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ТҮЙІН

Көптеген елдерде, соның ішінде ТМД-да желінсауына қарсы күрес бойынша мемлекеттік немесе ұлттық бағдарламалар құрылуда. Айта кету керек, желінсауға қарсы жоспарлы күресті жаппай ұйымдастыру (меншік түріне қарамастан) маңызды ұлттық экономикалық шара ғана емес, сонымен бірге экономикалық тұрғыдан да тиімді, өйткені желінсаудың келтірген зиян көлемі онымен күресті ұйымдастыруға қажетті мөлшерден әлдеқайда жоғары.

Ірі қара маститімен күресудің тиімділігі осы этиологияның негізгі себептерін дұрыс анықтаған кезде ғана болуы мүмкін. Сиырлардың бұл патологиясы әлі толық ашылған жоқ. Сондықтан желінсау этиологиясындағы микробтық фактордың ықтимал рөлін анықтауға бағытталған зерттеулер өзекті мәселе. Жұмыста сауын сиырлардағы клиникалық желінсаудағы микрофлораның нәтижелері келтірілген, олардың көпшілігінде стафилококктар (69,3%) және стрептококктар (24,4%) болған, бұл олардың осы аурудың пайда болуындағы басты рөлін атап өтуге мүмкіндік береді. Сауу және суалу кезеңдердегі жеңілсаудың негізгі қоздырғышы стафилококктар болып табылатыны анықталды, ал сары стафилококктың үлесі бөлінген микроорганизмдер санының 39,18% және 40,74% құрайды, коагулазды теріс стафилококктардың үлесі тиісінше 27,02 және 35,18% құрайды, лактация кезеңінде агалактиялық стрептококктарға тек 29,72% жатқызылды, ал суалу кезеңде 24,07%.

Осылайша, лактация кезеңіндегі сиырларда маститтің дамуындағы микробтық фактордың мүмкін болатын рөлін талдай отырып, желіннің әртүрлі жағдайларын ескере отырып, стафилококктар мен стрептококктар арасындағы қатынастың өзгеруіне ерекше назар аудару керек екенін атап өткен жөн.

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Nagimova G. Kh., Ph.D student, **the main author**, https://orcid.org/0009-0009-0298-5150,
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir khan», Uralsk, st. Zhangir khan 51, 090009, Kazakhstan, gauhar.nagimova@mail.ru
Montaeva N.S., Ph.D, Acting Associate Professir, https://orcid.org/0000-0003-2614-1592,
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir khan», Uralsk, st. Zhangir khan 51, 090009, Kazakhstan, montayeva-n@mail.ru
Kushmukhanov Zh., Ph.D, https://orcid.org/0000-0002-5132-7359
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir khan», Kazakhstan, Zhangir khan 51, Uralsk, Republic of Kazakhstan, jenis.90@mail.ru
Tolegen A.I., master of veterinary sciences, https://orcid.org/0009-0004-9620-5760,
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir Khan», Uralsk, st. Zhangir Khan 51, 090009, Kazakhstan, tolegen.ainur@mail.ru

INFLUENCE OF MINERAL FEED ADDITIVE OPOKA ON SANITARY-MICROBIOLOGICAL AND CHEMICAL INDICATORS OF BROILER CHICKEN MEAT

ANNOTATION

Currently, there is an urgent need to develop and use new feed additives for poultry. We conducted experiments to determine the quality of meat of broiler chickens after using the mineral feed additive of siliceous rock - opoka - in the diets of poultry. For this purpose, 3 groups of broiler chickens were formed according to the principle of analogues. The first group was the control group and received feed according to the scheme adopted on the farm. A mineral feed additive was included in the diets of chickens in the experimental groups.

The work is devoted to studying the influence of the feed additive opoka on the sanitary and microbiological chemical parameters of broiler chicken meat. According to the results of the study, it was established that the inclusion of a feed additive in the diet of chickens does not change the sanitary and microbiological qualities of meat in comparison with the control group. The chemical composition and calorie content are shown, and it is established that broiler meat is of good quality, has high energy and nutritional value, meets the requirements of hygienic standards, and can be sold without restrictions. According to the chemical composition, the meat had a greater amount of minerals, fat and protein, and was higher in calories than that of the control bird.

