Thus, top of the performance in all groups experiment accounts for the third month in a productive period. In this case, upon receipt of the control group – 9,4 eggs in two and three experimental groups were received on 1,8-2,4 eggs more. Dynamics of eggs receiption in groups shows that in the groups at feeding experiment sprouted grains by the average number of eggs laying hens and in subsequent months was higher compared to the control group.

The efficiency of using sprouted grains to normalize the physiological activity confirmed by researches of reproductive females one month from the beginning of a productive period. Namely in 210 day age from each experiment group was scored by 3 female head, from which explored the development of their reproductive organs.

The analyzed indicators show better development reproductive organs of the research groups of geese at this age. Thus, the length of the oviduct in geese of the third experimental group was advanced by 1,9%, more weight oviduct – by 1,8 % and ovarian – by 2,1 % compared with the control group. The second research group exceeded these indicators on control by 0,5; 1,1; 1,4%.

Significant influence of feeding sprouted barley and oats was on reproductive ability of geese, which contributed to obtaining the best fertility of eggs in research groups (88,2-89,4%) compared with the control group (87,7%). This contributed to higher output derivability eggs and goslings that were in the experimental groups higher on 1,6-2,3% and 0,6-1,7% in comparison with the control group.

The weighting results of geese breeder at the beginning of the experiment and at the end of productive period shown that the same live weight at the beginning of a productive period in all groups at the end of the experiment productive period geese live weight tended to decrease, due to high egg productivity females . But live weight of females from research groups was a slight excess in comparison with the control group.

At the same time, the live weight of males geese at the end of productive period increase and experimental groups dominated geese control group respectively by 129-164 g But the difference was in the probable.

According to the results of a 5-month productive period of the control group, which feed only dry mixed feed, received 5447 eggs, while the 2 nd experimental group, which is fed during the period of the experiment sprouted barley in an amount of 30 g per head/day were obtained for 321 eggs more. The highest total yield of – 6104 eggs were obtained in the 3rd experimental group, which sprouted oats fed in an amount of 30 g per head/day, which was significantly (at $P \leq 0,05$) than the control group to 657 eggs.

Research groups exceeded the control group both in the average egg laying hen and eggs by weight. Thus, the mass of eggs for research groups were relatively higher by 2,1-6,6 g in the control group. During the experiment the safety of livestock was on 0,5-0,9% higher in the experimental groups compared to the control.

Thus, on the basis of these researches we can conclude the feasibility of feeding sprouted grain cereals poultry, since the fiber structure varies germination of grain, improved digestibility of feed, which increases the availability of nutrients and changes the microbial populations in the gut of poultry. Such positive changes taking place throughout the productive period, enhance the productive and reproductive characteristics of poultry.

Keywords: geese, sprouted grain, safety, egg production, egg weight, egg fertilization, output of young.

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INFLUENCE OF MIXED LIGAND COMPLEXES OF ZINC, MANGANESE, COBALT WITH SUPPLEX SE AND COPPER SULFATE AND POTASSIUM IODITE ON THE MILK PRODUCTIVITY OF HIGH-PRODUCTIVE HOLSTEIN BREEDS OF GERMAN SELECTION

Для отримання екологічно чистого молока із високопродуктивних корів голштинської породи німецької селекції та кращого засвоєння мікроелементів організмами експериментальних тварин до низькокомпонентних кормових сумішей вводили комбіновані кормові концентрати з різними рівнями змішаних комплексів цинку, марганцю та кобальту, Supplex Se, сульфату міді, йодиду калію, який доповнив поживну суміш міддю та йодом до норми, а концентрацію селену врегулювали до показників 0,3 мг/кг кормової суміші сухої речовини. У кормовій суміші корів 1-ї контрольної групи доза цинку та мангану становила до 60,8 мг / кг сухої речовини, а кобальту - 0,78 мг / кг. Дози цинку та мангану - 60,8 мг / кг, а кобальту - 0,78 мг / кг магнію показали найвищий вихід молока з експериментальних корів у попередньому експерименті. У ньому корови голштинської породи, української чорно-білої молочної та української червоної молочної порід були залучені у перші 100 днів лактації. Доза цинку, марганцю та кобальту була збільшена на 10% для корів другої експериментальної групи, для корів 3-ї експериментальної групи, навпаки, була зниженана 10%, тоді як для корів четвертої та п'ятої експериментальних груп знизилися на 20% і 30% відповідно.

