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# USE OF A PREMIX FOR DAIRY COWS DURING THE FIRST PERIOD OF LACTATION

# EFICACITATEA PREMIXULUI PENTRU VACILE DE LAPTE ÎN PRIMA PERIOADĂ DE LACTAȚIE

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*This work includes scientific investigations of the new recipe of a premix for the dairy cows in the first period of lactation. Use of a mineral-vitamin premix has positive influence on milk performance through the increasing the daily milk yield from 18 to 20 kg or on 2.5 kg per cow, the contents of a protein in milk from 2.5 to 2,65%, casein in milk from 1.93 to 2.07%, mineral matter from 0.77 to 0.82%. Economic effect per cow in the trial group has made 404.1 lei in comparison with the control group.*
**Key words:** dairy cow, mineral-vitamin premix

## Introduction

Proper feeding of cows with milk performance above average during the first period of a lactation represents a serious problem which is necessary to be scientifically argued. To produce high milk yield cows need receipts with the high level of energy and protein. Therefore, it is the need in increased level of the concentrated fodder in the receipt structure with the increased contents of energy and proteine. However, it is known, that increase of concentrates level in a diet leads to increase of acidity of the stomach medium in ruminants. Thus the rumen microflora is being suppressed and it leads to reduction of feed digestibility and reproduction function.

This problem can be partially resolved by using of buffer substances which help to reduce pH to normal ratio. Other aspect consists that for cows with high dairy performance it is not enough to balance a diet only under the contents of crude and digestible protein, but also on such important amino acid as methionine, macro- and micro elements, especially selenium which plays the important role as an antioxidant acting very effectively in a combination with vitamin E.

Considering the above mentioned it was offered to develop and approve the recipe of mineral-and-vitamin premix for lactating cows of the first lactation period.

## Materials and Methods

The receipt of the premix was developed in accordance with the macro- and micro elements and vitamins in feed and with the specific requirements for the milking cows in the first lactation period.

Approving of the premix in the experience was implemented in the conditions of the Institute of Animal Husbandry and Veterinary Medicine dairy farm and with this aim two groups of cows have been formed which have been entered into the experiment immediately after calving. At formation of groups of cows were considered the following: performance for the previous lactation, fat contents in milk, age of animals, and state of health.

The difference in feeding between groups consisted that animals from experimental group II in addition to the basic diet (BD) received mineral-and-vitamin premix in a proportion of 3% from the concentrate fodder.

Voluminous forages (hay, silo) were distributed in equal quantity, and their amount was determined on the average on group by weighing over a experiment period of every 10 days.

Records of milk performance parameters were conducted by the control milking individually per cow every 10 days.

Indices of milk quality were determined once per month and biochemical and morphological blood indices two times for the period of the experiment.

At the same time parallel to the monitoring of milk performance it were sampled blood tests in the beginning of the experiment (14-21 days after calving) and after 45 days. In the blood it were determined: hematocrit, quantity of the haemoglobin, quantity of red blood cells and leukocytes – according to the widely used methods of haematologic investigations. In the blood plasma it were determined quantity of calcium, phosphorus, total amount of the proteins and albumine by the method of the biochemical analyses (Stat fax 1904 Plus), it were applied special Keets (Flitech, France). Determining of the dialdehide of the malonic acid (DAM) in the blood plasm and red blood cells was conducted according to the method proposed by Korobeynikov E.N. (5).

## Results and Discussions

The new receipt of mineral-and-vitamin premix for the dairy cows of the first period of lactation contained of (per 1 kg): vitamin A – 830 th. IU, vitamin D3 – 85 th. IU, vitamin E – 665 IU, copper – 270 mg, zinc – 2527 mg, manganese – 750 mg, cobalt – 496 mg, iodine – 53.5 mg, selenium – 20.3 mg, methionine – 165 g, buffer substances-652g.

Developed receipt was distinguished from the known receipt due to the additional quantiity of methionine, selenium and buffer substances.

Use of this new developed premix for the cow feeding showed positive influence on the balance of the ration as for contents of miro elements, such as

copper, zinc, cobalt, manganese, iodine, selenium and vitamins A and E, resulted to the increasing of the animals milk performance. While milk yield in control group of cows during the experiment was 1623.6 kg per cow, in the experimental group it amounted 1846.5 kg of milk per cow or 13.7% more. Milk yield converted to 4% butter-fat was higher in the experimental group too: 1792.5 against 1625.3 kg or 10.3% more (fig. 1). Daily milk yield was more by 2.5 kg (18.0 against 20.5 kg), and converted to 4% butter-fat by 1.9 kg (18.0 against 19.9 kg). At the same time specific consumption was slightly lower in the experimental group in which for production of 1 kg of milk it were spent 0.87 IU against 0.91 IU in the control group.