***Key words**: feed additive, opoka,broiler chickens, poultry meat, veterinary sanitary assessment*

Introduction. Currently, great importance is attached to maximizing the biologically beneficial properties of food raw materials and meat products, as well as protecting them from the effects of a variety of harmful biological, chemical and physical factors [1].

The influence of the mineral feed additive opoka on the sanitary-microbiological and chemical parameters of broiler chicken meat is an important topic for research, since the health of birds, their productivity and meat quality directly depend on the diet and use of additives.

Poultry meat contains biologically complete proteins, easily digestible fat and other components. It has high digestibility, caloric value and good taste qualities, since it differs in many respects from the meat of other slaughtered animals.

In the practice of veterinary pharmacology, fundamentally new compounds are increasingly being used, for example, biologically active feed additives with a high degree of digestibility, which can increase the biological and nutritional value of meat.

The use of mineral feed mixtures, particularly Opoka-mineral feed mixtures, in broiler production has garnered attention due to their potential impact on the physico-chemical and bacterioscopic indices of broiler meat. The incorporation of mineral additives in poultry diets has been shown to enhance growth performance, improve meat quality, and influence the microbial safety of poultry products. Research indicates that mineral feed additives, such as zeolites and aluminosilicates, can significantly improve the growth and health of broilers. For instance, Banaszak et al. demonstrated that the use of aluminosilicates in feed not only stimulates growth but also enhances the intestinal morphology of birds, thereby improving nutrient absorption and overall health [2]. Similarly, Kapitonova et al. reported that mineral feed additives can enhance meat quality, achieving high organoleptic indices and carcass yields [3]. These findings suggest that Opoka-mineral feed mixtures may similarly enhance the growth performance and meat quality of broilers. In terms of bacterioscopic indices, the microbial quality of poultry feed is critical for ensuring the safety of meat products. Studies have shown that feed contamination can lead to significant microbial loads, which may adversely affect meat quality and safety [4, 5]. The use of mineral feed additives has been associated with reduced microbial contamination in poultry feeds. For example, the incorporation of probiotics and phytobiotics has been shown to improve the microbial quality of feed and subsequently the meat produced [6]. Furthermore, the use of chelated minerals has been linked to improved nutrient digestibility and reduced excretion of minerals in litter, which can mitigate environmental pollution and enhance the overall health of the poultry [7]. Additionally, the physico-chemical properties of broiler meat, such as its chemical composition, are influenced by the type of feed provided. The inclusion of minerals and other additives can alter the amino acid and fatty acid profiles of the meat, leading to improved nutritional value [8]. The antioxidant properties of certain feed additives, such as ginger and carotenoids, have also been noted to enhance the oxidative stability of meat, thereby improving its shelf life and quality [9, 10]. In conclusion, the use of Opoka-mineral feed mixtures in broiler production appears to offer several benefits, including enhanced growth performance, improved meat quality, and better microbial safety. The integration of such mineral additives can play a crucial role in optimizing the nutritional profile of broiler meat while ensuring the health and productivity of the birds.

According to a number of scientists, changes in the biological value and chemical composition of meat can occur when biologically active additives are applied to the body of animals. They are used in animal diets as additional ingredients that increase productivity and improve the quality of livestock products. However, with all the variety of additives used in poultry farming, recommended for the bird's body as sources of essential amino acids, vitamins, microelements and other biologically active

substances, literary sources often lack data on the effect of the additives used on the quality of the resulting products. Therefore, the relevance of these studies is beyond doubt.

The problem of using the mineral feed additive opoka in the diet of broilers to increase the digestibility, assimilation of nutrients in feed and improve the quality of meat and by-products is relevant and requires further study.

In this regard, extensive and industrial tests were carried out to determine the effectiveness of the mineral feed additive opoka on broiler chickens. As part of this work, one of the tasks was to study the sanitary microbiological parameters of poultry meat when using a new feed additive in the diet.

The aim of the research was the sanitary assessment of the meat of broiler chickens that received different doses of the feed additive opoka in addition to the main diet.

