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ТЕХНОЛОГІЯ ВИРОБНИЦТВА ТА ПЕРЕРОБКИ ПРОДУКЦІЇ ТВАРИННИЦТВА

**ANIMAL HUSBANDRY PRODUCTS
PRODUCTION AND PROCESSING**



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**ТЕХНОЛОГІЯ ВИРОБНИЦТВА
І ПЕРЕРОБКИ ПРОДУКЦІЇ
ТВАРИННИЦТВА**

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Effect of mineral-vitamin premix on milk productivity and hematological blood parameters of cows

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The application of specialized premixes containing all the necessary elements for effective ration enrichment is the main direction of normalizing the mineral and vitamin nutrition of cows. The introduction of biologically active substances into animal diets in the form of premixes helps to increase the efficiency and productivity of the feed application.

The purpose of our study was to investigate the effect of the mineral-vitamin premix Biomix on milk productivity and hematological blood parameters of cows. The experiment was carried out on Ukrainian Black-and-White Dairy cows. Two groups were formed for experiment; each group contains 10 heads. The animals of the experimental group were fed by premix Biomix at the rate of 50 g per 1 head per day as a part of the main diet. The control group was fed by the equivalent amount of monocalcium phosphate.

The introduction of the Biomix premix into the diet of the research group made it possible to eliminate the deficiency of phosphorus, copper, zinc, cobalt, and iodine, and to bring the level of vitamin D₃ to normal.

Optimizing of the cows' mineral and vitamin nutrition through the application of Biomix premix ensured the dairy productivity and the milk quality increase. The average daily milk yield of the experimental cows increased by 5.9 % for 90 experimental days. The fat and protein content increased by 0.05 and 0.07 %, respectively. Cows of the experimental group surpassed the control ones by 153.1 kg in gross milk yield, and by 1.71 kg in average daily yield in terms of 4 percent milk; it is 7.4 % relative to the control (P<0.05). The level of dry matter, calcium, phosphorus, and lactose have increased in milk; its total energy value has also increased.

Feed consumption per 1 kg of milk decreased by 5.1 % and 5.4 % in terms of energy and digestible protein.

Feeding Biomix premix did not have a negative effect on hematological changes in the body. Morphological and biochemical blood parameters of cows corresponded to physiological norms. An increase in total protein (P<0.95), hemoglobin (P<0.95), and creatinine (P<0.95) was noted. There was a tendency to increase the level of erythrocytes, glucose, urea, and calcium in the blood.

Key words: cows, premix Biomix, vitamins, minerals, milk, fat, protein, blood, erythrocytes, hemoglobin.

Problem statement and analysis of recent research. The practical experience of cattle breeding shows the relationship between biologically complete feeding of cows, metabolic processes in their bodies, milk productivity and quality, and preservation of reproductive functions, health and viability of newborn calves. Realization of

the genetic potential of milk productivity can be achieved only by providing cows with the necessary amount of energy, nutrients and biologically active substances in accordance with physiological needs [1, 2].

The key to achieving the feed maximum efficiency is the creation of a feeding system that

would provide the most optimal conditions for the intensification of anabolism processes. The vitamin-mineral factor occupies one of the leading places because it affects energy, protein, carbohydrate, and lipid metabolism and participates in almost all links of decay and synthesis, redox reactions as catalysts [3, 4].

The level of providing livestock with mineral elements and vitamins at the farms of the forest-steppe zone of Ukraine is characterized by its shortage in water, soil, and feed. Therefore, cattle rations without the inclusion of special feed additives do not provide full mineral and vitamin nutrition [5].

Due attention should be paid to the mineral nutrition of cows because trace elements take an active part in the metabolism and affect the conversion of feed nutrients into livestock products [6]. According to scientific publications [7–9], a lack, excess or violation of the ratio of trace elements in the body of cows, metabolic processes are first disrupted, then various diseases develop, the productivity of animals decreases and their life expectancy decreases, too. The optimal content and ratio of trace elements in the tissues lead to a stable metabolism ensuring a normal state of health and high productivity.

The application of specialized premixes is an effective option for normalizing the mineral nutrition of cows, because premixes contain all the necessary elements for effective ration enrichment [10, 11]. Premixes are dosed to coarse and juicy feeds, enriching the diet with minerals and vitamins [12].