It should be noted that in the beginning of the experiment (I decade) milk performance in both groups was practically equal (15.8 and 16.0 kg), whereas with the increase of experiment duration cows from the experimental group had permanently higher daily milk yield (fig. 1, 2, 3, 4).

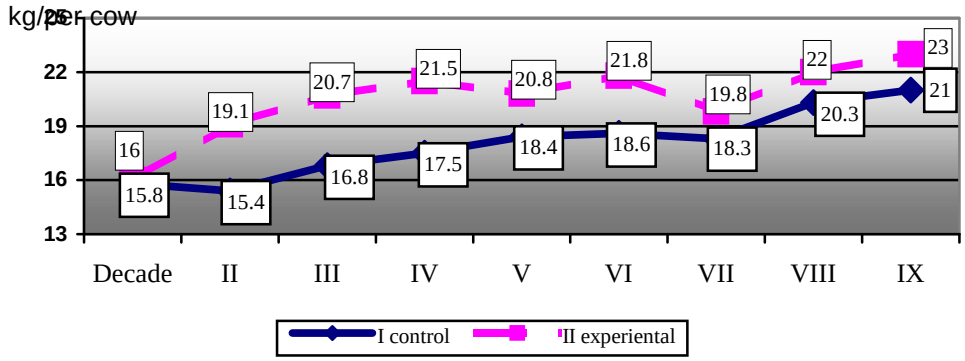


Fig. 1. Dynamics of the whole milk yield per cow for experiment period

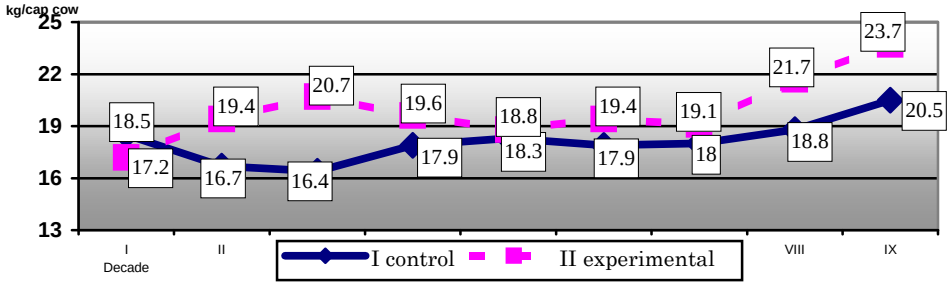


Fig. 2. Dynamics of the milk yield converted to 4% butter-fat per cow for experiment period.

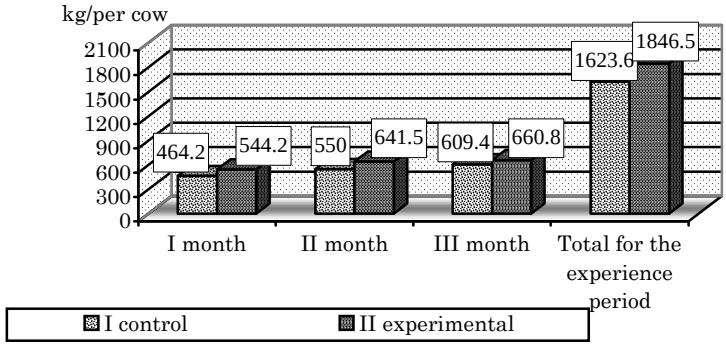


Fig. 3. Whole milk yield.

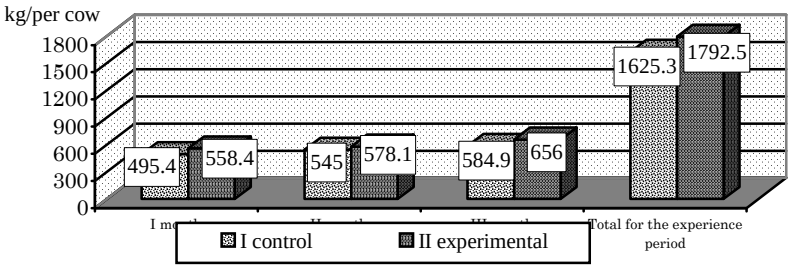


Fig. 4. Milk yield converted to 4% butter-fat

Data presented in figures 1-4 sufficiently expressive demonstrate efficiency of the new vitamin-and-mineral premix receipt utilization of the diets for cows in experimental group.

Utilization of of the premix had positive impact on the biochemical indices of milk composition too (tab. 1).

