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Organoleptic Evaluation of Quail Meat Using Chlorella Vulgaris Microalgae Biomass in the Diet

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ANNOTATION
Currently, poultry farming is one of the most rapidly developing branches of animal husbandry. The development of this industry is inextricably linked with the introduction of new technologies, as well as the use of biologically active feed additives that stimulate the viability, growth rates and productivity of poultry. The main preference is given to the use of additives of natural origin. Most often, plant components are introduced into the poultry diet, which allow enriching the feed not only with vitamins and microelements, but also with plant protein and essential amino acids. Our task was to study the influencemicroalgae Chlorella vulgarisfor veterinary and sanitary assessment of the quality of slaughter products of Texas quail. For this purpose, 4 groups of quails aged 1 day were formed on the basis of the farm of Z.I. Alimchueva of the Republic of Mari El, 50 heads in each group.Birds of all groups received compound feed PK-5 start 1-3 weeks, from 4-7 weeks PK-5 growth. The first experimental group received dry biomass of microalgae Chlorella vulgaris with feed daily at a dosage of 2 mg/kg of live weight, the second experimental group - 4 mg/kg of body weight, the third - 6 mg/kg of body weight.. In each group, 5 carcasses were selected for organoleptic and physicochemical evaluation of slaughter products. Poultry meat, in the diet of which amaranth was included, met the organoleptic, physicochemical and bacteriological indicators of the GOST requirements for fresh meat of good quality.
Keywords: *organoleptic evaluation, quail, qualitative characteristics of meat, qualitative reaction, tasting.*

INTRODUCTION

One of the main tasks in the livestock industry is to obtain quality products, while not forgetting about the economic benefits of production. That is why a promising direction for reducing costs is improving the feed base for farm animals. One of these directions has become the introduction of natural plant components in an easily digestible form into the diet [1].

Natural biologically active additives have become especially popular in the poultry industry, demonstrating their effectiveness and allowing to increase profitability in the process of industrial poultry farming. The use of premixes is aimed at balancing rations for missing nutritional elements, improving the digestibility of basic feeds, increasing the digestibility and use of nutrients in rations, and improving the quality of products. It should not be overlooked that the quality characteristics of meat products depend on many factors, among which the initial place is occupied by the original quality of meat raw materials [2].

At present, many agricultural specialists consider the forage crop amaranth to be one of the most profitable plant resources. Amaranth is of particular value as a protein-containing crop, which is not inferior in amino acid content to legumes and forage lupine. In terms of protein output per hectare, amaranth is 3-4 times superior to corn, as well as legumes, soybeans, rapeseed, alfalfa and other protein crops [3].

Recently, the problem of the need to introduce resource-saving technologies for keeping and feeding poultry has increasingly arisen in agriculture. One of them is the use of chlorella biomass as a vitamin-feed additive and a preventive measure against diseases. Its introduction in the form of a suspension into the poultry diet allows to replace expensive vitamin and medicinal preparations to a significant extent [4,5].

Chlorella is a genus of single-celled green algae that surpasses all plant feeds and agricultural crops in vitamin content. Chlorella is an active producer of proteins, carbohydrates, lipids, and vitamins [6].

The high economic efficiency of using chlorella in poultry farming lies in its high concentration and rich set of biologically active substances in an easily digestible form for the bird's body, the low cost of the suspension, and its availability and ease of cultivation directly on farms.

Currently, the human habitat, as well as that of farm animals, is constantly threatened by resource

depletion. Often, available crop areas and natural forage lands do not always provide agricultural producers with the ability to organize adequate feeding of farm animals and aquaculture objects [7].
In the conditions of industrial breeding of animals and poultry, the diet has changed significantly. Most large farms and agro-holdings have switched to feeding with concentrated feeds, additives and mixtures, while the amount of green feeds has significantly decreased, which has led to the absence of chlorophyll in the diets, while the animal's body has been using green feeds for millions of years. Which, undoubtedly, is reflected in: decreased productivity and immune resistance; deterioration of conversion rates and bioavailability, and the quality of the resulting products [8].
Therefore, specialists in many countries of the world, including Russia, are intensively searching for alternative, ecological feed sources that would contribute to the efficient use of natural resources. In recent years, in many countries of the world, including Russia, algae have been added as one of the sources of ingredients in diets [9].
Algae are autotrophic organisms that can be used as food, animal feed and humans. A representative of green microscopic aquatic plants is a significant reserve for improving animal nutrition due to its unique composition. Which, as a possible natural biostimulant, has an immunoprophylactic effect on animals and has a positive effect on the productive, reproductive qualities and safety of young farm animals, poultry and aquaculture objects [10].
Chlorella suspension has a complex effect on the body of all animals, fish, etc. without exception. The suspension contains all amino acids, vitamins, prebiotic components, immune stimulants, etc., which has a pronounced therapeutic, prophylactic and immunostimulating effect on the body. Thus, the use of the suspension allows not only to increase productivity, but also to significantly reduce mortality and morbidity [11].
The aim of the research was to conduct an organoleptic evaluation of quail meat that received Chlorella vulgaris microalgae in various dosages with their main feed.