На підставі цих даних, в ході науково-економічного експерименту було встановлено, що збільшення концентрації цинку, мангану та кобальту на 10% в 1 кг сухої речовини відносно першої контрольної групи за рахунок їх змішаних лігандних комплексів в пайках молочних корів голштинської породи німецької селекції в перші 100 днів лактації сприяли одержанню найвищої продуктивності, порівняно з контрольними та іншими експериментальними групами. Найкращі показники щоденного удою молока були в корів 2-ї експериментальної групи, яка переважала щоденний середній удій молока корів 1-ї контрольної групи на 10,8%, третьої експериментальної групи - на 3,9%, четвертої експериментальної групи - на 6,2% і п'ятої експериментальної групи - на 8,7% з показниками жирності в 1-й контрольній групі - 3,74%, другій - 3,78%, третій - 3,79%, четвертій - 3,80%, а у п'ятій - 3,82%.

У ході науково-економічного експерименту, доведено, що генетичний потенціал високопродуктивних корів голштинської породи німецької селекції в лісостеповій зоні України найкраще реалізується при концентрації 1 кг комбікорму сухої речовини, мг: цинк 66,9; манган 66,9; кобальт 0,86; селен 0,3; мідь 12 і йод 1.1.

Ключові слова: високопродуктивні корова, премікс, мікроелементи, комплекси змішаних лігандів, цинк, манган та кобальт, сульфат міді, йодистий калій, Seplex Se, лактація, вихід молока, вміст жиру в молоці, комбікорм, дефіцит.

Formulation of the problem. In the modern dairy complexes in Ukraine, cows of Holstein breed with high genetic potential were kept and for its realization the animals need adequate conditions for their nutritionally complete nutrition, which will provide high milk yields, will restore the cost of their organism to its production, especially in the first 100 days of lactation, and maintain high reproductive abilities and long-term use of them [1, 2, 3, 4, 5].

Highly productive cows of the Holstein breed in the first 100 days of lactation intensively use the body's energy reserves to secrete milk that is not covered by nutrients consumed by feeds, therefore, have a long negative balance and if it is not eliminated, then lactic productivity is decreased, reproductive functions are deteriorated, health disorder comes [8, 9]. This is due to the fact that the maximum productivity of cows manifests itself on the 50-60 day after calving, and the maximum consumption of food on day 70-80.

In this period, it is necessary to introduce high-quality, easy-to-peer feed with a high concentration of energy and other nutrients in kg of dry matter in the feed mix. Therefore, when organizing full balanced nutrition of high-yielding cows in the first place, it is necessary to pay attention to the consumption of dry matter (DM) of the diet, since DM is a limiting factor for feed intake [10]. While DM consumption depends on the concentration of nutrients and biologically active substances, including microelements in it.

It is installed that trace elements stimulate and normalize metabolism, have a positive effect on immune biological resistance of the organism and life expectancy [5]. Lack of trace elements in diets leads to a violation of metabolism and the synthesis of protein in the body, to deterioration of health, a sharp decline in milk productivity, reproductive capacity, as well as genetically programmed, determined by breed features, high productivity potential. Such changes are develop both in the mother and in the body of the offspring [6, 7].

Analysis of recent research and publications. An important role in increasing the biological value of high-yielding cows feeding is played by such normalized trace elements as Ferum, Copper, Zinc, Mangan, Iodine, Cobalt, and unsigned Selenium has not been regulated in recent years yet. The standardization of which should be carried out taking into account the peculiarities of the biogeochemical provinces of a particular region of Ukraine.

Studies on the rationing of trace elements in rations and the establishment of their optimal standards for animals were engaged in B.D. Kalnytskyj [16], S.P. Kuznetsov [18], G.T.Klitsenko [17], V.T. Samokhin [19] et al., which found that when the introduction of trace elements in rations in the form of their sulfate and chloride compounds, the assimilation of the organism of animals is 5-30%, which leads to pollution of the environment. The introduction into rations of cows of trace elements in the form of organic minerals, their assimilation by an animal organism is increased to 90-98% [14,15].

