

ANNOTATION

**of the dissertation work by Kauimbayeva Moldir on the topic:
“Veterinary and Sanitary Assessment of Broiler Meat while Using Nontraditional
Feed Additive «ShungiKus», submitted in fulfillment of the requirements for the
degree of Doctor of Philosophy (PhD) of educational program 8D09102 –
«Veterinary Sanitation»**

Relevance of the research topic. Poultry farming is currently one of the most dynamically developing and strategically important sectors of agriculture. Its rapid expansion is primarily driven by the high economic efficiency of poultry meat and egg production compared to other branches of animal husbandry. In addition, the high dietary value and nutritional quality of poultry products contribute to a steady increase in consumer demand. The combination of these factors enhances production efficiency and ensures the sustainable growth of poultry meat and egg output. However, feed resources used in poultry production do not always fully meet biological safety requirements. In particular, such feeds are susceptible to contamination by mould fungi that produce mycotoxins. In this regard, in recent years special attention has been given to feed additives based on natural minerals. These additives are capable of binding mycotoxins, reducing their toxic effects, enriching feed with mineral elements, and improving nutrient digestibility. Furthermore, they help reduce the toxic load on the organism, improve the physiological condition of poultry, and enhance productivity. In recent years, scientific and practical interest in non-traditional mineral feed additives has significantly increased. One such natural mineral is shungite.

Shungite is a rare naturally occurring black carbon-containing mineral. Due to the peculiarities of its structure, it is easily pulverized, which makes it suitable for use as a feed additive. Its chemical composition contains more than 30 elements, some of which may contribute to meeting the physiological needs of the avian organism. In addition, a special form of carbon—fullerenes—has been identified in shungite. These compounds, due to their unique molecular structure, possess high reactivity. Shungite is characterized by its ability to participate in redox reactions, as well as by pronounced sorption and catalytic properties. Owing to these characteristics, it is capable of binding harmful impurities, neutralizing toxins, and enhancing the biochemical stability of the environment. Therefore, it can be widely used in veterinary medicine, agriculture, human medicine, and various industrial sectors.

Although the mineral composition of shungite is based on a carbon structure similar to graphite, it differs from it and belongs to a special type of fullerene-like carbon characterized by a unique molecular, atomic, and layered structure. Research on this mineral has been conducted for more than two centuries. At present, a wide range of applications has been developed across various sectors of the national economy. In particular, it is widely used in water purification systems as a filtration material, in veterinary medicine as an agent with antioxidant and anti-inflammatory properties, as well as a sorbent and feed additive. Shungite is distinguished by its high adsorption, catalytic, antioxidant, regenerative, and antibacterial properties. Moreover, its environmental safety and relatively low cost allow it to be considered as an alternative

to activated carbon. The presence of novel structural forms of carbon and unique properties in shungite provides a basis for its further in-depth investigation. Research in this direction opens up opportunities for developing new technologies for obtaining fullerenes and other carbon nanostructures based on shungite, as well as their effective practical application.

The reserves of shungite raw materials within the country are estimated at millions of tons. In Kazakhstan, a number of shungite deposits have been identified, including Koksu, Mayak, Akbalshik, Klubnichnoe, Ilichebek, Yeskenzhol, as well as Bakyrshik and other deposits. Among these sites, special attention as a primary raw material source is given to the shungite-bearing rocks of the «Bakyrshik» deposit located in the East Kazakhstan region. According to geological exploration data, the shungite reserves at this deposit are estimated at approximately 30 million tons. The results of elemental analysis show that in shungite samples from the «Bakyrshik» deposit, after flotation, there is a significant increase in the content of carbon, nitrogen, hydrogen, and sodium, while the proportion of elements such as silicon, aluminum, magnesium, potassium, calcium, and iron decreases.

At present, research on shungite and its application in various fields within the country is still at an early stage of development; however, there is a high level of scientific interest in this mineral. Both domestic and international researchers are comprehensively studying the physicochemical properties of shungite and its potential for effective use in veterinary medicine, agriculture, and other industries.

Objective of the dissertation research - Veterinary and Sanitary Assessment of Broiler Meat while Using the Nontraditional Feed Additive «ShungiKus»

Research objectives:

1. To study the production technology of shungite and the veterinary and sanitary requirements for it;
2. To develop the technology for preparing the non-traditional feed additive «ShungiKus» and evaluate its toxicological effects on laboratory animals;
3. To investigate the chemical and mineral composition of experimental feed rations for broilers;
4. To determine the effect of the feed additive «ShungiKus» on productivity and hematological parameters of broilers;
5. To conduct a veterinary and sanitary assessment of broiler meat quality;
6. To study the effect of the feed additive on the chemical, mineral, and amino acid composition of poultry meat;
7. To determine the residual levels of heavy metals in meat;
8. To perform morphohistological studies of muscle tissue and internal organs of poultry.

Materials and Methods of the Study

Objects of the study: Natural mineral shungite and the non-traditional feed additive «ShungiKus» developed on its basis, as well as broilers raised using this feed additive, and their meat and internal organs (muscle tissue, liver, kidneys, etc.).

Research methods: The study employed a complex of veterinary-sanitary, hematological, toxicological, morphohistological, and statistical methods. Growth performance of broiler chickens, hematological and biochemical blood parameters,

chemical, mineral, and amino acid composition of meat and eggs, residual levels of heavy metals, as well as histological structure of internal organs and muscle tissue were evaluated in accordance with standard laboratory methodologies.

