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CHLORELLA – REPRESENTATIVE OF GREEN ALGAE USE OF CHLORELLA IN POULTRY FARMING

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Annotation. *The deterioration of the ecological parameters of the natural environment due to the increasing influence of the anthropogenic factor leads to a decrease in the content of micro- and macroelements and organic substances in animal feed. One of the ways out of this situation is the use of plant materials, hydrobionts, fungi, biotic elements and a number of other products of natural origin, one of which is the green microscopic algae - chlorella. The article is devoted to the technology of growing Chlorella vulgaris and its use as a premix for farm animals.*

Key words: *chlorella, microscopic algae, nutrient medium, protein, carbohydrates, lipids, vitamins, suspension, food.*

ХЛОРЕЛЛА – ПРЕДСТАВИТЕЛЬ ЗЕЛЕНЫХ ВОДОРОСЛЕЙ ИСПОЛЬЗОВАНИЕ ХЛОРЕЛЛЫ В ПТИЦЕВОДСТВЕ

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Аннотация. *Ухудшение экологических показателей природной среды вследствие усиления влияния антропогенного фактора приводит к снижению содержания микро- и макроэлементов и органических веществ в кормах для животных. Одним из выходов из этой ситуации является использование растительного сырья, гидробионтов, грибов, биотических элементов и ряда других продуктов природного происхождения, одним из которых является зеленая микроскопическая водоросль - хлорелла. Статья посвящена технологии выращивания хлореллы обыкновенной и использованию ее в качестве премикса для сельскохозяйственных животных.*

Ключевые слова: *хлорелла, микроскопические водоросли, питательная среда, белок, углеводы, липиды, витамины, суспензия, пища.*

The deterioration of the environmental situation, which arose in the process of technogenic pressure, is a serious obstacle to providing the population of our

country with environmentally friendly food [2; 3]. Technogenic pollution directly or indirectly, through complex biogeocenotic chains, affects the human body and animals, as a result of which the morbidity and mortality of animals increases, and their productivity decreases.

One of the reasons for this situation is the use in livestock farming of drugs obtained by chemical synthesis and antibiotics as fertilizers and prophylactic agents [1; 2; 3].

In accordance with the European Union's requirements for the safety of feed and food products, established since January 2006, a ban on the use of a number of antibiotics and other drugs obtained by chemical synthesis forces producers to look for alternative replacements. In this regard, the search for effective and safe sources of raw materials for the development of premixes and medicinal products is currently of particular relevance. One of the ways out of this situation is to use plant materials, hydrobionts, fungi, biotic elements and a number of other products of natural origin as alternative sources.

Chlorella is an active producer of proteins, carbohydrates, lipids and vitamins, with an easily adjustable ratio of these compounds when changing cultivation conditions: if, when grown on ordinary mineral media, its dry biomass contains 40-55% protein, 35% carbohydrates, 5-10% lipids and up to 10% minerals, then by changing the ratio of the components of the medium it is possible to obtain biomass of the required composition: 9-88% protein, 5-86% lipids, 6-38% carbohydrates. Chlorella develops on a nitrogen-rich medium, accumulates predominantly protein; when nitrogen is deficient, it synthesizes mainly fats and carbohydrates; the addition of glucose and acetate to the medium leads to an increase in the content of carotenoids, etc. In terms of the quality of the proteins and vitamins produced, chlorella surpasses all known feed and food products - protein contains all the necessary amino acids, including essential ones. By correctly selecting a nutrient medium, the necessary ratio of various substances is formed in terms of quantitative and qualitative indicators.

Chlorella can be grown both on mineral media and on media of natural organic fertilizers; waste from livestock and poultry complexes, as well as domestic and industrial wastewater can be used.

The chemical composition of chlorella is subject to significant fluctuations depending on growing conditions. When chlorella is grown on mineral media, it accumulates more protein and carotene, and on organic media it accumulates more fat and carbohydrates [3; 5].

