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RESEARCH OF QUAIL MEAT FOR THE PRESENCE OF HEAVY METALS AND PESTICIDES WHEN ADDING A MINERAL FEED ADDITIVE TO THEIR DIET

ANNOTATION

The article presents the results of laboratory tests for the presence of heavy metals and pesticides when adding a mineral feed additive to the diet of birds. The relevance of the study is related to the cultivation of healthy and highly productive quails in order to ensure food security of the Republic of Kazakhstan. The conducted studies of meat to assess the indicators for the presence of heavy metals and pesticides for the purpose of using a mineral feed additive on experimental birds (quails) allowed us to obtain the following results: pesticides in all samples - less than 0.005 mg/kg, mercury and arsenic - less than 0.0002, the presence of lead in four samples did not reach critical indicators. A comprehensive analysis of the results obtained on the basis of scientific and experimental studies of meat to assess the indicators for the presence of heavy metals and pesticides showed the harmlessness of mineral feed additives when used in the diet of quails.

Key words: *heavy metals, pesticides, flasks, quail, opoka, experiment, mineral feed.*

Introduction. The relevance of raising healthy and highly productive animals and poultry is inextricably linked with food security and is of great global importance [1-2].

Heavy metals and pesticides present in the composition of mineral feed additives are one of the real threats to the health and productivity of birds [3-4].

The pollution of the biosphere by a group of pollutants, which received the general name "heavy metals", has acquired particular importance. These include more than 40 chemical elements of the periodic table of D. I. Mendeleev. Heavy metals are capable of forming complex complex compounds with soil organic matter, therefore, in soils with a high humus content, they are less accessible for rinsing. Excess moisture in the soil promotes the transition of heavy metals to lower oxidation states and into soluble forms. Anaerobic conditions increase the availability of heavy metals to plants. Therefore, drainage systems that regulate the water regime contribute to the predominance of oxidized forms of heavy metals and thereby reduce their migration characteristics. Plants can absorb microelements from the soil, including heavy metals, accumulating them in tissues or on the surface of leaves, thus being an intermediate link in the "soil - plant - animal - human" chain [5].

Opoka - opalcristobolite rock - is a mineral sorbent based on highly dispersed silica that binds mycotoxins in feed (aflatoxin B1, T-2 toxin, zearalenone, ochratoxin A), heavy metal salts, chemical toxins, radionuclides, gases and other metabolic products due to the huge sorption surface. Thus, a sorption surface of at least 150 m is created per gram of flask due to the micropores present in the

mineral, which is easily accessible for the sorption of molecules with a minimum size of 2-90 nm. Silicon ensures the growth and strengthening of tissues during the development and formation of the skeleton and participates in bone mineralization even with a deficiency of calcium, phosphorus, chlorine, fluorine, sodium, sulfur and other chemical elements. Any feed contains toxic substances, including radionuclides, heavy metals and mycotoxins, so one of the important components of biological additives should be the presence of a sorbent in the additive that removes toxins from the feed [6].

One of the important keys to the sustainable development of Kazakhstan's economy is agriculture. For this reason, state support of livestock farms is an important strategic direction. To date, agricultural buildings and structures for keeping animals indoors and at poultry farms are actively developing. In these conditions, the animal is constantly under the influence of various environmental factors. These factors can be distinguished in the following order:

- 1) ecological environment;
- 2) feed and water quality;
- 3) creation of the latest enclosing structures and buildings inhabited by animals;
- 4) feeding and watering regime of animals;
- 5) sanitary measures for the prevention of diseases;

The environmental situation in the world has a significant impact on the health of farm animals. Due to soil and water pollution, plants and livestock products are contaminated with heavy metals such as zinc, cadmium and lead [7, 8, 9, 10].

Considering the above, it is necessary to introduce sorbents into the feed. Significant economic damage to animal husbandry is caused by food diseases due to the use of substandard, defective feed and improper organization of sanitary measures. As a result, there is a problem of proper feeding of cattle and poultry, keeping them in environmentally friendly conditions.

Buildings constructed from natural raw materials are of particular relevance. These materials have high thermal protection. Striving for profitability of production in market conditions, livestock and poultry breeders are forced to use more advanced technologies that ensure the maximum level of health and productivity of animal husbandry [11, 12, 13, 14]. At the present stage, one of the progressive ways to achieve these goals is the use of mineral and biologically active substances in animal feeding. Mineral and vitamin mixtures, premixes play an important role in this. Analysis of data from foreign and kazakh studies shows that their use in the diet has always been effective [15, 16, 17, 18].