Main provisions submitted for defense:

- development of the non-traditional feed additive «ShungiKus» based on the local mineral shungite and investigation of its toxicological effects;
- determination of the effect of the feed additive «ShungiKus» on broiler productivity and hematological blood parameters;
- veterinary and sanitary evaluation of the feed additive's influence on broiler meat quality, including its chemical, mineral, and amino acid composition;
- study of the effect of the feed additive «ShungiKus» on the reduction of residual heavy metal contents (Cd, Pb, etc.) in poultry meat;
- morphohistological investigation of muscle tissue and internal organs of broilers under the application of the feed additive.

Description of the main research results

The results of the conducted study showed that the inclusion of the non-traditional feed additive «ShungiKus», developed on the basis of the natural mineral shungite, in the diet of broiler chickens has a positive effect on their productive and quality indicators. In particular, improvement in growth performance, an increase in the chemical, mineral, and amino acid composition of meat, as well as a reduction in residual heavy metal contents were observed in the experimental groups.

In addition, hematological and biochemical blood parameters remained within physiological norms, indicating a stable overall physiological condition of the birds.

Morphohistological analysis revealed no pronounced pathological changes in the muscle tissue, liver, kidneys, and intestines; the structural integrity of these organs was preserved.

Overall, the obtained data confirm that the feed additive «ShungiKus» is an effective biological agent that improves the veterinary and sanitary quality of broiler meat and contributes to the production of environmentally safe poultry products.

Justification of the novelty and significance of the obtained results

The scientific significance of the study is determined by a comprehensive assessment of the effects of the non-traditional feed additive «ShungiKus», developed on the basis of the natural mineral shungite, on physiological, biochemical, and morphohistological changes in the broiler organism.

Within the framework of the research, scientifically substantiated changes in macro- and microelement metabolism in the poultry organism were established, as well as the specific features of the formation of the chemical, mineral, and amino acid composition of meat. In addition, mechanisms for the reduction of residual heavy metal contents were identified. Furthermore, new data were obtained on the detoxification and metabolic effects of the sorption and biologically active properties of shungite in the poultry organism.

The obtained results contribute to scientific knowledge in the fields of veterinary and sanitary expertise, poultry product safety, and evaluation of nutritional quality, and may also serve as a theoretical basis for the development of new feed additives.

Description of the doctoral candidate's contribution to the preparation of each publication. Under the supervision of academic advisors, the doctoral candidate has published 4 scientific papers, including **3 articles** in journals indexed in the Scopus database.

1. Sarsembayeva N., Abdigaliyeva T., Omarkulova Z., Kauymbayeva M., Ustenova G., Lozowicka B., Yefremov S., Ibragimov P. Effect of Primary and Active Shungite on the Quality of Feed, Meat and Eggs of Broilers // International Journal of Veterinary Science. — 2025. — Vol. 14, № 1. — P. 171–180. — DOI: <https://doi.org/10.47278/journal.ijvs/2024.234>.

2. Sarsembayeva N., Kauymbayeva M., Abdigaliyeva T., Lozowicka B., Yefremov S., Ibragimov P. Veterinary and Sanitary Parameters and Histological Characteristics of Muscle Tissue and Internal Organs of Broilers when Using the Shungikus Non-Traditional Feed Additive // International Journal of Veterinary Science. — 2025. — DOI: <https://doi.org/10.47278/journal.ijvs/2025.xxx>.

3. Sarsembayeva N., Abdigaliyeva T., Kauymbayeva M., Yefremov S., Ibragimov P., Omarkulova Z., Lozowicka B. Influence of Activated Shungite on Quail Productivity and the Biometrical Parameters and Chemical Composition of Quail Eggs // International Journal of Veterinary Science. — 2025. — Vol. 14, № 5. — P. 900–911. — DOI: <https://doi.org/10.47278/journal.ijvs/2025.039>.

1 article was published in a scientific journal recommended by the Committee for Control in the Sphere of Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan.

Omarkulova Zh.K., Sarsembayeva N.B., Kauymbayeva M.Sh., Ustenova G.O., Yefremov S.A. Analysis of patent documentation on the use of shungite in pharmacy, medicine, cosmetology, and veterinary medicine // Pharmacy of Kazakhstan. – 2024. – No. 4 (255). – pp. 252–263. DOI: <https://doi.org/10.53511/pharmkaz.2024.57.48.029>

2 patents for a utility model of the Republic of Kazakhstan have been obtained:

1. Method of feeding broilers with a mineral feed additive. 02.05.2025, No. 9935. Authors: Sarsembayeva N.B., Omarkulova Zh.K., Abdigaliyeva T.B., Kaumbaeva M.Sh., Zhumageldiev A.A., Akkozova A.S., Alimov A.A.;

2. Method of feeding broilers with a biologically active feed additive. 02.05.2025, No. 9936. Authors: Sarsembayeva N.B., Omarkulova Zh.K., Abdigaliyeva T.B., Kaumbaeva M.Sh., Ustenova G.O., Ibragimov P.Sh., Akkozova A.S.

Volume and structure of the dissertation. The dissertation is presented on 120 pages of computer-typed text (formatted on 153 pages including appendices) and consists of an introduction, literature review, materials and methods of research, results of original research, generalization and evaluation of research results, conclusion, list of references, and appendices. The dissertation is illustrated with 23 tables and 17 figures. The reference list includes 197 sources.