MATERIALS AND METHODS

The scientific and economic experiment was conducted in the peasant farm of Alimchueva Z.I. Medvedevsky district of the Republic of Mari El, where 5 groups of day-old quails of the Texas breed were formed according to the principle of analogues, 20 heads in each. Feeding and housing conditions were the same for all quails. Birds of all groups received compound feed PK-5 start 1-3 weeks, from 4-7 weeks PK-5 growth. The first experimental group received dry biomass of microalgae Chlorella vulgaris with feed daily at a dosage of 2 mg / kg of live weight, the second experimental - 4 mg / kg of body weight, the third - 6 mg / kg of body weight (Table 1).

Table 1: Scheme of conducting scientific and economic experiment

Group	Diet characteristics
Control	Basic diet (BD)
1st experimental	OR + dry biomass of microalgae Chlorella vulgaris at a dose of 2 mg/kg live weight
2nd experimental	OR + + dry biomass of microalgae Chlorella vulgaris at a dose of 4 mg/kg live weight
3rd experimental	OR + + dry biomass of microalgae Chlorella vulgaris at a dose of 6 mg/kg live weight

During the experiment, changes in live weight were monitored every 7 days. After the end of growing, all quails in the experimental and control groups were slaughtered on the 50th day, followed by a veterinary and sanitary assessment of the slaughter products after 24 hours of storing the carcasses at a temperature of +2+4 °C. Organoleptic testing was carried out in accordance with GOST 7702.0-74 "Poultry meat. Methods of sampling. Organoleptic methods for assessing quality." The following was determined: appearance, smell, color, consistency of muscle tissue and fat, degree of bleeding, condition of muscles on the cut, transparency and aroma of the broth.
Physicochemical studies were carried out according to GOST 7702.2-74 “Poultry meat. Methods of chemical and microscopic analysis of meat freshness” for the following indicators: amino-ammonium nitrogen, peroxidase, benzidine test, reaction with copper sulfate and reaction to ammonia [13]. The obtained data were processed using the SSPS for Windows software package.

RESULTS AND DISCUSSION

During the experiment, the weight of the quails was monitored. No deviations from the physiological norm were found in the experimental population during the study period. The absolute increase during the study period was 320 g in the control, with this indicator in the experimental groups being higher than in the control by 1.72% in Group I, by 7.34% in Group II, and by 8.75% in Group III (Table 2).

Table 2: Changes in live weight of quails during the growing period

Indicator	Groups (n=50), (M±m)			
	Control	I	II	III
Live weight, g: at the beginning of the experiment	11.96±0.33	11.73±0.42	11.17±0.46	11.70±0.50
at the end of the experiment	332.52±11.49	337.79±6.40	355.27±6.75	360.32±7.92
Absolute increase, g	320.56	326.06	344.10	348.62
Average daily gain, g	6.54	6.65	7.02	7.11
Relative growth, %	186.11	186.57	187.81	187.42

The maximum average daily gain in live weight for the entire growing period was noted in the 6th week of the experiment in quails of the 2nd experimental group - 11.31±3.1 g, in the 3rd experimental group - 10.69±2.8 g, and in the control group it was only 9.49±4.6 g (Fig. 1).

