

# THE INFLUENCE OF NEW MINERAL - VITAMIN BLOCKS ON COW PRODUCTIVITY AND REPRODUCTIVE ABILITIES

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## ABSTRACT

For the research Latvian Brown breed (LB) cows were selected and assigned by the analogy principle to two treatments groups (n=2x12). During the trial, the dairy cows received the total feed mix (TMR) which consisted, calculating per cow per day of: 20 kg maize silage (45.15% by mass), 16 kg cereal grass - clover silage (36.12% by mass), 2 kg hay (cereal grass - clover) (4.51% by mass), 4 kg concentrated feed mixture (rape oil - cake-barley meal) (9.03% by mass), 2 kg protein concentrate (4.53% by mass), 0.1 kg mineralpremix ViloMin 9/6 (0.22% by mass), 0.1 kg sodium chloride (0.22% by mass) and 0.1 kg sodium carbonate (0.22% by mass). The analysis of the productivity indicators suggests that the milk yield in the experimental group of cows was approximately 0.17 to 1.02 kg ECM per day higher than that in the control group of cows. Feeding cows with the mineral and vitamin blocks has contributed to the improvement of indicators of the reproductive abilities: shortening of the service period by 9 days, the insemination index by 0.1 and the number of pregnant cows from the first insemination by 16%, as compared with the control group. Feeding of the supplementary blocks left a positive effect on the process of parturition of cows.

**KEY WORDS:** mineral substances and vitamin blocks, cow, milk, reproductive abilities

## INTRODUCTION

The need of mineral substances for the animal is known and the difference between the existing in the feed and the required quantity in the cow is reduced by appropriate mineral supplements. However, various factors (many of them have not even been established) affect the need and availability of mineral substances and vitamins. The concentration of mineral substances and vitamins in feed is highly variable and often their quantity is not even determined. In order to resolve this situation, in addition to the staple feed, animals are fed with additives of different types and composition (Lean et al., 2006; Hackbart et al., 2010). Unlike various imported mineral additives used in Latvia, in the block the local raw materials are used at maximum such as feed lime, sapropel, red clay, gypsum, etc., supplemented with minerals that are not found in Latvia in sufficient quantity. The block comprises, in addition to the above mentioned raw materials, the quantity and content of Zn, Mn, Cu, I, Co, Se in both organic and inorganic forms correspond to the quantities of the latest scientific knowledge. The aim of the study: to examine the effect of the new mineral-vitamin blocks on the productivity, milk quality and reproductive abilities of cows.

## MATERIALS AND METHODS

Trials were carried out on the peasant facility "Druvas", Vitinu Parish, Dobeles Municipality. For the research Latvian Brown breed (LB) cows were selected and assigned by the analogy principle to two treatments groups (n=2x12). The trial was carried out from January to May 2013, i.e., 151 days.

The average live weight of cows was 600 kg, the cows of high productivity in the end phase of lactation were included in the experiment with the average yield of 20.33 kg per day, fat content 4.03 % and protein content 3.64 %. During the trial, the dairy cows received the total feed mix (TMR) which consisted, calculating per cow per day of: 20 kg maize silage (45.15%

by mass), 16 kg cereal grass- clover silage (36.12% by mass), 2 kg hay (cereal grass- clover) (4.51% by mass), 4 kg concentrated feed mixture (rape oil-cake-barley meal) (9.03% by mass), 2 kg protein concentrate (4.53% by mass), 0.1kg mineralpremix ViloMin 9/6 (0.22% by mass), 0.1 kg sodium chloride (0.22% by mass) and 0.1 kg sodium carbonate (0.22% by mass).