It has been proven that the complex introduction of biologically active substances into animal diets in the form of premixes balances and contributes to increasing the efficiency of feed application. Therefore, the productivity of animals, their state of health and reproductive capacity increases [13, 14].

The action of premixes is due to the presence of vitamins (A, D₃, E, K, C, group B), trace elements (iron, manganese, copper, cobalt, iodine, and selenium), macroelements (magnesium, and sulfur), amino acids, enzymes, antioxidants, antimicrobial drugs in optimal amounts and ratios [15, 16].

Mineral compounds can be introduced into premixes and compound feeds in inorganic and organic form. Inorganic forms such as oxides or sulfates are cheap and available. However, they have low bioavailability due to the antagonism of some metals in the intestine because they limit their assimilation. In organic forms, the trace element is chemically linked to amino acids or to small peptides. These minerals are much more available and

bioactive. They interact less than inorganic ones in the digestion processes easily reaching the intestinal wall where they are absorbed into the blood. Organic minerals were created to maximize biological availability, the basis of their production technology is the process of chelates formation [17, 18]. Trace elements, in particular zinc, copper, manganese, associated with amino acids, have the same properties as natural organic trace elements found in plants.

Lots of studies have proven better assimilation of trace elements from their chelated compounds than from inorganic forms. Milk productivity increased by 14.9 % when using a premix with chelated forms of such trace elements as zinc, manganese, cobalt in the diet of dairy cows for the first 100 days of lactation. The increase in average daily milk yield, compared to the control, was 9.82 % due to the use of zinc, manganese, cobalt and copper sulfates in the premix [19].

The use of premixes increased feed digestibility, the balance of nitrogen, manganese, and cobalt [20, 21, 22, 23]. The experimental cows gave birth better and there were no cases of placental retention [24].

In the summer, the introduction of mineral premix Intermix into the diet of dairy cows had a positive effect on the processes of the intensity of ruminal metabolism, as evidenced by the increase in the concentration of raw biomass of microflora and volatile fatty acids [25].

The range of premixes, mineral and vitamin supplements is increasing every year due to the introduction of new biologically active additives into their composition, i.e., prebiotics, probiotics, and phytobiotics. Phyto-genic supplements include extracts and essential oils obtained from herbs or spices. The presence of carotenoids, flavonoids, and steroid glycosides has a nutritional effect on the digestion and assimilation of feed nutrients.

This type of mineral and vitamin concentrates includes premix Biomix. It contains oregano extract; its biological effect is to inhibit pathogenic microflora and stimulate the development of lactobacilli.

The purpose of our study was to investigate the effect of the mineral-vitamin premix Biomix on milk productivity and hematological blood parameters of cows.

Material and methods of research. The scientific experiment was conducted to study the effectiveness of the mineral-vitamin premix Biomix-application in feeding dairy cows in the conditions of the Zoloty Kolos farm in the Vinnytsia district. Two groups of Ukrainian Black-and-White Dairy cows according were formed, each group had 10 cows (Table 1). Cows of 2–3 lactations were se-

lected for the experiment in the third-fourth week after calving with a weight of about 600 kg, the average daily yield of milk of natural fat content was 25 kg with a fat content of 3.67 %.

The animals were fed the main ration fodder twice a day, in particular, bulk fodder was fed in the form of a feed mixture, concentrated fodder was fed twice a day during morning and evening milking. The control group received monocalcium phosphate (50 g/head per day) as part of the main diet. The monocalcium phosphate was replaced by an equivalent amount of the premix Biomix Standard in the diet of the experimental group.

The studied mineral-vitamin complex included such fat-soluble vitamins as 830 thousand IU/1kg of retinol (A), 220 thousand IU/1kg of calciferol (D₃), 11,600 mg of tocopherol; macroelements (18 % of calcium and 37 % of phosphorus) and such trace elements as 9,000 mg of zinc, 6,000 mg of manganese, 2,000 mg of copper, 120 g of cobalt, 300 g of iodine, 60 mg of selenium, antioxidants, andorigano extract. Wheat bran, saponite flour,

chalk were used as fillers. The total energy content of 1 kg of premix was 7.2 MJ of exchangeable energy and 79 g of crude protein.

The calculation of milk productivity was carried out with the help of the Ekomilk ultrasonic analyzer based on the results of the decennial control milking.

