Effect of Live Yeast Culture *Saccharomyces cerevisiae* on Milk Production and some Blood Parameters

Judit Peter Szucs\(^1\), Agnes Suli\(^1\), Tamas Halasz\(^2\), Attila Arany\(^1\), Zoltan Bodor\(^1\)

\(^1\)University of Szeged Faculty of Agriculture, 6800 Hódmezővásárhely Andrassy út 15 Hungary
\(^2\)Hodmezogazda Ltd. 6800 Hódmezővásárhel Serhazter út 2 Hungary

**Abstract**

The aim of this study was to investigate the effect of live yeast culture (*Saccharomyces cerevisiae* Sc 47) on milk yield, milk composition and some blood parameters of dairy cows during their early lactation on farm conditions. The live yeast culture was given in the diet of heifers and cows (5 g day\(^{-1}\) solid Actisaf) for 14 days before calving and exclusively for the treated cows 12 g day\(^{-1}\) dissolved in 500 ml of water, during 14 days after calving. The experiment took until 100th day of lactation on farm conditions. Yeast culture supplementation was the most effective for the performance of primiparous cows: It was advantageous for blood plasma parameters: decreased the beta-hydroxy butyrate (BHB) content and free fatty acids (FFA) which indicated the protection of the animals against ketosis or other metabolic disorders. Increased the daily milk production and the lactose/glucose content of the milk. The live yeast culture increased the lactose content of the milk and decreased the somatic cell count of multiparous cows. The listed parameters were not significant (P<0.05) compare to the results of positive control groups. The applied live yeast culture supplementation did not significant affect for other performance of the cows.

**Keywords:** blood plasma parameters, live yeast culture, milk composition, milk production, *S. cerevisiae*

**1. Introduction**

Use of yeast culture as a dietary supplement has been suggested as a useful tool to stabilize ruminal fermentation based on several in vitro and in vivo research. Yeast culture products contain *Saccharomyces cerevisiae* fermentation metabolites (B vitamins, amino acids, organic acids) and may have a number of effects in the rumen including increased pH altered volatile fatty acids concentrations [1] increased numbers of cellulyotic bacteria [2].

There are several *Saccharomyces cerevisiae* products on the market with different recommendation of dosage and in their manufacturing processes that may have an influence on performance. The direction and strength of the effect of live yeast supplementation on ruminal fermentation and milk production seems not to be dependent on dosage and live cell concentration of the *Saccharomyces cerevisiae* products [3].

The effect of supplemental live yeast products should be considered separately from that of yeast culture products because their mode of action differs. Live yeasts may enhance the rumen environment by scavenging free oxygen, as evidenced by a lower redox potential in the rumen [4]. Others have also shown that live yeast can consume oxygen in vitro [5]. Marden et al. (2008) [6] observed less lactate build up in the rumen, as well as improved fiber digestion, with live yeast supplementation. Also increases in rumen pH and decreases in rumen lactate concentration have been observed with supplemental live yeast [7]. [8] increased average rumen pH and reduced the amount of time that rumen pH was under 5.6 and 6.0 with the addition of live yeast to the diet. In some studies, yeast cultures improved milk
production. The experiment of [9] milk yield increased by 1.5 kg (4.1%) with supplemental live yeast. The aim of Dolezal et al. (2012)[10] was to determine the effect of yeast culture (Saccharomyces cerevisiae SC 47) addition in the diet of dairy cows. Average daily fat corrected milk (FCM) production was higher in the experimental group (38±3.33 vs. 33±1.64), (P<0.05) on sampling days 30 and 60. According to Cakiroglu et al. (2010) [11] may suggest that S. cerevisiae prolongs the peak period of lactation. Whereas Arambel, and Kent, (1990) [12] found a little or no response to yeast cultures for the milk yield and milk composition.