The following tasks were defined:

- to test several doses of opoka in feeding broilers;
- to conduct a veterinary and sanitary assessment of the meat and by-products of broilers;
- to study the organoleptic, microbiological indicators and chemical composition of broiler meat.

Materials and methods of research. The research materials were carcasses and internal organs of ROSS-308 broilers.

The object of the study was the mineral feed additive of siliceous rock - opokka from the Taskalinsky deposit of the West Kazakhstan region. Production tests of the opoka feed additive were carried out at the «Zhardem Vet» clinic at the university. Laboratory studies of the carcasses were carried out by the veterinary and sanitary examination laboratories of the veterinary institute. To determine the effectiveness of the feed additive, three groups of broiler chickens of the ROSS-308 cross were formulated.

The slaughter of the experimental and control groups was carried out on the 42nd day of fattening, after which laboratory tests of the carcasses were carried out for physicochemical and microbiological parameters. For testing, 10 animals were selected from each group.

Post-mortem veterinary and sanitary inspection of chicken carcasses was carried out in accordance with the "Rules for veterinary inspection of slaughter animals and veterinary and sanitary examination of meat and meat products". Samples for research were taken in accordance with GOST R 53597-2009 "Poultry meat, by-products and semi-finished products from poultry meat. Methods of sampling and preparing them for testing. Organoleptic indicators were studied according to GOSTs R 52702-2006, R 51944-2002 and R 53747-2009. Microbiological indicators were determined according to GOSTs R 51448-99, 7702.2.0-95, R 53665-2009, R 50396.1-2010 and R 51921- 2002 in accordance with SanPiN 2.3.2.1078-01. The concentration of hydrogen ions was measured using a laboratory pH meter 1-2 hours after slaughter.

The study of physicochemical indicators of broiler meat allows us to objectively assess the freshness and quality of the products produced. During construction, the carcasses of all broiler groups were inspected for veterinary and sanitary assessment, which is a mandatory step in confirming the safety and compliance of products with sanitary standards.

The pH value can be determined using a potentiometer (pH meter), colorimetric method or indicator papers. Potentiometer measurements are intended for electrometric determination of hydrogen ion concentration: the electromotive force arising on the electrodes when they are immersed in the test solution is measured. Glass electrodes are used to determine the pH of meat. The pH determination range is from 1 to 9. To determine the pH of the meat samples (meat products) being studied, it is necessary to prepare an aqueous solution - an extract in a ratio of 1:10. To do this, 10 g of pure muscle tissue is finely chopped, ground with a pestle in a porcelain mortar, and a small part of the total amount of water (100 ml) is added. Then the resulting gruel is quantitatively transferred into a flask, the rest of the water is added. Insist for 30 minutes with periodic stirring, filter through a paper filter. The hydrogen index is determined according to the instructions attached to the device used.

When studying the concentration of hydrogen ions (pH), a shift towards acidity was noted, which indicates increased resistance of meat to putrefactive microorganisms. The differences in pH values between the categories of the 2nd, 3rd (5.62) and 1st (5.60) groups turned out to be insignificant, the deviation did not exceed 0.2 units.

To assess the freshness of the meat samples studied, several qualitative reactions were carried out. One of the key stages was the determination of the acid number of fat. The obtained values for both

groups were within 0.9 mg of KOH, which indicates that the samples met the established regulatory requirements.

The peroxide value of all broiler meat samples was measured at 0.1% iodine, which confirms the freshness of meat products from all groups. Meat samples are classified as fresh if the amino-ammonium nitrogen content does not exceed 1.26 mg. In this study, the average amino-ammonium nitrogen level of the samples ranged from 0.79 mg (group 2) to 0.80 mg (group 1). Qualitative reactions to peroxidase (positive) and copper (II) sulfate (negative) also confirmed the high quality of the studied broiler meat samples.

Protein in meat was determined in accordance with GOST 25011-81 "Meat and meat products. Methods for determining protein". The method is based on the mineralization of the sample according to Kjeldahl and photometric measurement of the color intensity of indophenol blue, which is proportional to the amount of ammonia in the mineralizate. To determine protein, it is necessary to plot a calibration graph.