Table 1

**Dynamics of the milk composition indexes**

| Group | Density, g/cm$^3$ | Protein, % | Casein, % | Lactose, % | Mineral matter, % | Dry matter, % |
|---|---|---|---|---|---|---|
| I month | | | | | | |
| I control | 1.0263 | 2.85±0.21 | 2.18±0.15 | 4.17±0.07 | 0.76±0.08 | 12.30±0.18 |
| II experimental | 1.0270 | 2.52±0.56 | 1.96±0.43 | 4.20±0.04 | 0.92±0.16 | 12.39±0.99 |
| II month | | | | | | |
| I control | 1.0266 | 2.32±0.24 | 1.81±0.19 | 4.19±0.03 | 0.73±0.09 | 11.89±0.17 |

| Group | Density, g/cm$^3$ | Protein, % | Casein, % | Lactose, % | Mineral matter, % | Dry matter, % |
|---|---|---|---|---|---|---|
| I month | | | | | | |
| II experimental | 1.0274 | 2.28±0.21 | 1.78±0.16 | 4.26±0.06 | 0.78±0.08 | 11.95±0.28 |
| III month | | | | | | |
| I control | 1.0262 | 2.33±0.28 | 1.81±0.21 | 4.17±0.08 | 0.82±0.27 | 12.12±0.86 |
| II experimental | 1.0275 | 3.16±0.35 | 2.46±0.27 | 4.36±0.04 | 0.76±0.12 | 12.72±0.32 |
| Average during experiment period | | | | | | |
| I control | 1.026 | 2.50±0.21 | 1.93±0.15 | 4.17±0.03 | 0.77±0.03 | 12.10±0.15 |
| II experimental | 1.027 | 2.65±0.32 | 2.07±0.25 | 4.27±0.06 | 0.82±0.06 | 12.35±0.27 |

Thus, though density and quantity of the dry matter during the experiment remained practically on the same level, quantity of the mineral matter increased from 0.77 in the control group to 0.82 in the experimental group or in 6.6% on the average. Protein content had tendency to increase in the experimental group up to 6.0% in comparison with the control group.

Casein and lactose content indices were also higher in the milk obtained from the cows of the experimental group - 2.07 against 1.93 and 4.28 against 4.17 respectively to casein and lactose.

As casein content in milk influence on technological parameters for milk processing, increasing of the casein content to 7.3% of this factor in milk of cows from the experimental group is very important.

During the experiment blood sampling for the assay were done (Table 2).

With respect to haematologic indices it should be mentioned that average and individual indices varied in the limits of physiological norms. It was observed tendency of their retention between the average and maximal level among observed, what reflect in fact that blood indices were satisfactory.

Quantity of hemoglobin and number of red blood cells undergo changes in the period of the investigations. So quantity of hemoglobin in the second investigation reduced in the experimental group at 6.45%, and in the control group at 18.3%. Dynamics of red blood cells showed increase of their number in the experimental group at 4.48% and in control group at 4.86%.

Table 2

**Blood indices**

| Indices | Investigation | Group | |
|---|---|---|---|
| | | Control | Experimental |
| Hematocrit **(%)** | 1<br>2 | 36.3 ± 3.75<br>35.0 ± 2.0 | 33.3 ± 2.2<br>35.0 ± 2.0 |
| Haemoglobin **(g/L)** | 1<br>2 | 184.2 ± 7.06<br>150.4 ± 9.5 | 171.1 ± 9.33<br>153.80 ± 7.2 |
| Red blood cells **(·$10^{12}$/L)** | 1<br>2 | 7.2 ± 0.08<br>7.6 ± 0.11 | 7.4 ± 0.18<br>7.58 ± 0.08 |
| Leukocyte **(·$10^{9}$/L)** | 1<br>2 | 11.1 ± 1.43<br>12.6 ± 0.74 | 13.3 ± 1.83<br>12.1 ± 0.6 |

Mean values of leukocytes indices did not exceed adequate limits. Analyses of the individual data obtained from some cows showed insignificant leucocytosis which could be caused by the remote effect of different aftereffects of illness in this period.

Biochemical indices represented in the table 3 reflect satisfactory proteins and mineral matter metabolism in both groups. Total amount of proteins and albumins increased in both investigations in the control group at 6.8% and 7.9%, in the experimental group at 2.44 and 5.5% respectively. Level of calcium and phosphorus in blood plasma reduced in the control group at 21.3% and 30.7%, while in the experimental group calcium reduced at 3.2%, and phosphorus increased at 20.6% respectively.