2. Material and methods

The trial was run on large cattle farm conditions with 2 groups of cows according to the administrated dosage of Saccharomyces cerevisiae strain Sc 47 (10^10 CFU g^-1 of Actisaf)

Positive control group have got 5 g day^-1 for 14 days before calving, while experimental, treated group got the same dosage at that time, but their treatment enlarged until 14 days after calving with the dosage of 12 g day^-1. These amount of live yeast culture additive was dissolved in 500 ml of water and were administrated to cows individually once a day.

Both groups started with the same number of cows containing similar primiparous and multiparous. The number of lactation, milk yield and milk composition were considered in case of multiparous cows for selection.

A statistical analysis was conducted in order to verify that the 2 groups were not statistically different (P>0.05) concerning all the criteria selected.

Feeding was realized under the form of group feeding system, feeds mixed in a mixing/weighing/distributing trailer, so the cows were fed the diet with the same composition and nutrition value.

The data of performances were recorded individually until 100 days after calving. The quantity of milk produced was recorded for each cow and at each milking.

An individual milk sample was taken once a month and analyzed in order to determine the fat-, protein-, glucose/lactose content and somatic cell count.

Blood samples were obtained for each cow on 7th and 1st days before expecting calving and 1st and 7th days postpartum, and analysed blood plasma glucose, free fatty acids/non esteryfied fatty acids and beta-hydroxy butyrate content.

The results were compared between treated and positive control groups and primiparous and multiparous groups.

Above them the blood parameters were compared to standard values through the statistical analyses. Differences were considered at a significance level of P<0.05.

3. Results and discussion

Evaluation of the metabolism of cows on the basis of blood parameters

Comparison of the results were between treated and positive control primiparous and multiparous groups and also with the accepted standard values as well.

The reference standard value of different parameters by Praxis Lab 2012

For suitable metabolism of cows should be the following values:

- Blood plasma glucose 2.7 mmol/l
- Beta-hydroxy butyrate (BHB) content 0.85 mmol/l
- Free fatty acids( FFA)/non esteryfied fatty acids (NEFA) 0.6 mmol/l

The blood plasma glucose content of treated and positive control primiparous cows was higher than the standard value (see Table 1.) The beta-hydroxy butyrate (BHB) content was similar in treated and control groups and significantly less than the reference value (see table 2.). The free fatty acid (FFA)/concentration were favourable low in the treated group, but it was higher in the control group and unfortunately improved on the standard value as well.

Concerning the blood components listed above were not significantly differences between the treated and control groups on P<0.05 level.

The blood plasma glucose of multiparous groups was lower and the beta-hydroxy butyrate (BHB) content was higher than in case of primiparous cows.
The free fatty acid concentration was almost the same and close to the standard value in the treated and the control group as well. We could not verify significant differences neither the groups nor the parameters.

When the basis of comparison was the standard value, there was significant difference in case of glucose and BHB content (see Table 1 and 2).

| Table 1. Comparison of blood plasma glucose content of primiparous and multiparous cows with the standard value (2.7 mmol/l) |
|-----------------|----------------|----------|--------|---------|
| Group           | n  | mean±sd mmol/l | CV % | t        | level of sig. |
| Control primiparous | 22 | 3.804±0.359 | 9.4 | 14.423  | 0.000* |
| Control multiparous | 40 | 3.447±0.454 | 13.2 | 15.586  | 0.000* |
| Treated primiparous | 90 | 3.650±0.370 | 10.1 | 16.237  | 0.000* |
| Treated multiparous | 50 | 3.456±0.527 | 15.2 | 10.131  | 0.000* |

*P<0.05

| Table 2. Comparison of blood beta-hydroxy butyrate BHB content of primiparous and multiparous cows with the standard value (0.85 mmol/l) |
|-----------------|----------------|----------|--------|---------|
| Group           | n  | mean±sd mmol/l | CV % | t        | level of sig. |
| Control primiparous | 22 | 0.615±0.293 | 47.6 | -3.763  | 0.001* |
| Control multiparous | 40 | 0.813±0.438 | 53.9 | -0.799  | 0.427 |
| Treated primiparous | 90 | 0.608±0.261 | 42.9 | -5.837  | 0.000* |
| Treated multiparous | 50 | 0.684±0.330 | 48.2 | -3.546  | 0.001* |