However, materials on the use of organic forms of trace elements such as mixed ligant complexes Zn, Cu, Mn, Co in rations of high-yielding Holstein breeds of different breeds in industrial complexes of the Ukrainian forest-steppe are not enough.

The aim of the research is the experimental substantiation of the recipe of improved zonal premixes for highly productive Holstein cows of German breeding with the use of different doses of mixed ligand complexes of Zinc, Mangan and Cobalt in combination with Supplex Se, copper sulfate, iodine potassium and to determine their effect on milk productivity in the first 100 days of lactation and feed costs per unit of production.

Materials and methods of research. Scientific and economic experiment on the establishment of optimal doses of Zinc, Manganese and Cobalt in combination with Supplex Se, copper sulfate, iodine potassium due to the use of their mixed ligand compounds, they were conducted in the conditions of OJSC "Terezine" in the Bila Tserkva district of the Kyiv region.

For an experiment for 50-60 days of the dry period, based on the principle of analogues (age, origin, live weight and milk yield for the previous lactation), 50 heads of cows were selected and formed 5 groups of 10 heads in each. All selected cows were Holstein breed of German breeding, had similar productivity of mothers, average fattening and were clinically healthy, kept in identical conditions and at the same time were brought by the owners to the farm. Scheme of scientific and economic experiment is shown in Table 1.

Table 1 – **Scheme of scientific and economic experiment on cows of Holstein breed of German breeding in the first 100 days of lactation**

Groups	Number of goals	Investigated factor
First control	10	FM + mixed ligand complexes of Zinc, Manganese, Cobalt + Supplex Se and copper sulfate and potassium iodite. In 1 kg of DM is found, mg: Zinc 60.8; Mangan 60.8; Cobalt 0.78; Selenium 0.3; Kuprum 12 and Iodus 1.1
Second experimental	10	FM + mixed ligand complexes of Zinc, Mangan, Cobalt + Supplex Se and copper sulfate and potassium iodite. In 1 kg DM is present, mg: Zinc 66.9; Mangan 66.9; Cobalt 0.86; Selenium 0.3; Kuprum 12 and Iodus 1.1
Third experimental	10	FM + mixed ligand complexes of Zinc, Mangan, Cobalt + Supplex Se and copper sulfate and potassium iodite. In 1 kg of DM is found, mg: Zinc 54.7; Manganese 54.7; Cobalt 0.7; Selenium 0.3; Copper 12 and Iodus 1.1
Fourth experimental	10	FM + mixed ligand complexes of Zinc, Mangan, Cobalt + Supplex Se and copper sulfate and potassium iodite. In 1 kg of DM is found, mg: Zinc 42.6; Mangan 42.6; Cobalt 0.55; Selenium 0.3; Copper 12 and Iodus 1.1
Fifth experimental	10	FM + mixed ligand complexes of Zinc, Mangan, Cobalt + Supplex Se and copper sulfate and potassium iodite. In 1 kg of DM is found, mg: Zinc 36; Mangan 36; Cobalt 0.6; Selenium 0.3; Copper 12 and Iodus 1.1

• Fodder mixture (FM)

Cows before calving and 10-20 days after calving were fed with a few component feed mixes, in which the hay was used as oatmeal – 4 kg (dry period), alfalfa – 4 kg (after calving), haylage of cereals and beans – 8-10 kg, corn silage – 15-25 kg, molasses 1-2 kg, and mixed feed concentrate -4,5 kg, respectively.

Research results. The intake of different doses of mixed ligand complexes of Zinc, Mangan and Cobalt combined with Supplex Se, copper sulfate, iodine potassium in the body of experimental cows, in the first 100 days of lactation, ensured direct dependence of daily yields on these indicators (Table 2).