Nevertheless, the purchase of premixes, mineral and vitamin mixtures for animal feeding always requires significant investments. The use of natural sorbents as non-traditional feed additives seems promising. In this regard, easily digestible mineral feed additives will make up for the deficiency of trace elements in the body of animals, will ensure the prevention of diseases. Optimal therapeutic measures are products of mineral and biological origin. Recently, there has been an interest in using an alternative local mineral.

Resources in the total feed balance have increased. Significant positive experimental data have been accumulated on the use of zeolite-containing volcanic and volcanogenic-sedimentary tuffs (with a zeolite content of 50-60% or more) as a mineral additive in the diets of livestock and poultry [19,20].

Material and methodology. The research was conducted in the testing department of the West Kazakhstan branch of JSC "National Center for Expertise and Certification" in Uralsk.

Texas quails were selected as an experiment. Grown in the veterinary clinic of the West Kazakhstan Agrarian and Technical University named after Zhangir Khan. Four groups of 6 laboratory birds were formed in each: the first and second groups served as controls, the third and fourth groups received a mineral feed additive at a dose of 30 mg / kg of feed. There were 6 birds in each of them. The quails were fed 6 times a day. Two types of feed were used as a diet. The first type includes barley and cake, and the second type - combined feed for productive quails. A mineral feed additive was crushed into the feed for experimental samples. Observations were carried out within 5 months from the moment of the first feeding. At the same time, the dynamics of changes in body weight and the general condition of birds were taken into account. The temperature of the room in which the quails were kept was in the range of 20-22 ° C. For the study, the natural flask rock of the Taskalinsky

deposit was used as a mineral feed additive. This mineral feed additive is a dense ball that is easily crushed to powder. Figure 1 shows a mineral feed additive.

Results and its discussion. At the initial stage, studies were conducted to assess the mineral feed additive on the general condition of experimental birds and to assess the degree of manifestation of their skin-irritating and skin-resorptive properties. As a result of the experiments, it seems possible:

- to obtain data on the assessment of the real danger of the presence of heavy metals and pesticides of the effects of mineral feed additives on control birds;
- if a real danger is detected, justify the need for technological and special protective measures aimed at the complete or partial exclusion of mineral feed additives from the diet of birds;

Monthly quails were selected for experiments. When feeding control samples, their death was not observed. As shown in picture 1, in laboratory birds of the first and second control groups, who received regular food after 3 weeks, general depression was noted: they were sluggish, didn't move much, started pecking at each other. No visible changes were found in the pathoanatomic autopsy of specially slaughtered birds.



Picture 1 – Control sample from cell №1

Picture 2 shows the finished mineral feed additive, which we then crushed. Mineral supplements are pre-weighed on the scales and added to the feed. We decided not to increase the dose and stopped at 30 grams, since the results of the experiment were not long in coming.



Picture 2 – Mineral feed additive obtained from the flask rock

It was found that the experimental groups showed visible changes in behavior and general condition. During the first week from the day of the start of feeding, the birds were in an excited state, actively moving, there were no clinical signs of poisoning. We can see this in picture 3.



Picture 3 – Quails for conducting an experiment from cells 3 and Weighing a bird

The birds were weighed on the first day before feeding. On the picture 3 shows a bird from the control group weighing 318 grams.

Tables 1, 2 show the results of studies on the presence of heavy metals and pesticides when using a mineral supplement in the diet of birds (barley, cake) of control and experimental samples

Table 1 – Results of testing meat of control samples (barley, cake) for the presence of heavy metals and pesticides

Name of the parameter	Regulatory documents for test methods	Norm	Fact	Extended uncertainty at K=2, P=0,95
1. Heavy metals, mg/kg	GOST 34141-2017	-	0,14	-
- lead				
- cadmium	GOST 34141-2017	-	0,019	-
- arsenic	GOST 34141-2017	-	less than 0.0002	-
- mercury	GOST 34141-2017	-	less than 0.0002	-
2. Pesticides, mg / kg: α,β,γ -isomer of hexachlorocyclohexane	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-
DDT and its metabolites	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-

Table 2 – Results of testing meat of experimental (barley, cake) for the presence of heavy metals and pesticides

Name of the parameter	Regulatory documents for test methods	Norm	Fact	Extended uncertainty at K=2, P=0,95
1. Heavy metals, mg/kg - lead	GOST 34141-2017	-	0,12	-
- cadmium	GOST 34141-2017	-	0,026	-
- arsenic	GOST 34141-2017	-	less than 0.0002	-
- mercury	GOST 34141-2017	-	less than 0.0002	-
2. Pesticides, mg / kg: α, β, γ -isomer of hexachlorocyclohexane	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-
DDT and its metabolites	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-

Tables 3, 4 show the results of research of experimental and control meat samples when using combined feed for productive birds in the diet. According to the latest tables, it can be seen that the results of the control and experimental samples (combined feed for productive animals) have the same value.