*P<0.05

The blood plasma glucose content was between 3.5-4.5 in all groups which was significantly higher (P<0.05) than that of standard 2.7 mmol/l. The average 0.61 mmol/l beta-hydroxy butyrate (BHB) content of the treated primiparous cows was the most favourable while the most unfavourable 0.81 mmol/l value was measured in the multiparous control group.

There was no significant difference of free fatty acid (FFA) content of groups compare to the standard value, and the treated primiparous cows 0.51 mmol/l FFA was lower only than the standard 0.6 mmol/l.

It can be stated that the analysed and introduced blood parameters indicated a suitable metabolite status of the cows on the contrary that the BHB concentrations in general and the FFA content in some case were higher than the standard values. The high glucose concentration of the blood might make balance with them and the cows were able to avoid the metabolic disorders like ketosis.

**Milk yield and milk composition**

The results of milk production confirmed the positive effect of live yeast culture –similar to some international experiences.

The best yield was performed by the treated primiparous cows, but it was not significant compare to control ones. The milk production increased gradually as usual but the tendency of the rising was stronger than in the control group (see Figure 1). The different was 3.2 kg from calving to 30th days, 4.5 kg during 30-60 days and 5.2 kg between 60th -100th days.

There was no important difference between the daily yield of treated and control multiparous cows (see Table 3.)

Milk composition: The milk fat and the milk protein content of treated cows decreased to a less degree but the difference was not significant compare to the control group.

The lactose/glucose content was higher in both primiparous and multiparous treated groups, but the difference was not significant also to the control groups.

The somatic cell counts of primiparous cows were variable during the experimental period. There was a decreasing tendency in the group of treated multiparous cows while there was measured a permanent somatic cell count of control cows. It was realized that the health state of primiparous cows was definitely better than that of multiparous cows.

The nutrition value of the daily ration (TMR) was suitable for the requirements of animals during the dry period and the early lactation as well.
4. Conclusion

The aim of the study was to determine the effect of yeast culture (*Saccharomyces cerevisiae* SC 47) addition in the diet of heifers and cows (5 g day⁻¹ solid Actisaf) for 14 days before calving and exclusively for the treated cows 12 g day⁻¹ during 14 days after calving. The experiment took until 100th day of lactation on farm conditions.

The effect of live yeast culture *Saccharomyces cerevisiae* Sc 47 for the performance of primiparous cows was the following: advantageous for blood plasma parameters, decrease the beta-hydroxy butyrate (BHB) content, decrease free fatty acids (FFA)/non esterified fatty acids (NEFA), indicate the protection of the animals against ketosis or other metabolic disorders increase the daily milk production and the lactose/glucose content of the milk.

The effect of live yeast culture *Saccharomyces cerevisiae* Sc 47 for multiparous cows: increase the lactose content of the milk and decrease the somatic cell count. The listed parameters of treated groups are not significant (P<0.05) compare to the results of positive control groups. Among the examined blood plasma parameters the beta hydroxy butyrate (BHB) content was significant lower (P<0.05) and the glucose content was higher (P<0.05) than the standard values.
References


2. Callaway, E. S. and Martin, S. A., Effects of a Saccharomyces cerevisiae culture on ruminal bacteria that utilize lactate and digest cellulose. J. Dairy Sci., 1997, 80, 2035-2044


11. Cakiroglu, D., Meral, Y., Pekmezci, Y., and Akdag, F., Effects of live yeast culture (Saccharomyces cerevisiae) on milk production and blood lipid levels of jersey cows in early lactation Journal of Animal and Veterinary Advances, 2010, 9 (9), 1370-1374