Blood samples were taken from 5 animals from each group to analyze hematological indicators. Blood was collected from the jugular vein in the morning in 0.5 hours before feeding and 2 hours after feeding. Blood parameters (morphological and biochemical) were studied according to the methods of the Institute of Animal Biology of the National Academy of Sciences (Vlizlo et al. 2012).

Results and discussion. The introduction of Biomix premix in the amount of 50 g to the diet of the experimental group made it possible to balance the mineral and vitamin composition of the diet. The nutritional value of the diets of the control and experimental groups are shown in Table 2.

Table 1 – Feeding patters

Group	Number of animals, heads	Cows feeding	
		Egalitarian, 15 days	Main, 90 days
1 – control	10	BD	BD
2 – experimental	10	BD	BD + premix Biomix (50g/head per day)

Table 2 – Nutritional value of the control and experimental groups diets

Indicator	Animal group		± control	According to the norm
	control	experimental		
Dry matter, g	21.8	21.84	0.04	20.5
Exchange energy, MJ	200.14	200.51	0.37	200
EFU	20.02	20.05	0.03	20.0
Crude protein, g	2668.2	2672.8	4.6	2810
Digestive protein, g	1830.3	1834.2	3.9	1825
Crude fiber, g	4542.8	4546.3	3.5	4510
Crude fat, g	640.5	641.9	1.4	625
Starch, g	2674.6	2674.6	–	2740
Sugar, g	1412.4	1214.3	3.9	1825
Calcium, g	121.86	125.75	0.49	126
Phosphorus, g	73.22	84.62	7.4	85
Magnesium, g	36.17	36.38	0.31	32
Potassium, g	284.18	284.30	0.12	132
Sulfur, g	34.01	34.10	0.09	42
Ferum, mg	4318.5	4327.0	17	1390
Cuprum, mg	100.3	200.8	100.5	175
Zinc, mg	562.7	1122.7	460	1130
Cobalt, mg	10.22	16.22	6.0	13.9
Manganese, mg	847.83	1247.57	399.7	1130
Iodine, mg	6.05	21.05	15.0	15.7
Carotene, mg	837.49	837.49	–	785
Vitamin E, mg	2075.2	2655.2	680	695
Vitamin D, thousand IU	4.67	15.67	11.0	17.4

The introduction of the Biomix premix into the diet of the research group made it possible to eliminate the deficiency of phosphorus, copper, zinc, cobalt, and iodine, and to bring the level of vitamin D₃ to normal (15.67 thousand IU against 17.4). The deficiency of phosphorus was 13.9 %, copper was 42.8 %, zinc was 50.2 %, cobalt was 26.5 %, manganese was 25 %, iodine was 61.5 %, vitamin D₃ was 73.2 % in the diet of the control group. All indicators are within the normal range, the deviation does not exceed 1 % except for vitamin D₃, its deficiency was at the level of 4.5 % in the experimental group.

It has been established that optimizing the mineral and vitamin nutrition of cows by Biomix premix ensures an increase in milk productivity of cows. Data on the productivity of cows and indicators of milk quality premix are shown in Table 3.

The milk yield (natural fat content) of the experimental cows was 2412.5 kg for 90 days of the main period. It is by 135 kg (5.9 %) more than the productivity of the control cows of the group. The average daily yield of the experimental cows fed the Biomix premix increased by 1.5 kg (P<0.05).

The share of fat and protein in milk increased by 0.05 % and 0.07 %, but the difference is unlikely.

In terms of 4.0 % milk, the cows of the experimental group exceeded their counterparts from the control group by 153.1 kg in gross milk yield, and by 1.71 kg in average daily milk yield, it is 7.4 % relative to the control (P<0,05).

The amount of milk fat was higher in the experimental group by 6.12 kg or 7.38 %. The cows of the experimental group surpassed the control animals by 5.9 kg and 8.3 % in terms of milk protein obtained.

The chemical composition of the experimental cows' milk is presented in Table 4.

According to Table 4, the higher energy value of milk was noted in the experimental group. Its indicator exceeds the control group by 0.7 %. The density of milk depends on the temperature and the content of its components. In the experimental group this indicator did not differ significantly and was in the range of 29.15-29.40 A.