*Table 3*

**Biochemical indices**

| Indices | Investigation | Group | |
|---|---|---|---|
| | | Control | Experimental |
| Proteins, total **(g/L)** | 1<br>2 | 79.1 ± 6.17<br>84.6 ± 1.97 | 75.2 ± 2.6<br>77.04 ± 6.1 |
| Albumine **(g/L)** | 1<br>2 | 33.76 ± 2.35<br>36.6 ± 2.35 | 35.1 ± 0.6<br>37.02 ± 1.4 |
| Calcium **(mmol/L)** | 1<br>2 | 2.16 ± 0.48<br>2.35 ± 0.55 | 2.5 ± 0.84<br>2.42 ± 0.7 |
| Phosphorus **(mmol/L)** | 1<br>2 | 1.89 ± 0.13<br>2.4 ± 0.18 | 2.04 ± 0.08<br>2.46 ± 0.37 |

In spite of average level of calcium remained in the adequate limits, individual indices of some cows were lower of permissible limits.

Dynamics of malonic dialdehyde (DAM) – derivation of lipids peroxidation - showed positive tendency in the experimental group. In plasma

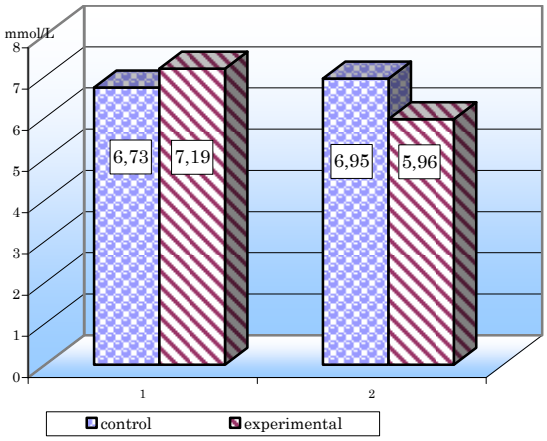


Fig. 5. DAM content in plasma

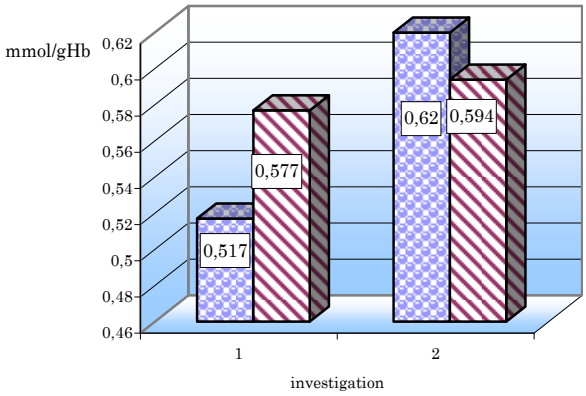


Fig. 6. DAM content in red blood cells

DAM amount reduced in the experimental group to 7.2% in the first investigation while in the control group to 3.2%. With respect to red blood cells it was determined increasing of DAM in the experimental group at 2.9%, while in the control group at 19.9% in comparison with the initial indices. At the same time level of DAM in plasma made up 4.3%, while red blood cells in the experimental

group were at 4.2% fewer in experimental group in comparison with the control group.

On the assumption of above, we can assume that including to the premix composition of vitamin E and selenium – substances having antioxidant effect – had impact on peroxidation processes expressed in accumulation of lower quantity of DAM and red blood cells in the experimental group.

It should be mentioned as well that use of vitamin-mineral premix in the diets for dairy cows of the first period of lactation led to positive influence and regards to reproduction indices this led to reduction of reproduction period, notably to reducing of period from the calving to the first insemination from 182 days in the control group to 97 days in the experimental group. On the end of the experiment in the experimental group it were detected 60% cows in calf while in the control group this index was sufficiently lower.

## Conclusions

1. Use of the new premix receipt has positive effect on milk performance which for the period of the experiment (90 days) increased from 1623.6 kg in the control group to 1846,5 kg of milk per cow in the experimental group or in 13.7%.

2. Use of the premix has positive effect on indices of qualitative indices of milk composition expressed in increasing of proteins amount from 2.5 to 2.65%, casein from 1.93 to 2.07%, mineral matter from 0.77 to 0.82%.

3. Due to including in the premix composition of oligominerals copper, zinc, cobalt, manganese, iodine and vitamin E for feeding cows in the experimental group it were determined the positive tendency in the haemoglobin dynamics and in processes of lipids peroxidation.

4. Indices of cows reproduction in the experimental group were slightly preferable in comparison with the control group. In the experimental group 60% of cows had indices of first insemination in two time lower (97 against 182 days).

5. Calculation of economic effect showed the commercialization of milk from cows from experimental group made up 5864,4 lei in comparison with 5460.3 lei in the control group what made up additional efficiency in 404.1 lei.

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