Table 2 – **Productivity of experimental cows during first 100 days of lactation and expenses of fodder at average by experiment (M±m, n=10)**

Indicator	Group				
	control	experimental			
	1	2	3	4	5
Average daily milk yield for 100 days of the experiment, kg:					
Natural fat	47,2±0,29	48,9±0,33**	46,2±0,39	43,4±0,45***	42,8±0,31***
Fat content in milk,%	3,74±0,132	3,78±0,145	3,79±0,164	3,80±0,169	3,82±0,188
4% of fat	44,1±0,31	46,2±0,36***	43,8±0,45	41,2±0,52***	40,9±0,57***
Protein content in milk,%	3,21±0,122	3,26±0,134	3,23±0,140	3,24±0,147	3,23±0,152
Gross milk yield per cow for 100 days of lactation, kg					
Natural fat	4720±28,9	4890±32,7	4620±38,4	4340±44,9	4280±30,8
4% of fat	4410±30,2	4620±35,7	4380±42,9	4120±51,9	4090±56,6
In% to control, 4% fat	–	103,6***	97,9*	92,0***	90,7***

From Table 2 it can be seen that the highest average daily milk yield in the first 100 days of lactation was in the cows of the 2nd experimental group in the feed mix which were injected 10% more Zinc, Mangan and Cobalt at the expense of their mixed ligand complexes compared with the control group.

The average daily natural milk yield of cows of the 2nd experimental group prevailed for cows of the 1st control group by 2.7 kg or by 3.6% (P <0.001). As a result, 4890 kg of milk with a fat content of 3.78% was obtained from cows of the 2nd experimental group for 100 days of the experiment against 4720 kg with a fat content of 3.74% of the 1st control group. At that time, the average daily yield of cows of the 3rd, 4th and 5th experimental groups receiving Zinc, Mangan and Cobalt at the expense of their mixed ligand complexes by 10%, 20% and 30% less than the cows of the 1st control group were lower: in the 3rd experimental group – 0.6 kg or 2.12%, in the 4th experimental group – 3.8 kg (P <0.001) or 8.05% and in the 5th experimental group – 4, 4 kg (P <0.001) or 9.3%.

In milk of experimental cows compared to control, although not very noticeable, but the protein content increased unambiguously (3.23-3.26 versus 3.21% in control).

As shown by the analysis of data obtained in the experiment, 4410 kg of milk of the 4th fat were obtained from the control group's cows for 100 days of the experiment, while the 2nd, 3rd, 4th and 5th experimental groups – respectively 4620 kg, 4380 kg, 4120 kg and 4090 kg, or by 3,6% more and by 2,1; 18.0 and 9.3 % less.

Conclusion. The highest productivity was shown by the cows of the Holstein breed of German breeding, which received feed forage in 1 kg of DM which was, mg: Zinc 66.9; Mangan 66.9; Cobalt 0.86; Selenium 0.3; Copper 12 and Iodus 1.1 at the expense of feed and mixed the ligand complexes of Zinc, Mangan and Cobalt in combination with Supplex Se, copper sulfate, iodine potassium.

Using in premixes mixed ligand complexes of Zink, Mangan and Cobalt in comparison with Supplex Se, copper sulfate, iodine potassium doesn't give the possibility for antagonism between these microelements.

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Влияние смешанных лигандных комплексов цинка, манганеса, кобалта с подводным семейством и медным сульфатом и калиям иодитом на молочной продуктивности высокопроизводительного породы холстейна немецкого выбора

Кропива Ю., Бомко В.

Для получения экологически чистого молока с высокопродуктивных коров голштинской породы немецкой селекции и лучшего усвоения микроэлементов организмами экспериментальных животных к низькокомпонентних кормовых смесей вводили комбинированные кормовые концентраты с различными уровнями смешанных комплексов цинка, марганца и кобальта, Supplex Se, сульфата меди, йодида калия, который дополнил питательную смесь медью и йодом в норму, а концентрацию селена урегулировали к показателям 0,3 мг / кг кормовой смеси сухого вещества. В кормовой смеси коров 1-й контрольной группы доза цинка и марганца составляла до 60,8 мг / кг сухого вещества, а кобальта - 0,78 мг / кг. Дозы цинка и марганца - 60,8 мг / кг, а кобальта - 0,78 мг / кг магния показали высокий выход молока из экспериментальных коров в предыдущем эксперименте. В нем коровы голштинской породы, украинской черно-белой молочной и украинской красной молочной пород были привлечены в первые 100 дней лактации. Доза цинка, марганца и кобальта была увеличена на 10% для коров второй экспериментальной группы, для коров 3-й экспериментальной группы, наоборот, была зниженана 10%, тогда как для коров четвертой и пятой экспериментальных групп снизились на 20% и 30% в соответствии.