Table 3 – Milk productivity of cows, M±m, n=10

Indicator	Group	
	control	experimental
Gross yield for the accounting period (90 days) of the experiment, kg	2277.4±45.49	2412.5±34.65*
Average daily yield of milk with natural fat content, kg	25.3±0.43	26.8±0.36*
Mass fraction of fat, %	3.64±0.04	3.69±0.03
Amount of milk fat, kg	82.90±1.08	89.02±1.44*
Mass fraction of protein, %	3.12±0.05	3.19±0.06
Amount of milk protein, kg	71.06±1.52	76.96±2.31
Milk yield for 90 days of the accounting period in terms of 4 % fat milk, kg	2072.4 ± 43.18	2225.5 ± 13.42*
Average daily yield of 4 % fat milk, kg	23.02 ± 0.41	24.73 ± 0.35*

* – P<005.

Table 4 – Chemical composition and quality indicators of milk, M±m, n=10

Indicator	Group	
	control	experimental
Energy value, MJ	2.85±0.07	2.87±0.06
Density, A	29.15±0.37	29.40±0.35
Acidity, T	17.4±0.02	17.6±0.03
MSNF, %	8.85±0.10	8.91±0.10
Dry matter, %	12.67±0.19	12.78±0.18
Lactose, %	4.60±0.05	4.64±0.05
Ash, %	0.69±0.03	0.71 ± 0.03
Calcium, g	1.25±0.01	1.26±0.02
Phosphorus, g	1.03±0.03	1.04±0.02

Milk solids include all components determining its nutritional and technological properties. The content of dry matter in the milk of the experimental cows was by 0,9 % higher than that of the control animals. The share of dry skimmed milk residue is also higher by 0.7 % in the experimental group than in the control one.

The level of lactose was 4.64 % in the milk of the experimental group cows, it is by 0.90 % more than in the control group. Milk sugar is part of enzymes-coenzymes involved in the synthesis of proteins, fats, vitamins, and it is necessary for normal intracellular metabolism in the body.

The calcium content was higher by 0.8 % and phosphorus content was higher by 1.0 % in the milk of the experimental cows than the control ones. According to the indicators of titrated acidity and density, the milk of cows of both groups

meets the requirements of the first class, no deviations between the groups were recorded.

The consumption of nutrients for milk production is an important indicator for evaluating the effectiveness of feed nutrients utilization (Table 5).

Thus, the experimental cows had a higher feed consumption. They spent 0.75 EFU per 1 kg of milk, it is by 5.1 % lower than in the control group, and it is by 3.9 g or 5.4 % lower than in the control group in terms of digestible protein.

According to the research results on the morphological and biochemical composition of the blood of the experimental and control cows conducted on the 30th day of the experiment, the hematological changes in the animals' bodies after the application of the mineral-vitamin premix had no pathological changes and were within physiological limits (Table 6).

Table 5 – Nutrient consumption per 1 kg of milk

Indicator	Group	
	control	experimental
Milk obtained during the main period of the experiment, kg	2277.4±45.49	2412.5±34.65*
Feed consumed for milk production:		
energy feed units (EFU)	1801.8	1804.5
digestible protein, kg	164.73	165.08
Feed consumption per 1 kg of milk:		
EFU	0.79	0.75
digestible protein, g	72.3	68.4

Table 6 – Hematological parameters of the cow blood (n=3)

Indicator	Group	
	1 – control	2 – experimental
Erythrocytes, T/l	5.76±0.11	6.15±0.26
Leukocytes, g/l	8.35±1.12	9.17±0.53
Basophils	0.63±0.16	0.85±0.23
Eosinophils	6.89±0.11	6.22±0.23*
Neutrophils:		
stab	7.24±0.52	7.84±0.19
segmented	24.09±0.31	23.67±0.21
Lymphocytes	60.08±0.09	60.29±0.08*
Monocytes	3.71±0.26	4.23±0.31
Hemoglobin, g/l	111.74±2.17	122.46±3.75*
Total protein, g/l	72.56±1.73	78.49±2.31*
Immunoglobulins, mg/ml	23.76±0.59	23.44±1.85
Glucose, mmol/l	2.42±0.1	2.64±0.27
Cholesterol, g/l	2.14±0.25	2.35±0.33
Urea, mmol/l	3.14±0.25	3.52±0.33
Creatinine, µmol/l	107.0±6.76	123.9±4.08*
Calcium, mmol/l	1.17±0.09	1.37±0.18
Carotene, mg %	0.51±0.01	0.58±0.05

Erythropoiesis is one of the important indicators of the hematopoietic organs functional state and the trace elements exchange. The number of erythrocytes in the blood of the experimental group increased by 5.76 % relative to the control, and the hemoglobin level was by 9.6 % higher ($P \leq 0.95$). The leukocyte formula of both groups' animals corresponded to the limits of homeostasis. A slight increase in basophils in the blood of the cows of the experimental group was accompanied by a decrease in eosinophils. The difference in the number of leukocytes was improbable. An increase in total protein and creatinine ($P \leq 0.95$) was also noted, it may indicate an increase in protein metabolism in the body.

