ВЕТЕРИНАРИЯ И ЖИВОТНОВОДСТВА

UDK 619:636.085:636.5.033:637.5.07

Abdigaliyeva T.B., Sarsembayeva N.B., Paritova A.Y, Bekbergen A.T.

Kazakh national agrarian university, Almaty

MINERAL CONTENT OF BROILER CHICKEN`S MEAT WHILE USING FEED ADDITIVES BASED ON VERMICULITE

Annotation

The article presents the results of the mineral composition of broiler chicken meat while using feed additives based on vermiculite produced in Kazakhstan. In the experiment were used chickens from day to 42-day (slaughter) of age, which were formed into five groups of 20 heads in each. During the accounting period, poultry feeding was carried out by the basic diet of the PK, balanced for all nutrients in accordance with the current recommendations for growing the poultry of this cross. Chickens of experimental groups (2-, 3-, 4-, 5-) in addition to the main diet received fodder additives: 3%, 5% vermiculite and 3% (1%V+2%FM), 5% (1.5%V+3.5%FM) vermiculite with fishmeal respectively. The results of the studies indicated the absence of any negative effect of new feed additives on the physiological condition of broiler chickens. The inclusion of vermiculite in the birds' diet contributed to a fuller realization of biological possibilities of bird productivity and provides greater safety and resistance of birds.

Keywords: mineral content, vermiculite, broiler chicken, feed additive, quality of meat.

Introduction

Poultry farming is one of the main branches of the agro-industrial complex providing the population with high-grade food products. Poultry meat is an affordable and dietary source of protein in the human diet [1]. To ensure normal life and high productivity, the bird should receive with the diet mineral substances that play a major role in the metabolism and are the plastic material of the skeleton [2]. In search of effective methods to increase the safety and productivity of poultry, the study was aimed at finding all sorts of little-known feed additives taking into account the use of locally available, cheap raw materials.

In recent years, the attention of researchers is directed to use natural mineral additives in poultry feeding. To increase the productivity of poultry farming and reduce costs per unit of production, the stimulants of natural origin are increasingly being used [3, 4].

Mineral and vitamin supplements in the total feed costs account for only 5-7%, but the efficiency is increased by 10-25% feed consumption per unit product is reduced by 8-15% and the morbidity and die-off is reduced by 20-40 percent [5].

The most promising, economically beneficial and environmentally safe mineral additives are local natural minerals. One of such local natural minerals is vermiculite [6]. The technology of production, experimental research and the introduction of bioactive feed additives for livestock and poultry, based on vermiculites, are relevant and contribute to the sustainable development of the agro-industrial sector.

Vermiculite (from *Latin language vermiculus*-worm) is a mineral from the group of hydromica that has a layered structure. It is a large lamellar crystal of golden yellow or brown color. When heated from plates, wormlike columns or threads of golden or silver color with a

transverse division into the finest scales (expanded vermiculite) are formed. Burned masses of vermiculite float freely on the surface of the water. The chemical composition corresponds to the formula $(Mg^{+2}, Fe^{+2}, Fe^{+3})^x 3[(AlSi)\ 4O_{10}]^x(OH)_2{}^x 4H_2O$ [7, 8].

In Kazakhstan there are several deposits of vermiculite. Since 2006, LLP "AVENUE" is developing the vermiculite of "Kulantau" deposit in the Tulkibas district of South-Kazakhstan region. In 2008, a workshop for the production of expanded vermiculite was built. At the moment the enterprise produces up to 1500m^3 of finished products per month. Vermiculite is a new material for the Kazakhstan market, although it is widely used in other countries. Due to its physicochemical, ion-exchange and sorption properties, vermiculite is a biologically active agent for increasing the productivity and natural resistance, preventing diseases and toxicoses, and also for improving the quality of the end products of livestock and poultry.

The purpose of the research is to study and determine the effectiveness of the application of Kulantau vermiculite deposits of South Kazakhstan region of the Republic of Kazakhstan in the diet of broiler chickens.

Materials and methods

The experimental part of the work was carried out in 2015 - 2016 in the conditions of the poultry farm "Sary bulak" LLP and at the laboratories of the Kazakh-Japan Innovation Center of the Kazakh National Agrarian University. As the object of research were used broiler chickens, which were randomly selected into 5 experimental groups of 20 heads in each (Table 1). The first group was the control group, received the main food ration without feed additives, the second experimental group received the main diet and 3% vermiculite, the third experimental group - the main diet and 5% vermiculite, the fourth experimental group - the main diet and 3% (1%V+2%FM), the fifth experimental group - the main diet and 5% (1.5%V + 3.5%FM).

