solutions (vitamin A and E) is important. Providing a combination of primary antioxidants such as selenium yeast proven for its superior bioavailability is shown to increase the antioxidant status of animals with positive consequences on milk quality.
- Carefully monitor the heating of the ration at the trough. A trial on farmed heifers revealed an 11% decrease in intake with a ration that was heating (Dr Kung, University of Delaware). If the ration heats, try to spread and push it more frequently.
- Distributing the ration at the coolest hours of the day also promotes consumption.