На основании этих данных, в ходе научно-экономического эксперимента было установлено, что увеличение концентрации цинка, марганца и кобальта на 10% в 1 кг сухого вещества относительно первой контрольной группы за счет их смешанных лигандных комплексов в пайках молочных коров голштинской породы немецкой селекции в первые 100 дней лактации способствовали получению наивысшей производительности по сравнению с контрольными и другими экспериментальными группами. Лучшие показатели ежедневного удоя молока были у коров 2-й экспериментальной группы, которая преобладала ежедневный средний удой молока коров 1-й контрольной группы на 10,8%, третьей экспериментальной группы - на 3,9%, четвертой экспериментальной группы - на 6,2 % и пятой экспериментальной группы - на 8,7% с показателями жирности в 1-й контрольной группе - 3,74%, второй - 3,78%, третий - 3,79%, четвертой - 3,80%, а в пятой - 3,82%.

В ходе научно-экономического эксперимента, доказано, что генетический потенциал высокопродуктивных коров голштинской породы немецкой селекции в лесостепной зоне Украины лучше реализуется при концентрации 1 кг комбикорма сухого вещества, мг цинк 66,9; марганец 66,9; кобальт 0,86; селен 0,3; медь 12 и йод 1.1.

Ключевые слова: высокопроизводительные корова, премикс, микроэлементы, комплексы смешанных лигандов, цинк, марганец и кобальт, сульфат меди, йодистый калий, Seplex Se, лактация, выход молока, содержание жира в молоке, комбикорм, дефицит.

Influence of mixed ligand complexes of Zinc, Manganese, Cobalt with Supplex Se and copper sulfate and potassium iodite on the milk productivity of high-productive Holstein breeds of German selection

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In order to obtain ecologically pure milk from highly productive Holstein cows of German breeding and better assimilation of trace elements by the organism of experimental animals, to the low-component feed mixes were introduced mixed feed concentrates with different levels of mixed-alloy complexes of Zinc, Manganese and Cobalt, Supplex Se, copper sulfate, potassium iodide, which supplemented the feed mix with Copper and Iodine to normal, and the concentration of Selenium was adjusted to 0.3 mg / kg DM (dry matter) forage mix. In the feed mix of cows of the 1st control group, the dose of Zinc and Mangan was adjusted to 60.8 mg / kg DM, and Cobalt – 0.78 mg / kg. Doses of Zinc and Mangan – 60.8 mg / kg and Cobalt – 0.78 mg / kg DM showed the highest milk yield results in experimental cows in the previous experiment, in which the cows of the Holstein, Ukrainian Black-and-White Dairy and Ukrainian Red-Whipped Dairy breeds were involved in the first 100 days of lactation. The dose of Zinc, Manganese and Cobalt were increased by 10% to cows of the 2nd experimental group, while the cows of the 3rd experimental group, on the contrary, were decreased by 10%, while the cows of the 4th and 5th experimental groups decreased by 20% and 30% respectively.

Based on these data, during the scientific and economic experiment, it was established, that an increase in the concentration of Zinc, Mangan and Cobalt by 10% in 1 kg of DM against the first control group at the expense of their mixed ligand complexes in the rations of the dairy cows of the Holstein breed of German breeding in the first 100 days of lactation, contributed to obtaining the highest productivity in comparison with the control and other experimental groups. The best indicators for daily milk yields were cows of the 2nd experimental group, which prevailed the average daily natural milk yield of cows of the 1st control group by 10.8%, the 3rd experimental group by 3.9%, the 4th experimental group on – 6.2% and the 5th experimental group – 8.7% with milk fat in the 1st control group – 3.74%, the second – 3.78%, the third – 3.79%, the 4-and 3.80% and the 5th – 3.82%.

On the basis of the data obtained during the scientific and economic experiment, it is proved, that the genetic potential of high-yielding cows of the Holstein breed of German breeding in the forest-steppe zone of Ukraine is best realized at a concentration of 1 kg of DM compound feed, mg: Zinc 66.9; Mangan 66.9; Cobalt 0.86; Selenium 0.3; Copper 12 and Iodine 1.1.

Key words: high productivity cows, premix, trace elements, mixed ligand complexes Zinc, Mangan and Cobalt, copper sulfate, potassium iodite, Seplex Se, lactation, milk yield, fat content of milk, feed mix, deficiency.

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