Birds were kept in isolated sections on deep bedding with a partial mesh floor. Feeding of birds, weight control and content in the course of the scientific experiment corresponded to the Guidelines on the cellular content of the final hybrids of this breed. Condition of the microclimate in the premises: air temperature in the poultry house during the warm season is 25-30°C, in the cold season - 19-24°C; humidity depending on the season and weather conditions - 57-78%; the speed of air movement is 0.1-1.5 m ps. All other conditions of maintenance and feeding were identical for all groups. At the end of the technological cycle, poultry was slaughtered and samples for laboratory tests were taken.

Table 1 – The scheme of the study

Groups	Experiment options	Feeding properties	Number of birds
1	Control	BD	20
2	1 experimental	BD + 3% vermiculite	20
3	2 experimental	BD + 5% vermiculite	20
4	3 experimental	BD + 3% (V+FM)	20
5	4 experimental	BD + 5% (V+FM)	20
Note: abbreviations: BD – main diet. V – vermiculite. FM - fishmeal.			

For experimental studies used vermiculite expanded M-150, fraction 0.5-3.0 mm. Bird feeding was carried out by dry complete feed of the PK, which consists of the following ingredients: wheat, 45% soybean meal, corn, 36% rosin meal, 30% sunflower meal, tricalcium phosphate, monocalcium phosphate, sunflower oil, vitamin premix, amino acids (methionine, lysine, threonine), salt, soda. In accordance with the recommendations of "Sary bulak" LLP. The

total amount of mineral substances was measured by burning dry sample in a muffle furnace at 800°C. The iron was determined by the atomic-adsorption method, using GOST 27998-88; potassium - GOST 30504-97, calcium - GOST 26570 - 95, phosphorus GOST 26657-97, copper GOST 3092-00, manganese GOST 27997-88, sodium GOST 30503-97, magnesium GOST 30502-97. To determine the mineral substances, the dry ashing method was used. That is, ashing took place in muffle furnaces at 400-600°C, NH (CO) was used to accelerate the disintegration process. The sample was placed in a flask, filled with oxygen and closed. The combustion process took 3 minutes. The resulting ash, in which the metals are in the oxides, was treated with a solution of HCl (1: 1) to obtain soluble metal chlorides.

For the measurement result received arithmetic mean mass fraction of i component in two parallel samples. All data was subjected to a one-way analysis of variance (ANOVA) using the computer program Statistica 8.0 to check the effect of experimental diets.

Results and discussion

Muscles of birds are rich in microelements, among them are potassium, sulfur, phosphorus, natrium, chlorine, calcium, which are allocated by the quantity, as well as trace elements: iron, zinc, copper, fluorine that play an important role in metabolism. The bulk element is in association with proteins and other constituents of meat, which contributes to their high digestibility. In turn mineral substances activate protein digestibility and assimilability, which distinguishes them from similar ones contained in vegetable products or mineral feeds [9].

The findings of the mineral composition of broiler chicken meat are presented in Table 2.

Table 2 – Quantitative content of macro and microelements in meat of broiler chickens

Groups / Indexes	1	2	3	4	5
K, g/kg	3.32±0.1	3.47±0.1	3.50±0.2	3.49±0.1	3.54±0.4
Ca, %	0.12±0.10	0.21±0.05	0.40±0.03	0.13±0.23	0.14±0.21
Mg, g/kg	0.36±0.05	0.25±0.01	0.41±0.03	0.45±0.01	0.63±0.2
P,%	0.91±0.01	0.82±0.03	0.94±0.04	1.14±0.10	1.31±0.02
Cu, mg/kg	0.46±0.1	0,47±1.6	0.64±0,9	0.44±0.3	0.48±0.5
Na, g/kg	0.88±0.1	0.87±0.4	0.75±0.4	0.94±0.6	0.98±0.1
Fe, mg/kg	12.4±2.1	13.6±1.6	13.9±1.5	12.4±2.2	12.5±3.1
Mn, mg/kg	0.33±0.1	0.33±1.1	0.35±0.5	0.37±0.3	0.39±0.1