Research results. The assessment of physico-chemical parameters of meat, allowing to control the change in its quality, was carried out 24 hours after slaughter in ripe meat. For the analysis of each carcass, a combined sample was made from the muscles of the chest and thigh, according to GOST 31470- 2012 "Poultry meat, offal and semi-finished products from poultry meat. Methods of organoleptic and physico-chemical research". According to the research results, it was found that the pH value of meat from broiler chickens of all groups ranged from 6.0, which corresponds to freshly ripened meat from healthy poultry. In the next series of experiments, the meat of broiler chickens from the experimental and control groups was examined for compliance with the "Hygienic requirements for food safety and nutritional value" (SanPiN 2.3.2.1078-01) according to microbiological indicators. The research results are presented in the table.

Table 1 – Results of microbiological studies of meat samples from experimental and control groups (n=10)

Name of quality and safety indicators	The value of indicators for SD	Control group result	Experimental group result
NMAFAnM (GOST R 50396.1-2010)	no more than $1*10^5$	no more than $1*10^5$	no more than $1*10^5$
Pathogenic, incl. salmonella (GOST 31468-2012)	in 25 g are not allowed	not found	not found
L. monocytogenes (GOST 32031-2012)	in 25 g are not allowed	not found	not found

Based on the results of the studies, it was established that in terms of bacteriological indicators, the meat of broiler chickens that received the mineral feed additive opok in their diet did not differ from those of control analogues, met the requirements of regulatory documentation, pathogenic microflora was not identified and the meat was recommended for sale on a general basis.

Pathogenic salmonella and L. monocytogenes were not detected in the studied samples.

Opoka, rich in natural minerals and trace elements, can have a positive effect on the metabolism and physiological processes of broilers, which, in turn, affects the chemical composition of their meat. The introduction of opoka into the diet of birds helps to increase the content of key nutrients, such as proteins and fats, as well as increase the energy value of the product.

One of the main criteria for assessing the quality of raw materials is nutritional value indicators, including the content of basic nutrients in the product (proteins, fats, carbohydrates, macro- and microelements) and the energy value of the product.

This study is devoted to studying the effect of flask on the chemical composition and nutritional value of broiler meat. For this purpose, the content of proteins, fats, moisture, ash and energy value was analyzed in the control group and two research groups where the flask was used in different quantities.

The purpose of the study is to identify patterns of changes in the composition of meat under the influence of flask, as well as to evaluate its effectiveness as a feed additive. The data obtained allow us to evaluate the potential of using flasks in industrial poultry farming to improve the quality of meat products.

The study of the chemical formation of broiler meat tissue allows us to assess the nutritional value of the resulting product. The most important parameter is the content of animal protein, which is necessary for various biochemical and humoral reactions in the human body. The full chemical composition and energy value of broiler meat samples is presented in Table 2.

Table 2 – Effect of opoka on the chemical composition and nutritional value of broiler meat

Options	Units of measurement	Research groups		
		Control	Group 1	Group 2
Proteins	g/100g	18.73±0.73	19.27±0.76	19,71±0,75
Fats	g/100g	11.29±0.46	13.65±0.49	15,14±0,61
Moisture	g/100g	69.08±2.78	66.16±2.71	64,20±2,57
Ash	g/100g	0.90±0.037	0.92±0.037	0,95±0,039
Energy value	kcal/100g	176.5±7.28	200.0±7.81	215,1±8,71

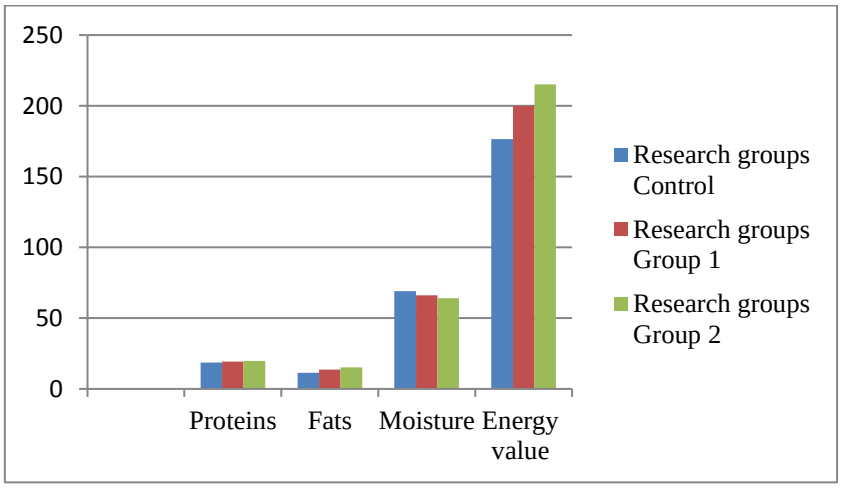

Figure 1 – Dynamics of the effect of opoka on the chemical composition and nutritional value of broiler meat