The results of our research are in line with the data obtained by Gading (2020) and Cavallini (2020), they confirm that the use of mineral pre-mixes with phytobiotics increased the growth indicators of calves and milk productivity of cows. No significant changes in the hematological parameters were noted.

Conclusion. The introduction of Biomix pre-mix into the diet of dairy cows at the rate of 50 g per head per day made it possible to optimize the mineral and vitamin nutrition of animals and increase the productive feed effect.

The average daily yield of milk of the experimental cows fed the Biomix pre-mix increased by 5.9 %, and the fat and protein content of the milk increased by 0.05 % and 0.07 %. The energy value of milk, the level of lactose, calcium and phosphorus increased. Feed consumption in terms of EFU per 1 kg of milk decreased by 5.1 %.

The system of control group cow homeostasis was in a state of equilibrium, i.e., hematological indicators remained at the level of the physiological norm. An increase in total protein ($P \leq 0.95$), hemoglobin ($P \leq 0.95$), creatinine ($P \leq 0.95$) was noted. There was a tendency to increase the level of erythrocytes, leukocytes, glucose, urea, and calcium in the blood.

REFERENCES

1. Bomko, V.S. (2019). Features of the formation and feeding of highly productive herd of cows: a monograph. Bila Tserkva: Bila Tserkivdruk, 375 p. Available at: (in Ukrainian)
2. Savchuk, I. M., Pelekhatyi, M. S., Basarhin, V. A. (2017). Feeding and breeding of animals. Zhytomyr, 491 p. (in Ukrainian)
3. Dvorska, Yu. (2016). A modern approach to mineral feeding of dairy cows. Farmer. no. 8(97), pp.18–21. (in Ukrainian)
4. Iefimov, V.H., Zavrina, S.V., Masiuk, D.M., Kulyk, K.A. (2016). Features of mineral nutrition of cows. Fodder and facts. no. 5(69), pp. 24–26. (in Ukrainian)

5. Vorobel, M. I. (2018). Dairy productivity of dairy cows for feeding vitamin and mineral supplements of new formulation in soil and climatic conditions of the Precarpathian zone. Bulletin of the Zhytomyr National Agroecological University. Issue 2 (33), Vol. 2, pp. 199–202. (in Ukrainian)

6. Weiss, W.P.(2017). A 100-year review: From ascorbic acid to zinc –mineral and vitamin nutrition of dairy cows. J. Dairy Sci., 100, pp. 10045–10060. DOI:10.3168/jds.2017-12935.

7. Bomko V.S., Kropyvka Y.G., Bomko L.G. Exchange of zinc, cobalt and selenium in high-yielding cows in the first 100 days of lactation after feeding them mixed ligand complexes. Taurian Scientific Bulletin. Agricultural sciences. Issue 114, pp. 156–163. DOI:10.32851/2226-0099.2020.114.18. (in Ukrainian)

8. Tyasi, T. L., Gxasheka, M., Tlabela, C. P. (2015). Assessing the effect of nutrition on milk composition of dairy cows: A review. Int. J. Curr. Sci., Vol. 17, pp. 56–63. Available at:

9. Bhandari, B. M., Garg, M. R. Saikat, S. (2016). Study on minerals status of dairy cows and their supplementation through area specific mineral mixture in the state of Jharkhand. J Anim Sci Technol., Vol. 58, 42 p. DOI:10.1186/s40781-016-0124-2.