By analyzing obtained data of the mineral composition of meat, against the background of general decline in mineral substances in the meat of the experimental groups were not certain trends. There was an increase in the content of calcium by 0.02% and phosphorus by 0.4%, respectively. In the third group the pattern was more pronounced and the difference with the control was 0.40%, and 0.84%, calcium - 0.28%, phosphorus - 0.03%. In the fourth group were obtained results similar to the third. An increase in the content of these two the most important mineral substances contributes to an increase in the biological value of meat, since calcium is involved in the regulation of vascular endothelial vascularity, in the creation of bone tissue structure, and in blood coagulation. It stimulates the activity of the heart muscle, lowers the permeability of cell membranes, and participates in the regulation of the activity of many enzymes. Due to the increase in phosphorus content, the meat of experimental birds becomes more valuable, since phosphorus is an integral part of bones and teeth, a component of nucleic acids, phosphoproteins and phosphotides, is part of buffer systems, macroergic phosphates, participates in many metabolic reactions, primarily glycolysis, glycogenolysis and oxidative

phosphorylation. The biological significance of microelements in the animal organism is well known. Microelements actively participate in the basic functions of the body: the processes of growth, development, reproduction and maintenance of health and productivity. The results of the study of the content of iron, manganese and copper in the muscle tissue of chickens of the experimental groups indicate that the amount of iron was higher in the birds of the experimental groups. Thus, in the second experimental groups, this index in red muscle tissue exceeded the control one by 1.2 mg, in the third group - by 1.5 mg, and in the 5-th - by 0.1 mg. The content of iron in white muscle tissue in the second experimental group exceeded the control by 8.8%, while in the 3rd - 10.8%. This is obviously due to the fact that in these chickens under the influence of natural mineral most intensively proceeded processes of hematopoiesis, since iron plays an important role in the hematopoietic processes.

According to the content of manganese and copper, the meat of the experimental chickens did not differ, although there was a tendency to increase these values in the experimental groups. Thus, the use vermiculite had a positive effect on the state of mineral metabolism of the organism broiler chickens. A certain increase in the level of intensity of metabolic processes led to changes in the hematological pattern and biochemical indices of muscle tissue, and besides the natural mineral influenced mainly on the metabolism, the protective mechanisms of the poultry organism, and the assimilation of essential nutrients that are eventually affected the quality of poultry meat. After analyzing the obtained indexes of mineral composition of chicken meat in feed supplemented with feed additives based on vermiculite, we came to the conclusion that there was no definite tendency for a general decrease in mineral substances in the meat of broiler chickens of experimental groups.

Conclusion

Natural vermiculites in the feeding of broiler chickens are effective in cases when feeds containing vermiculite with a mass fraction of 5% during the growing period are used in broiler feeding. As can be seen from the obtained data, the use of mixed fodders containing vermiculite in feeding chicken broilers is effective. Significant economic effect in this case is manifested by saving feed, reducing morbidity, improving product quality.

References

1. Стратегия индустриально - инновационного развития РК на 2003-2015 годы: Утверждена Указом Президента РК 17.05.2003 года, № 1096 // Справочная правовая система ЮРИСТ.

2. *Ansenberger K., Richards C., Zhuge Y., Barua A., Bahr J.M., Luborsky J.L., Hales D.B.* Decreased severity of ovarian cancer and increased survival in hens fed a flaxseed-enriched diet for 1 year. Gynecol Oncol 2010; 117: 341–347.

3. *Битиева И.* Природные минеральные премиксы // Животноводство России. 2010. - № 3. - С. 26-27. Гаврикова Л.М. Совершенствование способов кормления и содержания птицы // Птица и птицепродукты. 2007. - № 1. - С. 35-37.

4. *Кузнецов С.Г.* Качество рационов – основа продуктивности птицы // Птицеводство.– 2010. – № 10. – С. 16.

5. *Tomanec R., Popov S., Vučinič D., Lazič P.* Vermiculite from kopaonik (yugoslavia) characterization and processing. Fizykochemiczne Problemy Mineralurgii 1997; 31: 247–254.

6. *Yildiz A., Yildiz K., Paydin B.* The effect of vermiculite as litter material on some health and stress parameters in broilers. Kafkas Üniversitesi Veteriner Fakültesi Dergisi. 2014.Vol. 20 No. 1 pp. 125-130.