The table shows the effect of flask on the chemical composition and nutritional value of broiler meat in the control group (without flask) and two research groups (group 1 and group 2). The analysis is carried out to compare the control group with group 1 and group 1 with group 2 in order to identify changes in the chemical composition of meat under the influence of the flask.

Comparison of the control group with group 1. Increase in protein content by 2.88% (difference 0.54 g/100g). This shows that the use of flask contributed to the increase in protein content in meat. Protein is an important component of nutritional value, so this improvement indicates an increase in meat quality.

Increase in fat content by 20.90% (difference 2.36 g/100g). A significant increase in fat content improves the calorie content of meat, making it more energy-rich. This may be due to the effect of flask on the metabolism of fats in poultry.

Reduced moisture content by 4.23% (difference 2.92 g/100g). The decrease in moisture may be due to an increase in dry matter (protein and fat) in the meat, which improves its texture and consistency.

Discussion. The incorporation of Opoka-mineral feed mixtures in broiler diets has significant implications for the physico-chemical and bacterioscopic indices of broiler meat. The physico-chemical properties, including pH, color, and texture, are crucial indicators of meat quality, and various studies have documented the effects of dietary supplements on these characteristics.

One of the primary physico-chemical parameters affected by feed composition is the pH of the meat. A higher pH in broiler meat can lead to reduced shelf life and increased susceptibility to spoilage due to microbial growth. Research by Kim et al. indicates that the pH of meat can increase during storage due to the accumulation of metabolites from bacterial action, which is a concern for meat quality and safety Kim et al. [11]. Similarly, Arshad et al. found that diets enriched with natural antioxidants resulted in higher pH levels in meat, suggesting a correlation between dietary components and meat quality [12]. This highlights the importance of managing dietary formulations to optimize meat quality and shelf stability.

Color attributes, such as lightness, redness, and yellowness, are also influenced by the type of feed provided to broilers. Grigore et al. reported that the supplementation of yeast bioproducts in broiler diets improved the color parameters of thigh meat, indicating a positive effect on the visual appeal of the meat [13]. The color of meat is not only a critical factor for consumer acceptance but also reflects the underlying chemical composition, including myoglobin content, which is affected by the dietary intake of minerals and antioxidants [14].

The chemical composition of broiler meat, including fat content and fatty acid profiles, is another area significantly influenced by dietary supplements. Studies have shown that the inclusion of selenium and other minerals in broiler diets can enhance meat quality by reducing lipid oxidation, which is crucial for maintaining the freshness and flavor of the meat [15, 16]. The presence of antioxidants in the feed, such as those derived from herbal sources, has been shown to improve the oxidative stability of meat, thereby enhancing its quality and shelf life [17].

Bacterioscopic indices, which refer to the microbial load in meat, are critical for ensuring food safety. The use of mineral feed mixtures has been associated with lower microbial counts in broiler meat, as evidenced by the findings of Ferdous et al., who noted that the inclusion of probiotics and phytobiotics in feed significantly reduced total coliform counts in broiler meat [18]. This reduction in microbial load is essential for improving the safety and quality of poultry products, as high microbial counts can lead to foodborne illnesses and spoilage.

Furthermore, the overall health and immune response of broilers can be positively influenced by the dietary inclusion of minerals and probiotics, leading to healthier meat with better quality indices. Studies have shown that dietary supplements can enhance the gut microbiota, thereby improving nutrient absorption and reducing the incidence of pathogenic bacteria [19, 20]. This not only contributes to better growth performance but also results in meat with improved physico-chemical properties.