Recently, in the livestock industry, the question of the need to introduce new technologies for keeping and feeding farm animals has increasingly arisen. One of them is the use of chlorella biomass as a feed additive and preventive agent against diseases. Its introduction in the form of a suspension into the diet of animals and birds can significantly replace expensive vitamin and drug preparations.

Chlorella is a representative of green algae - microscopic aquatic plants, which includes 20 species. The most famous and widespread is Chlorella vulgaris, which forms huge clusters in ditches, ponds and muddy puddles. Chlorella is widespread almost everywhere, as it is undemanding to the environment and multiplies quite quickly. Representatives of the genus can be found in fresh and salty bodies of water and highly moist soils.

The study of the properties and cultivation of chlorella is of interest due to its usefulness when used as feed additives and intensive accumulation of biomass. It is used for experimental experiments in ecological closed life support systems. Representatives of this genus release a lot of oxygen during photosynthesis during their life. This feature made it possible to use it for air regeneration in spaceships and submarines.

Algae protein contains many useful vitamins, microelements and amino acids. In terms of nutritional value, it is compared to beef meat. Chlorella is also used to make medications - it enhances the protective functions of the immune system, is an analgesic, reduces blood pressure, and removes heavy metal compounds. Algae is also used for wastewater treatment.

For the industrial cultivation and use of microscopic algae, including Chlorella vulgaris, it is necessary to create favorable conditions (lighting and temperature, carbon dioxide concentration, mixing) and select an optimal nutrient medium that satisfies the physiological needs of the algae for growth and development. The nutrient medium in its composition must correspond to the conditions under which the species lives in nature. Nutrient media used for the

cultivation of Chlorella vulgaris contain macro- and microelements that ensure normal cell functioning.

Based on the above, the purpose of this work is to determine the optimal nutrient medium for the cultivation of chlorella.

Materials and methods. Research work was carried out in the laboratories of the departments of ❸Pharmacology and Toxicology❾ and ❸Biotechnology❾ of the Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology.

The subject of the study was microscopic algae - chlorella. As a cultivation medium, we used a special medium with a certain concentration of mineral elements (KNO3 - 0.1%, Ca(NO3)2 - 0.01 g/l, K2HPO4 - 0.02 g/l, MgSO4 * 7H2O - 0.01 g/l, FeCl3 * 6H2O * 0.0001 g/l) based on farm wastewater, as well as in the form of control options, a medium made of mineral elements (Knop solution) and on livestock wastewater. The prepared media were poured into 3 flasks with a capacity of 500 ml, 300 ml in each.

30 ml of chlorella stock suspension was added to each flask. The results were taken into account by changes in the optical density of the culture after 24, 48 hours and on the 8th day of the experimental period.

Research results. The chemical composition of chlorella is subject to significant fluctuations depending on growing conditions. When chlorella is grown on mineral media, it accumulates more protein and carotene, and on organic media it accumulates more fat and carbohydrates. Studies have established that the growth rate of microalgae varies depending on the nutrient medium. At the same time, during the first day, an increase in the number of cells was observed in all flasks studied. In particular, in the first variant the amount of chlorella increased 4 times. In the second and third flasks, with the corresponding nutrient media, 1.0 and 1.4 mg, respectively.

Accounting of the results, carried out after 48 hours of cultivation, showed that in the first flask the number of chlorella, in relation to the initial indicators, increased by 3.7 times, in the second - 1.5, in the third - 1.2 times. By the end of the study (day 8), the amount of chlorella in the first flask increased 8.5 times, in the second ☙ 5.3 times. In the third flask with waste water, the number of cells increased in small quantities (3.2 times).

We also determined the amount of total and individual wet and dry biomass of Chlorella vulgaris studied in vitro. It has been established that algae produce different amounts of biomass on nutrient media ❸04❾ and Knop in laboratory conditions.