Table 3 – Results of studies of meat of control samples (combined feed for productive birds) for the presence of heavy metals and pesticides

Name of the parameter	Regulatory documents for test methods	Norm	Fact	Extended uncertainty at K=2, P=0,95
1. Heavy metals, mg/kg - lead	GOST 30178-96	-	0,11	-
- cadmium	GOST 30178-96	-	0,023	-
- arsenic	GOST 31266-86	-	less than 0.0002	-
- mercury	GOST 26927-86	-	less than 0.0002	-
2. Pesticides, mg / kg: α, β, γ -isomer of hexachlorocyclohexane	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-
DDT and its metabolites	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-

Conclusion. Studies conducted to assess the toxicological parameters of poultry meat in order to use a mineral feed additive in their diet showed that the condition of control samples (No. 1, No. 2) worsened three weeks after the first feeding with conventional feed compared with experimental samples. They became sluggish, moved little, pecked at each other. From this we can conclude that the birds lacked nutrients. It turned out that the mineral feed additive strongly affects the central nervous system. The quails of the experimental samples were in an excited state for the first few days after the addition of the supplement to their diet.

Table 4 – Results of studies of meat of experimental samples (combined feed for productive birds) for the presence of heavy metals and pesticides

Name of the parameter	Regulatory documents for test methods	Norm	Fact	Extended uncertainty at K=2, P=0,95
1. Heavy metals, mg/kg - lead	GOST 30178-96	-	0,14	-
- cadmium	GOST 30178-96	-	0,023	-
- arsenic	GOST 31266-2004	-	less than 0.0002	-
- mercury	GOST 26927-86	-	less than 0.0002	-
2. Pesticides, mg / kg: α, β, γ -isomer of hexachlorocyclohexane	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-
DDT and its metabolites	ST of the Republic of Kazakhstan 2011-2010	-	less than 0.005	-

After a week, they started behaving as usual. According to the results of studies of experimental and control samples of poultry meat, which were given compound feed, it can be noted that their results are the same and the indicators are uncritical. As a result of the study of the mineral feed additive of the Taskalinsky deposit, when added.

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ТҮЙІН

Мақалада құстардың рационына минералды жемшөп қоспасын қосу кезінде ауыр металдар мен пестицидтердің бар-жоғын зертханалық зерттеу нәтижелері келтірілген. Зерттеудің өзектілігі Қазақстан Республикасының азық-түлік қауіпсіздігін қамтамасыз ету мақсатында сау және жоғары өнімді бөдене өсірумен байланысты. Тәжірибелік құстарға (бөдене) минералды жемшөп қоспасын қолдану мақсатында ауыр металдар мен пестицидтердің бар - жоғын бағалау үшін етке жүргізілген зерттеулер келесі нәтижелерді алуға мүмкіндік берді: пестицидтер барлық үлгілерде - 0,005 мг/кг-нан аз, сынап пен мышьяк-0,0002-ден аз, қорғасынның болуы төрт үлгіде сыни көрсеткіштерге жеткен жоқ. Ауыр металдар мен пестицидтердің бар-жоғын бағалау үшін етті ғылыми-эксперименттік зерттеулер негізінде алынған нәтижелерді кешенді талдау бөдене рационында қолданылған кезде минералды жемшөп қоспасының зиянсыздығын көрсетті.

РЕЗЮМЕ

В статье представлены результаты лабораторных исследований на наличие тяжелых металлов и пестицидов при добавлении минеральной кормовой добавки в рацион птиц. Актуальность исследования связана с выращиванием здоровых и высокопродуктивных перепелов в целях обеспечения продовольственной безопасности Республики Казахстан. Проведенные исследования мяса для оценки показателей на наличие тяжелых металлов и пестицидов с целью применения минеральной кормовой добавки на подопытных птицах (перепелах) позволили получить следующие результаты: пестициды во всех образцах - менее 0,005 мг/кг, ртуть и мышьяк - менее 0,0002, наличие свинца в четырех образцах не достигло критических показателей. Комплексный анализ результатов, полученных на основе научно-экспериментальных исследований мяса по оценке показателей на наличие тяжелых металлов и пестицидов, показал безвредность минеральной кормовой добавки при использовании в рационе перепелов.