7. *Polyakov V.V., Klimenko P.L.* Results of prospecting works on vermiculite in South Kazakhstan. Research and application of vermiculite, Leningrad. 44-40.

8. *Житенко П.В.* Ветеринарно-санитарная экспертиза и технология переработки птицы / П.В. Житенко, И.Г. Серегин, В.Е. Никитченко. – М.: «Аквариум» ЛТД 2001.-с.86.

9. *Булатов А., Душников Н., Миколайчик И.* Бентонит в рационах цыплят-бройлеров// Животноводство России. 2006. - Спец. выпуск по птицеводству. - С. 46-48.

Абдигалиева Т.Б., Сарсембаева Н.Б., Паритова А.Е., Бекберген А.Т.

ВЕРМИКУЛИТ НЕГІЗІНДЕГІ АЗЫҚТЫҚ ҚОСПАЛАРДЫ ҚОЛДАНҒАН ЖАҒДАЙДАҒЫ БРОЙЛЕР БАЛАПАНДАРЫ ЕТІНІҢ МИНЕРАЛДЫҚ ҚҰРАМЫ

Аңдатпа

Мақалада Қазақстанда өндірілген вермикулит негізіндегі азықтық қоспаларды қолданған кездегі бройлер балапандары етінің минералдық құрамының нәтижелері көрсетілген. Тәжірибеде жасы бір тәуліктен 42 тәулікке дейінгі (соуға жарамды) әр топта 20 бастан бөлінген бес топ балапандар қолданылды. Тіркеу мерзімі кезінде құстарды тамақтандыру берілген құсты өсіру ұсыныстарына сәйкес барлық құнарлы заттары теңестірілген ПК негізгі азықпен жүзеге асырылды. Тәжірибелік топтағы (2, 3, 4, 5) балапандар негізгі ас үлесіне қосымша азықтық қоспалармен азықтандырылды: сәйкесінше, 3%, 5% вермикулит және 3% (1%В+2%БҰ), 5% (1,5%В+3,5% БҰ) вермикулит балық ұнымен. Зерттеу нәтижелері бройлер балапандарының физиологиялық жағдайына жаңа азықтық қоспалардың қандай да теріс әсерінің жоқтығын көрсетті. Құстардың ас үлесіне вермикулитті қосу құс өнімділігінің биологиялық мүмкіндіктерін толық жүзеге асыруға ықпал етті және құстардың төзімділігі мен сақталу көрсеткішінің жоғарылығын қамтамасыз етеді.

Кілт сөздер: минералды құрамы, вермикулит, бройлер балапандары, азықтық қоспа, еттің сапасы.

Абдигалиева Т.Б., Сарсембаева Н.Б., Паритова А.Е., Бекберген А.Т.

МИНЕРАЛЬНЫЙ СОСТАВ МЯСА ЦЫПЛЯТ-БРОЙЛЕРОВ ПРИ ПРИМЕНЕНИИ КОРМОВЫХ ДОБАВОК НА ОСНОВЕ ВЕРМИКУЛИТА

Аннотация

В статье приведены результаты минерального состава мяса цыплят-бройлеров при применениий кормовых добавок на основе вермикулита Казахстанкого производства. В опыте использовались цыплята с суточного до 42-дневного (убойного) возраста, которые были сформированы в пять группы по 20 голов в каждой. На протяжении учетного периода кормление птицы осуществлялось основным рационом ПК, сбалансированными по всем питательным веществам в соответствии с действующими рекомендациями по выращиванию птицы данного кросса. Цыплята опытных групп (2-, 3-, 4-, 5-) дополнительно к основному рациону получали кормовые добавки: 3%, 5% вермикулита и 3% (1%В+2%РМ), 5% (1,5%В+3,5%РМ) вермикулит с рыбной мукой соответственно. Результаты исследований свидетельствовали об отсутствии какого-либо негативного воздействия новых кормовых добавок на физиологическое состояние бройлеров. Включение вермикулита в рацион птиц способствовало более полной реализации биологических возможностей продуктивности птицы и обеспечивает повышенную сохранность и резистентность птицы.

Ключевые слова: минеральный состав, вермикулит, цыплята-бройлеры, кормовая добавка, качество мяса.