The meat of broiler chickens in the experimental and control groups that received the drug abiopeptide-plus does not have significant differences in physicochemical parameters, and also in the microbiological parameters of the muscles of broiler chickens in the experimental and control groups does not exceed the MPL. Data from the studies confirm that the feed additive abiopeptide-plus is safe when used in industrial poultry farming.

When microscopying smear impressions made from the surface of the muscles, the meat of the experimental poultry according to NMAFAnM had less contamination than the control analogues. In terms of the chemical composition, the meat of broilers receiving nano-sized bentonite had a greater amount of minerals, fat and protein, and was more nutritious than that of the control birds.

In conclusion, the use of Opoka-mineral feed mixtures in broiler diets has a multifaceted impact on the physico-chemical and bacterioscopic indices of broiler meat. By optimizing dietary formulations, producers can enhance meat quality, improve safety, and meet consumer demands for high-quality poultry products.

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ТҮЙІН

Қазіргі таңда ауылшаруашылық құстарына арнап жаңа жемшөп қоспаларын жасап, қолданудың шұғыл қажеттілігі туындап отыр. Бройлер тауықтарының рационында кремнийлі тау жынысының минералды азықтық қоспасы – опоканы қолданғаннан кейін бройлер тауықтарының етінің сапасын анықтау мақсатында тәжірибелер жүргіздік. Осы мақсатта аналог принципі бойынша бройлер тауықтары балапандарынан 3 топ құрылды. Тәжірибе топтарындағы тауықтардың рационына минералды азық қоспасы енгізілді.

Жұмыс бройлер тауық етінің санитарлық-микробиологиялық және химиялық көрсеткіштеріне опока - жемдік қоспаның әсерін зерттеуге арналған. Зерттеу нәтижелері бойынша бройлер балапандары рационына азық қоспасын қосу бақылау тобымен салыстырғанда еттің санитарлық және микробиологиялық сапасын өзгертпейтіні анықталды. Химиялық құрамы мен калориялылығы көрсетіліп, бройлер етінің сапалы, энергетикалық және тағамдық құндылығы жоғары, гигиеналық стандарт талаптарына сай келетіні, шектеусіз шығаруға болатындығы анықталды. Химиялық құрамы бойынша ет бақылау топтағы бройлер балапандарына қарағанда минералды заттардың, майдың және ақуыздың көп мөлшеріне ие болды және калориялары жоғары болды.

РЕЗЮМЕ

В настоящее время назрела необходимость в разработке и применении для сельскохозяйственной птицы новых кормовых добавок. Нами были проведены опыты по определению качества мяса цыплят-бройлеров после применения минерально кормовой добавки кремнистой породы - опоки в рационах цыплят-бройлеров. Для этого по принципу аналогов было сформировано 3 группы цыплят-бройлеров. Первая группа была контрольной и получала комбикорма по принятой в хозяйстве схеме. В рационы цыплят опытных групп была включена минеральная кормовая добавка.

Работа посвящена изучению влияния кормовой добавки опоки на санитарно-микробиологические химические показатели мяса цыплят-бройлеров. По результатам исследования установлено, что включение в рацион цыплят кормовой добавки не изменяет санитарно-микробиологические качества мяса в сравнении с контрольной группой. Показан химический состав и калорийность, и установлено, что мясо бройлеров является доброкачественным, имеет высокую энергетическую и пищевую ценность, соответствует требованиям гигиенических нормативов, и может реализовываться без ограничений. По химическому составу мясо имело большее количество минеральных веществ, жира и белка, и было более калорийным, чем у контрольной птицы.

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Кошеметов Ж.К., биология ғылымдарының докторы, профессор, **негізгі автор**, https://orcid.org/0000-0003-2718-6506
«Биологиялық қауіпсіздік проблемаларының ғылыми-зерттеу институты» ЖШС, Жамбыл облысы, Қордай ауданы, Гвардейский қтқ, Б. Момышұлы көшесі 15, 080409, Қазақстан, zh.koshemetov@biosafety.kz
Оразымбетова Н.К., аға ғылыми қызметкер, https://orcid.org/0000-0003-2049-686X
«Биологиялық қауіпсіздік проблемаларының ғылыми-зерттеу институты» ЖШС, Жамбыл