

# The Effect of Stimulative Substance on the Content of Components in Cow's Milk and the Number of Ciliates in Rumen Fluid

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## Abstract

The aim of this work was to assess the impact of the liquid Biopolym FZT on quality components in cow's milk and the number of microorganisms, respectively ciliates in the rumen fluid. Biopolym was, calibrated by a milking robot, given to dairy cows in a selected breeding in South Bohemian region for a selected period of time. The constituents of milk, there was a slight increase in both values in milk fat, and protein values. The number of ciliates in 1 ml of rumen fluid was higher in the experimental group (241 000) than in the control group (130 000).

**Keywords:** Biopolym, ciliates, fat, proteins, rumen

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## 1. Introduction

Breeding is a constant effort to increase livestock performance and production economics. The most important part is then to provide quality nutrition to dairy cows, enabling them to efficiently convert roughage to milk. Additive substances that favourably influence the characteristics of feed improving performance and resilience of animals also play an important part in cow feed. At present, attempts are made to use substances derived from natural products. Biopolym is hydrolysed brown seaweed, *Ascophyllum nodosum*. It stimulates the development of intestinal micro-flora, microorganisms for gastric digestion, and accelerates the transmission of nutrients into the bloodstream [1]. Milk is a suitable testing medium for the evaluation of development of the energy metabolism in dairy cows [2]. To ensure adequate nutrition for dairy cows and to meet their needs, is a very challenging task [3]. Unless optimum nutrition is ensured, there cannot be any

expectations on good milk production. In assessing the level of nutrition it is not enough to judge only from the content of nutrients in the ration, but also from the reached levels of fermentation processes in rumen. As these actually decide the conversion of nutrients and the level of precursors of milk production, they also the greatest extend determine the resulting milk production and composition [4]. Fat content in milk is the most variable component and can fluctuate in a wide range (up to 3% total) [5]. According to [6] milk fat content is usually around 3.75%. Minor changes occur in protein content and the smallest change is observed in the content of lactose and majority of minerals [4]. The average protein content in milk is around 3.3% [7]. Digestive processes in the rumen are of critical importance for the nutrition of dairy cows and for subsequent commercial properties [8]. The most important processes that take place in the rumen are the fermentation of carbohydrates and the conversion of the less valuable vegetable protein to high quality bacterial one [2]. These chemical and microbial processes in the rumen and the abomasum are caused by bacterial and protozoal activity [9]. Bacteria carry out about

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80% of ruminal metabolism and there is around  $10^{11}$  bacteria in 1 ml of ruminal fluid [9]. Protozoa - ciliates stand for about 20% of ruminal metabolism with about  $10^6$  ciliates in 1 ml of ruminal contents. Class Ciliata predominates among the approximately 150 kinds of reticulum specific protozoa. About 60 species have been identified in cattle. Regularly subclasses Holotricha with flagellas over the entire surface of the body, with genera such as Isotricha and Dasytricha, and Entodiniomorpha with flagellas concentrated in bunches, with genera Diplodinium, Entodinium and Epidinium. These microorganisms are anaerobic, they live without oxygen. During the fermentation process both bacteria and protozoa produce short chain volatile fatty acids, carbon dioxide and methane [9], with final products being fatty acids such as acetic, propionic and butyric [10]. Nutrients from feed transformed by microbial activity form the foundation for cow nutrition and milk precursors [2].

## 2. Materials and methods

The effect of liquid Biopolym FZT on the content of milk constituents, especially fat and protein, and the number of microorganisms in rumen fluid was studied on selected animals kept near the town Písek. This breed has four milking robots Astronaut A3 Dutch from company Lely. The experiment included two groups of cows divided

as experimental and control. The product Biopolym FZT at a dose of 24 ml/cow/day was sprayed on the granules given to the experimental group. This dose was diluted with water in 1:1 ratio. The mixed product was dispensed by the milking robot. In both groups (control and experimental) cows were divided according to lactation (first, second, third and others). Individual lactations groups were compared for milk components (fat, protein) between control and experimental groups. The experimental period lasted four months (December - March). The content of milk components (fat, protein) was obtained from the monthly monitored performance. During this experiment rumen fluid was also collected from both experimental and control groups of Holstein cows kept on a school farm for the purpose of determining the number of ciliates in 1 ml by Bürker chamber count. Rumen fluid sampling was conducted in three phases: before the experiment, during the experiment and after the experiment.