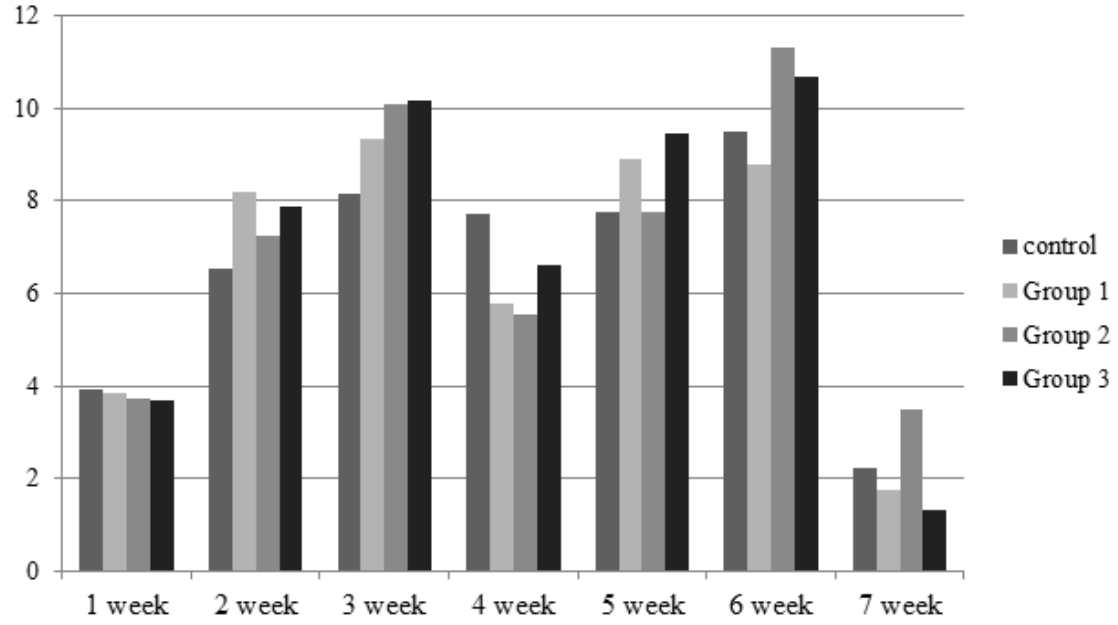


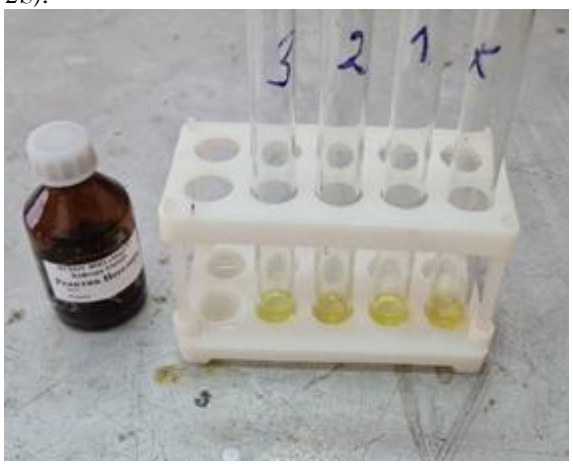
Figure 1: Average daily growth rates, g

The method for determining the freshness of meat is based on an organoleptic assessment of their quality using the senses. The appearance and color of the muscles were determined immediately after cutting the muscle tissue in the deep layers of meat. It met the requirements: good bleeding, pale pink color, no drops of blood on the cut. At the same time, the absence of stickiness was established by palpation and the moisture content of the meat surface.

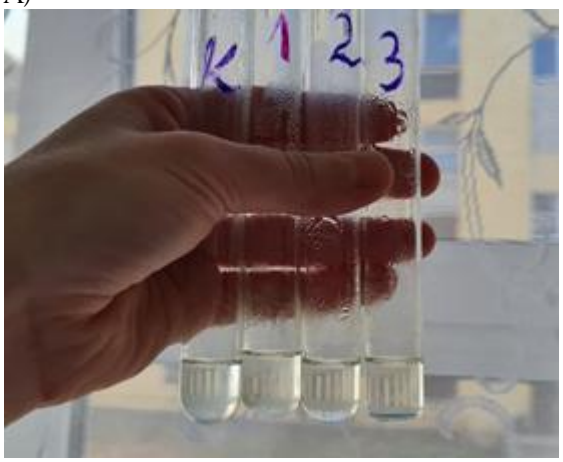
The consistency was determined by cutting the carcass and its parts. The muscles on the cut were slightly moist, light pink, of a dense elastic consistency. A pit was formed by lightly pressing the spatula and its leveling was monitored. When pressing, the pit quickly leveled out. The smell of the surface layer of the carcass and its parts was assessed. The smell was characteristic of fresh poultry meat, foreign smells were absent. The organoleptic indicators of meat from the experimental groups of quails that received feed with the addition of amaranth flour in various doses also had indicators that meet the requirements for fresh meat obtained from healthy poultry.

A qualitative reaction for ammonia formation in poultry meat was carried out with Nessler's reagent. All the studied samples were fresh meat, since the color of the extract did not change when 10 drops of the

reagent were added (Fig. 2a). As a result of the reaction of the filtrate from the meat of the experimental samples with a 1% solution of acetic acid, followed by heating in a water bath (80 °C) for 5 minutes. All the studied samples had a transparent filtrate, which once again confirmed the freshness of the meat (Fig. 2b).



A)



b)

Figure 2: Determination of meat freshness: a) reaction with Nessler reagent b) reaction with 1% acetic acid solution

Another quality indicator is the determination of the amino-ammonia nitrogen content in the meat hydrolysate. This study was conducted in accordance with GOST R 55479-2013.