The wet and dry biomass of algae was determined 15-18 days after planting them on nutrient media. For this purpose, algae cultures grown in 100-250 ml flasks and aquariums were used.

To determine the biomass of the resulting chlorella, clean filter paper was first weighed on an electronic balance. The flask in which the algae was grown was thoroughly shaken. Then 10 ml of algae suspension was taken, poured onto filter paper and weighed together with the paper. The result obtained was multiplied by 100. The resulting number is the mass of chlorella in 1 liter of nutrient medium.

Then, together with the filter paper, they were kept in an oven at a temperature of 105°C for 30 minutes. The filter paper was then weighed again. This number is subtracted from the previous number and converted to 1 liter. The resulting number is the dry biomass of chlorella.

The experimental results are presented in Table 1.

1-table

Amount of wet and dry biomass of Chlorella vulgaris.

Nutrient medium	Biomass amount mg/l	
	Wet biomass	Dry biomass
«04»	111,9±1,2	1, 2122±0,5
Knop	103,3±2,2	1, 1002±1,1

When growing algae on the Knop nutrient medium for 15-18 days, it was found that the result was slightly lower than on the 04 nutrient medium. According to the data presented in Table 1, it can be seen that the nutrient medium ❽04❾ is up to 10% more effective than the Knop nutrient medium.

The grown chlorella was used as a dietary supplement to the main feed for Japanese quails.

Quail farming is a cost-effective industry. This is due to the high physiological precocity of quails, the small areas required for poultry breeding, the high quality of quail eggs and meat, resistance to diseases and many other indicators [3].

One of the promising directions for increasing the productivity of quails is the inclusion of various biological additives and non-traditional feeds in their diet. Among dietary supplements, one of the most promising is chlorella.

The real purpose of our research was to study the effect of the feed additive of chlorella suspension on the productivity of quails (egg production, egg quality and meat).

For the study, three groups of quails were formed: the first - control, the second and third groups - experimental. During the research, the experimental second group was given a multivitamin complex for poultry, and the third group of quails, throughout the entire production cycle of poultry use, was given a suspension of chlorella (Chlorella vulgaris strain IFR No. C-111 at a concentration of 30-40 million cells in 1 ml) in the diet in the amount 2.0% by weight of the feed, respectively. Chlorella suspension was not included in the diet of the control and first experimental groups.

Our research has established that the introduction of a chlorella suspension into the diet of quails affected the feed intake of quails in the experimental groups. Thus, in the control it was 85.3%, and in the first and second experimental groups it was almost the same - 98.5-98.7%.

Chlorella has been found to have beneficial effects on meat and egg quality due to increased concentrations of omega-3 polyunsaturated fatty acids and carotenoids, as well as on performance indicators and immune function [3].

In our studies, we determined the dynamics of body weight growth in quails over a period of 60 days. The live weight of the quails of the experimental group at the beginning of the experiment was 76.6 g, at the end of the experiment - 186.2 g; in the second experimental group -80.9 and 153.4 at the beginning and at the end of the experiment, in the control group - 80.2 g and 147 g, respectively. The death rate of quails by the age of 60 days in the experimental group 1 was 2 pieces, in the second group 1 piece, and in the control group 5 pieces. The safety of quails at 60 days of age was 90% in the 1st experimental group, 95% in the second experimental group, and 80% in the control group, respectively.

And so, the inclusion of Chlorella vulgaris in the diet of quail poultry makes it possible to improve zootechnical and economic indicators, in particular, improve their safety, increase the live weight of quails by 9.8%; reduce quail mortality.

Conclusions. Thus, we can conclude that chlorella can be grown on pure mineral media, but then the amount of biomass formed will be less than in a balanced (mineral elements + mullein) nutrient medium.

In the studies carried out, intensive growth of chlorella was observed when using the nutrient medium ❽04❾, enriched with mineral elements with the addition of mullein.

It is safe to say that when growing quails, adding chlorella to feed has a positive effect on increasing live weight.

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