10. Dovgiy, Yu.Yu., Senichenko, V.Yu., Feshchenko, D.V., Chala, I.V. (2019). The influence of vitamin-mineral complexes on milk productivity and hematological parameters of cows. Bulletin of the Poltava State Agrarian Academy. no. 2 (93), pp. 85–91. DOI:10.31210/visnyk2019.02.10. (in Ukrainian)

11. Kozynets, A.I., Holushko, O.H., Kozynets, T.H., Nadarynska, M.A. (2019). Productivity of cows with the use of micronutrient nanoparticles in the diet. Technology of production and processing of animal husbandry products. no. 1, pp. 57–62. DOI:10.33245/2310-9289-2019-147-1-57-63. (in Ukrainian)

12. Duplessis, M., Fadul-Pacheco, L., Santschi, D.E., Pellerin, D. (2021). Toward Precision Feeding Regarding Minerals: What Is the Current Practice in Commercial Dairy Herds in Québec, Canada? Animals. 11(5), 1320 p. DOI:10.3390/ani11051320

13. Farionik, T.V. (2020). Influence of vitamin and mineral nutrition on cow productivity and milk quality. Slovak international scientific journal. Bratislava, no. 40, Vol. 1, pp. 48–55.

14. Horchanok, A., Kuzmenko, O., Lytvyshchenko L., Lieshchova M., Prysiazhniuk, N., Bezv, O., Slobodeniuk O. (2020). Efficiency of pre-mixes with Bioplex® microelements in the diets of Holstein. Ukrainian Journal of Ecology, 10(2), pp. 289–293. DOI:10.15421/2020_99. (in Ukrainian)

15. Denkovych, B.S., Pivtorak, Ya.I., Hordiichuk, N.M. (2017). Growing breeding heifers using the concentrate "Intermix-calf 30 %". Scientific Bulletin of Lviv National University of Veterinary Medicine and Biotechnology named after S.Zh. Gzhytskyi. Vol. 19, no. 74, pp. 147–151. DOI:10.15421/nvlvet7433. (in Ukrainian)

16. Sethy, K., Behera, K., Mishra, S. K., Gupta S.K., Sahoo, N., Parhi, S.S., Mahapatra, M. R., Khadanga, S. (2018). Effect of organic zinc supplementation on growth, metabolic profile and antioxidant status of Ganjam Sheep. *Indian J. Anim. Res.*, 52(6), pp. 839–842. DOI:10.18805/ijar.B-3297
17. Gayathri, S.L. (2018). Chelated minerals and its effect on animal production. *Agricultural Reviews*. 39(4), pp. 314–320. DOI:10.18805/ag.R-1823
18. Hassan, A.A., El Ashry, Gh. M., Soliman, S.M. (2011). Effect of supplementation of chelated zinc on milk production in ewes. *Food and Nutrition Science*. 2(7), pp. 706–713. DOI:10.4236/fns.2011.27097.
19. Kropyvka, Yu.H., Bomko, B.S. (2017). The effectiveness of the use of premixes based on metal chelates in feeding cows in the first 100 days of lactation. *Scientific Bulletin of Lviv National University of Veterinary Medicine and Biotechnology named after S.Zh. Gzhytskyi*. Vol. 19, no. 79, pp. 154–158. DOI:10.15421/nvlvet79. (in Ukrainian)
20. Kropyvka, Yu.H., Bomko, V.S. (2021). Efficiency of use of mixed ligand complexes of zinc, manganese and cobalt in feeding of highly productive cows in the early dry period. *Bulletin of the Poltava State Agrarian Academy*. no. 3, pp. 118–126. DOI:10.31210/visnyk2021.03.14. (in Ukrainian)
21. Bomko, V., Kropyvka, Yu., Bomko, L., Chernyuk, S., Kropyvka, S., Gutyj, B. (2018). Effect of mixed ligand complexes of Zinc, Manganese, and Cobalt on the Manganese balance in high-yielding cows during first 100-days lactation. *Ukrainian Journal of Ecology*, 8(1), pp. 420–425. DOI:10.15421/2018_230. (in Ukrainian)
22. Kropyvka, Yu.H., Bomko V.S., Babenko, S.P. (2021). The effect of feeding mixed ligand complexes of Zinc, Manganese and Cobalt on the productivity of cows, feed digestibility and nitrogen metabolism in the last period of lactation. *Collection of scientific works "Technology of production and processing of animal husbandry products"*. no. 1, pp. 34–41. DOI:10.33245/2310-9289-2021-164-1-34-41 (in Ukrainian)
23. Smetanina, O.V., Ibatulin, I.I., Bomko, V.S., Bomko, L.H., Kuzmenko, O.A. (2017). Influence of mixed ligand complex of cobalt on its metabolism in the organism of highly productive cows. *Ukrainian Journal of Ecology*, 7(4), pp. 559–563. DOI:10.15421/2017_160. (in Ukrainian)
24. Daniel, J.B., Kvidera, S.K., Martín-Tereso, J. (2020). Total-tract digestibility and milk productivity of dairy cows as affected by trace mineral sources. *Journal of Dairy Science*, Vol. 103 (10), pp. 9081–9089. DOI:10.3168/jds.2020-18754
25. Kharko, M.V., Denkovych, V.S., Pivtorak, Ya.I. (2016). The use of Intermix concentrate in the structure of the diet of summer cows. *Scientific Bulletin of Lviv National University of Veterinary Medicine and Biotechnology named after S.Zh. Gzhytskyi*. Vol. 18, no. 2 (67), pp. 265–268. DOI:10.15421/nvlvet6758. (in Ukrainian)
26. Vlizlo, V.V., Fedoruk, R.S., Ratych, I.B., Vishchur, O.I. (2012). *Laboratory research methods in biology, animal husbandry and veterinary medicine: a guide*. Lviv: SPOLOM, 764 p. (in Ukrainian)
27. Gading, B.M.W.T., Agus, A., Irawan, A., Panjono, P. (2020). Growth Performance, Hematological and Mineral Profile of Post-Weaning Calves as Influenced by Inclusion of Pelleted-Concentrate Supplement Containing Essential Oils and Probiotics. *Iranian Journal of Applied Animal Science*, 10(3), pp. 461–468.
1. Cavallini, D., Mammi, L.M.E., Palmonari, A., García-González, R., Chapman, J.D., McLean, D.J., Formigoni, A. (2022). Effect of an Immunomodulatory Feed Additive in Mitigating the Stress Responses in Lactating Dairy Cows to a High Concentrate Diet Challenge. *Animals*. 12, pp. 21–29. DOI:10.3390/ani12162129.