## 3. Results and discussion

When evaluating the content of milk components fat values were higher in the experimental group than in the control group (Table 1). Most of this increase in value (4.31%) resulted in dairy cows in first lactation (Figure 1). The values of protein in the experimental group differed slightly from those in the control group.

**Table 1.** Comparison of the values of fat between the groups during the experimental period

	December	January	February	March
Control group- fat	3.98	3.81	3.65	3.49
Experiment group - fat	3.98	3.93	3.83	3.70

The values of protein in the experimental group differed slightly from those in the control group. The most significant increase in values was again observed in the first lactation (3.58%). Rumen fluid sampling and subsequent counting of ciliates showed increased numbers of ciliates in the experimental group in all three sampling phases, with highest increase seen during the experiment. The number of ciliates in the experimental group was significantly higher than the control group

(Figure 2). The effect of liquid Biopolym FZT showed an increased number of microorganisms and ciliates, as observed by [1], thus supporting the development of microorganisms of gastric digestion. The average protein content in the experimental group after treatment increased slightly (3.47%) since, as [7] states the average protein content in milk is normally 3.3%. According to [9], milk fat content is around 3.75%. The obtained results show an average

higher fat value (3.86%), but it must also be stressed that the fat component is the biggest

variable in milk content and may fluctuate over a wide range (up to 3% absolute) [5].

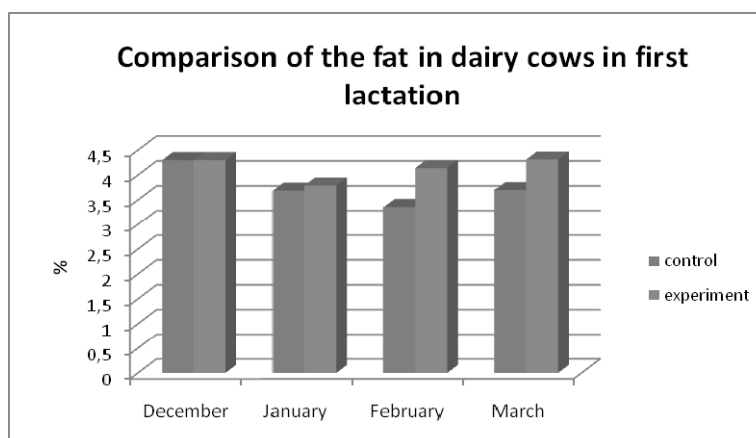


Figure 1. Comparison of the fat in dairy cows in first lactation

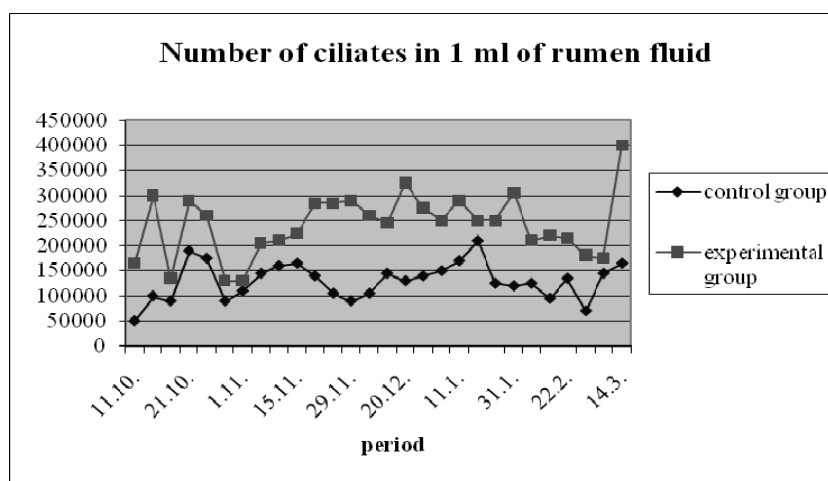


Figure 2. Number of ciliates in 1 ml of rumen fluid

#### 4. Conclusion

It can be concluded that the product Biopolym FZT added to cow feed increased the values of fat and protein components in cow milk. The increase in fat content was especially pronounced. The number of ciliates in rumen fluid after application of liquid Biopolym FZT also increased in all three phases of sampling.

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