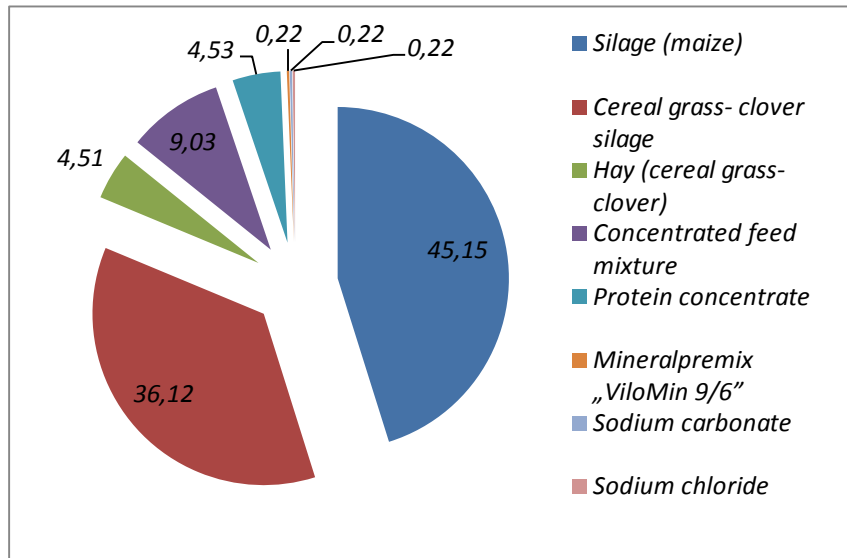


Figure 1. Total feed mix structure, %

The two groups of cows were placed in one cow shed and got a similar feed ration, which was adjusted depending on the level of productivity of the cow (Table 1). The supplementary lick blocks (3.5 kg) were provided for a free animal access and the product consistency was especially tailored for the animal to be able to lick of 250-350 grams per day and thus be able to take all of the necessary elements for the body in optimum quantities. Yield control and registration were carried out once a month, according to the control-day indicators.

The feed ration changed depending on each cow's milk yield and physiological condition, and it was adjusted upon the outcome of control of milk, the dry period and health condition. The parameters characterizing the feed ration correspond to the NRC (USA National Research Council) regulatory requirements for cows with the live weight of 600 kg, milk yield of 24 kg per day and 3.5% of fat content in milk (NRC, 2001).

The forage analyses were made in the accredited Research Laboratory of Agronomic Analyses laboratory of the LUA, according to the: dry matter - Forage Analyses met.2.2.1.1: 1993, crude protein - LVS EN ISO 5983-2: 2009, fiber - ISO 5498: 1981, NDF% - LVS EN ISO 16472: 2006, ADF%, NEL, MJ kg<sup>-1</sup> - LVS EN ISO 13906: 2008, ash - ISO 5984: 2002/Cor 1: 2005, calcium - LVS EN ISO 6869: 2002, phosphorus - ISO 6491: 1998 standart. Milk analyses were made of a/s "Siguldas CMAS" the milk control laboratory using Milkosan equipment according to ISO 9622:1997 standard. The data mathematical processing was made applying the program MS Excel. Credibility of results was tested by t-Test.

Table 1

**Cow feeding during the trials (live weight of cows – 600 kg)**

<b>Feedstuffs, kg</b>	<b>Daily milk yield 24 kg</b>
Cereal grass- clover silage	16
Maize silage	20
Hay (cereal grass- clover)	2.0
Concentrated feed mixture (rape oil-cake- barley meal )	4.0
Protein concentrate	2.0
Mineralpremix „ViloMin 9/6”	0.1
Sodium chloride	0.1
Sodium carbonate	0.1
Total	44.3
Feed ration contains:	
Dry matter, kg	19.21
Crude protein, g	2438
NEL, MJ	130
Calcium, g	107
Phosphorus, g	49

### RESULTS AND DISCUSSION

During the trial, the indicators representing the cow productivity is presented in Table 2. The analysis of the productivity indicators suggests that the milk yield in the experimental group of cows was approximately 0.17 to 1.02 kg ECM per day higher than that in the control group of cows ( $p < 0.05$ ).

Table 2

**Cow productivity during the trials, on average kg FCM (n = 2×12)**

<b>Group</b>	<b>Beginning of the trials</b>	<b>Middle of the trials</b>	<b>End of the trials</b>	<b>±, compared to the beginning</b>
Trial	20.21±0.86	21.54±0.50	23.68±0.81	+3.47
Control	20.38±1.71	21.37±0.99	22.66±0.42	+2.28
±, compared to the control	-0.17	+0.17	+1.02	+1.19

$P < 0.05$

In various sources of literature, many authors indicate that inadequate feeding, especially during the period of dryness and after calving leave impact faster on animal reproduction abilities and health condition than on milk productivity (Trupa, Latvietis, Ruvalds, Strikauska 1999; Trupa, 2000; Trupa., Latvietis, 2000; O'Donoghue, Boland, 2002).