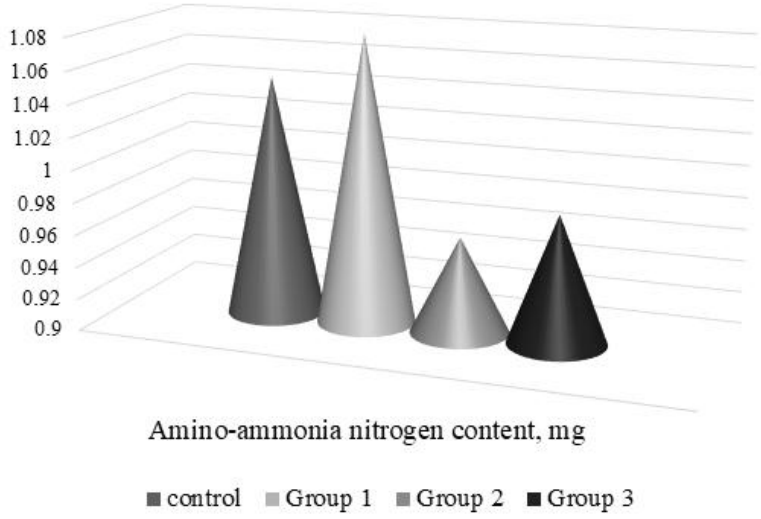


Figure 3: Content of amino-ammonia nitrogen in quail meat

The meat is classified as fresh with an amino-ammonia nitrogen content of up to 1.26 mg. All samples meet the requirements for fresh meat, with the lowest amino-ammonia nitrogen content observed in the 2nd and 3rd experimental groups (Fig. 3).

Thus, summarizing the above studies, it can be stated that all samples are fresh meat. Consequently, the introduction of the biomass of the microalgae Chlorella vulgaris into the quail diet did not affect the quality characteristics of the meat.

To assess the taste characteristics, the broth and poultry meat were tasted on a five-point scale, according to the VNITIP method. The richness of the broth was determined by the sensation of concentrated meat taste. The tasting assessment of the broth from quail meat of all groups is quite high. The broth is aromatic, light straw-colored, without flakes (Fig. 4).

Figure 4: Carrying out broth evaluation: a) preparation of samples; b) broth of the studied samples

The highest overall rating was given to the carcasses of the second and third experimental groups. The tasting committee gave a high score to the aroma and taste of the broth of the above-mentioned samples (Fig. 5).

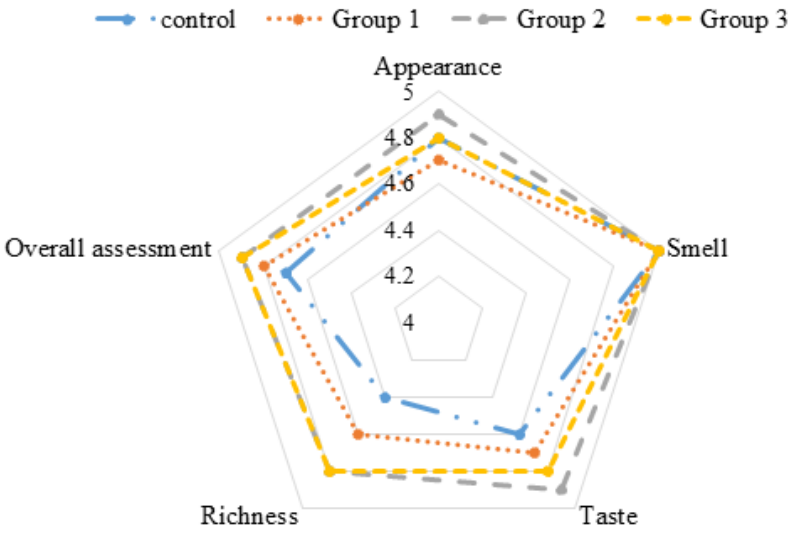


Figure 5: Results of tasting evaluation of broth

When tasting quail meat, it was noted that the meat of the control and experimental groups was juicy, had a pleasant specific taste, aroma and was easy to chew.

The test samples obtained from quails fed with amaranth flour were rated higher by the committee during meat tasting than similar meat samples from quails in the control group. The highest overall score was given to test samples 2 and 3, with the taste and aroma of the meat being highly rated.

CONCLUSION

The results of our studies showed that dry biomass of the microalgae Chlorella vulgaris contributes to an increase in the live weight gain of quails and an increase in slaughter yield. All samples corresponded to the category of fresh meat, which was proven by conducting qualitative reactions. Based on the organoleptic and tasting assessment of the studied quail meat samples, we found that the samples of the 2nd and 3rd experimental groups had the highest taste qualities. The increase in the assessment of the organoleptic indicators of these samples is due to the content of extractive substances in amaranth, enriching the product with micronutrients and essential amino acids.

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