Вплив мінерально-вітамінного преміксу на молочну продуктивність та гематологічні показники корів

Сироватко К.М.

Основним напрямом нормалізації мінерального та вітамінного живлення корів є застосування спеціалізованих преміксів, які у своєму складі містять всі необхідні елементи для ефективного збагачення раціону. Введення до раціонів тварин біологічно активних речовин у вигляді преміксів сприяє підвищенню ефективності використання кормів, у результаті чого зростає продуктивність.

Метою досліджень було вивчити вплив згодуювання мінерально-вітамінного преміксу «Біомікс» на молочну продуктивність та гематологічні показники корів. Дослід проведено на двох групах корів української чорно-рябої молочної породи по 10 голів в кожній. Тварини дослідної групи у складі основного раціону отримували премікс «Біомікс» із розрахунку 50г на 1 голову за добу, а контрольної – рівноцінну кількість монокальційфосфату.

Введення до складу раціону дослідної групи преміксу «Біомікс» дало змогу ліквідувати дефіцит фосфору, купруму, цинку, кобальту, йоду, майже до норми довести рівень вітаміну Д₃.

Оптимізація мінерального та вітамінного живлення корів, шляхом використання преміксу Біомікс, забезпечила підвищення молочної продуктивності корів та якості молока. Середньодобовий надій корів дослідної групи протягом 90 днів основного періоду досліді зріс на 5,9 %. Вміст жиру та білку в молоці збільшились на 0,05 та 0,07 % відповідно. У перерахунку на 4-відсоткове молоко корови дослідної групи перевершували своїх аналогів з контрольної групи за валовим надоєм на 153,1 кг, та за середньодобовим – на 1,71 кг, що становить 7,4 % відносно контролю (P<0,05).

У молоці підвищився рівень сухої речовини, кальцію, фосфору, лактози, зросла його загальна енергетична цінність.

Витрати кормів на 1 кг молока за рівнем енергії та перетравного протеїну знизались на 5,1 та 5,4 %.

Згодовування преміксу «Біомікс» не мало негативного впливу на гематологічні зміни в організмі. Морфологічні та біохімічні показники крові ко-

рів відповідали фізіологічним нормам. Відмічено збільшення загального білка ($P \leq 0,95$), гемоглобіну ($P \leq 0,95$), креатиніну ($P \leq 0,95$). Спостерігалась тенденція до збільшення в крові рівня еритроцитів, глюкози, сечовини, кальцію.

Ключові слова: корови, премікс «Біомікс», вітаміни, мінеральні речовини, молоко, жир, білок, кров, еритроцити, гемоглобін.



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