Analysing how mineral and vitamin blocks feeding has affected the cow reproduction indicators, we see that the service period (duration of non-pregnancy) in the trial group is about 9 days shorter, compared to the control group ( $p < 0.05$ ). About the cow reproduction abilities, we can also judge from the insemination index changes (Table 3). We see that in both groups of cows, the number of inseminations until the pregnancy was optimum within the recommended limits, but by 0.1 less in the trial group (norm  $< 1.8$ ). The fertilization percentage from the first insemination was high in the trial group - 60% when compared with the control group (the optimum limit 45-60%).

Table 3

**Some average reproductive indices of cows during the trial (n = 2×12)**

Group	Service period, days	Insemination index	Number of pregnant cows from the first insemination, %
Trial	119 $\pm$ 22	1.4 $\pm$ 0.51	60
Control	128 $\pm$ 16	1.5 $\pm$ 0.52	44
$\pm$ , compared to the control	-9	-0.1	+16

During the trial, the effect of mineral and vitamin blocks was also observed in the animal calving process, which is characterized by Table 4. During the study, such cows were purposefully chosen, that should calve in the month of April and May and that should as far as possible be with closer lactations. In the trial group, there were chosen: two cows of the 2<sup>nd</sup> lactation, and two cows of the 1<sup>st</sup> lactation, while in the control group - two cows of the 2<sup>nd</sup> lactation and two cows of the 1<sup>st</sup> lactation.

Table 4

**Indices of the parturition process in the groups of cows**

Group	Count	Length of delivery, h	Removal of the fetal blanket, h
Trial	4	$\pm$ 1	4-5
Control	4	3-4	6-8

Feeding of the supplementary blocks left a positive effect on the process of parturition of cows. Typical is the fact that the length of parturition for the trial group of cows on average was  $\pm$  1 hour, but the separation of the fetal blanket occurred within 4-5 hours after the birth of the calf. In turn, for the control group of cows the length of parturition on average was 3 - 4 hours, but for two cows from them, the separation of the fetal blanket occurred 6 - 8 hours after calving, but in two cases help of an official veterinarian was necessary in this process. However, in most cases it is found that the animal's reproductive ability is affected not by one single element, but by a collection of many trace elements through the metabolic processes of the body. Therefore, for a normal provision of the cow's health, productivity and reproduction, all the trace elements are necessary (Gerloff., Morrow, 1986; Andrieu, 2007). The milk sale and feed cost summary records for the trial that lasted 151 days show that the economic efficiency of mineral vitamin blocks feeding has been positive. Each group of cows, which was fed with complementary blocks, gave on average 2.94 Euro higher milk output than the cows in the control group.

**CONCLUSION**

1. Getting mineral-vitamin feed supplementation blocks, with the trial group of cows, the milk yield increased by 0.17 to 1.02 kg ECM per day, compared with the control group ( $p < 0.05$ ).
2. Feeding cows with the mineral-vitamin feed supplementation blocks has contributed to the improvement of indicators of the reproductive abilities: shortening of the service period by 9 days, the insemination index by 0.1 and the number of pregnant cows from the first insemination by 16%, as compared with the control group.

3. The parturition process of the cows was positively affected by the feeding of the supplementation blocks. In the trial group of cows, the length of delivery averaged  $\pm$  1 hour, but the separation of the fetal blanket occurred within 4-5 hours after the birth of the calf, but for the control group of cows the length of parturition on average was 3 - 4 hours and the separation of the fetal blanket occurred 6 - 8 hours after calving.
4. Feeding of the feed supplementation blocks to dairy cows was economically beneficial. Each cow of the trial group gave an average of 2.94 Euros higher production of milk than their counterparts in the control group.

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