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Chlorella is a Source of Protein Feed, Vitamins and Other Physiologically Active Substances in the Diet of Quails

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Abstract In this work, the most suitable media for chlorella cultivation have been studied and selected. The experiments necessary for the selection of the optimal nutrient medium for the cultivation of Chlorella vulgaris have been carried out. A comparative assessment of the nutrient media recommended for cultivation has been carried out. The use of chlorella suspension as a dietary supplement to the main feed of quails has a positive effect on increasing live weight, egg production and viability.

Keywords Chlorella, Algae, Dietary supplement, Quail, Egg, Protein, Shell

1. Introduction

Obtaining food and feed protein is one of the main problems at the moment. In the context of a continuous increase in the world's population and a shortage of food and feed protein, research aimed at finding the most economical methods of fixing atmospheric nitrogen is becoming important. In this regard, the phenomena of biological fixation of atmospheric nitrogen by algae attract great attention of scientists from various countries. To increase the efficiency of feed use, the modern market offers a wide range of often expensive feed additives, nutrients, biostimulants, ergotropics of domestic and foreign production. However, the economic condition of many farms does not allow them to go to additional costs, and they are satisfied with the natural gains and reproductive qualities of animals. Chlorella suspension increases the digestibility of feed, removes toxins from the body, etc. [1].

Algae in reservoirs form organic substances. About 80% of the carbon on our planet is organic carbon synthesized by algae. Such a form of algae as plankton is food for various invertebrates and fish [4-6].

Algae are widely used in animal husbandry — thanks to them, animal resistance to various diseases is developed. The use of these substances as dietary feeds with special nutritional purposes makes it possible to improve the health of animals, fish and poultry.

Algae can be a good alternative source of protein, vitamins and minerals [1-4].

Chlorella is a representative of green algae, microscopic aquatic plants that combines 20 species. The most famous and widespread is Chlorella vulgaris, which forms huge accumulations in ditches, ponds and muddy puddles. Chlorella is widespread almost everywhere, as it is undemanding to the environment and reproduces quite quickly. Representatives of the genus can be found in fresh and salty reservoirs, heavily moistened soils.

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2. Materials and Methods

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. Ee is used for experimental experiments in ecological closed life support systems. Representatives of this genus emit a lot of oxygen during photosynthesis during their vital activity. The yield of microalgae depends on environmental conditions: temperature, illumination, nutrient medium, pH, supply of carbon dioxide, oxygen [2].

Our research was conducted in the laboratory of the Department of Biotechnology of the Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology.

The subject of the study was a microscopic algae – chlorella. As a medium for cultivation, a special medium with a certain concentration of mineral elements was used (KNO_3 – 0.1%, $Ca(NO_3)_2$ – 0.01 g/l, K_2HPO_4 – 0.02 g/l, $MgSO_4 * 7H_2O$ – 0.01 g/l, $FeCl_3 * 6H_2O$ * 0.0001 g/l) with

the addition of mullein, a also in the form of control variants of a medium made of mineral elements (Knop solution) and a medium from farm wastewater (without mineral elements). The prepared media were poured into 3 flasks (for each variant, respectively) with a capacity of 500 ml, 300 ml each.

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

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, while organic ones accumulate more fat and carbohydrates [3].

The conducted studies have established that the intensity of microalgae growth varies depending on the nutrient medium. At the same time, an increase in the number of cells in all the studied flasks was observed during the first day. In particular, in the first variant, the number of chlorella increased 4 times. In the second and third flasks, with corresponding nutrient media of 1.0 and 1.4 mg, respectively.

The results taken into account after 48 hours of cultivation showed that in the first flask, the number of chlorella increased 3.7 times in relation to the initial values, in the second – 1.5, in the third – 1.2 times. By the end of the studies (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 wastewater, the number of cells multiplied in insignificant quantities (3.2 times).

3. Result and Discussion

We also determined the amount of total and separate wet and dry biomass of Chlorella vulgaris studied in the laboratory. It has been established that algae produce different amounts of biomass on nutrient media "04" and Knopa in laboratory conditions.

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

To determine the biomass of the resulting chlorella, clean filter paper was first weighed on an electronic scale. The flask in which the algae was grown must be thoroughly shaken. Then 10 ml of algae suspension was taken, poured onto filter paper and weighed together with the paper. The result 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 a drying cabinet at a temperature of 105℃ for 30 minutes. Then the filter paper was 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.

Table 1. The amount of wet and dry biomass of Chlorella vulgaris

Nutrient medium	Amount of biomass mg/l	
	Wet biomass	Dry biomass
"04" + mullein	111,9±1,2	1, 2122±0,5
Knop	103,3±2,2	1, 1002±1,1

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

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

Quail farming is a cost–effective industry. This is due to the high physiological precocity of quails, the small areas necessary for poultry breeding, the high quality of quail eggs and meat, resistance to diseases and many other indicators [5].

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. Chlorella is one of the most promising dietary supplements.

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

To study the effect of chlorella suspension on the growth and development of quails, three groups 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 was injected with chlorella suspension (Chlorella vulgaris strain IGF No. C-111 at a concentration of 30-40 million cells per 1 ml) in an amount of 2.0% by weight of compound feed, respectively, throughout the entire production cycle of use in the poultry diet. Chlorella suspension was not included in the diet of the control and first experimental groups.

It has been proven that this ensured the survival and safety of quail pups, an increase in the live weight of poultry, and an increase in the profitability of production by 1.3%. Materials reflecting the peculiarities of nutrition and breeding of quails with cellular content in small areas, in private subsidiary farms [5] are presented.

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

Many researchers have found that chlorella has a beneficial effect on the quality of meat and eggs, due to the increased concentration of omega-3 polyunsaturated fatty acids and carotenoids, as well as in terms of performance and immune function. an essential reserve for realizing the productive potential of poultry is to improve the quality of compound feed and increase its biological usefulness. Studies have been conducted on the introduction of the

planktonic strain Chlorella vulgaris IGF No. C-111 into the diets of quails. Studies have found that the introduction of chlorella suspension into quail feeding diets increases the productive qualities of poultry and the safety of the second generation. The use of an unconventional chlorella feed additive in the cultivation of quails had a positive effect on egg production and hatchability [3,5].

For 60 days, we determined the dynamics of body weight growth of quails. 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 case of quails by the age of 60 days in the experimental 1st group is 2 pcs., in the second 1 pc., and in the control group — 5 pcs. 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.

The quails of both experimental groups began to lay eggs from the age of 70 days, and the quails of the control group - from the age of 76 days (six days later). We determined the biometric parameters of the eggs obtained (Table 2).

It was found that the total weight, protein and yolk of eggs obtained from quails of the experimental variant were slightly higher than those of the eggs of the control variant. And also the difference in the experimental versions is not significant, it follows that the use of chlorella suspension will significantly save the cost of purchasing expensive multivitamins.

4. Conclusions

Thus, it can be concluded that chlorella can be grown on pure mineral media, but the number of cells formed is inferior to a balanced (mineral elements + mullein) nutrient medium.

In our research, the intensive growth of chlorella is observed when using the nutrient medium "04", enriched with mineral elements with the addition of mullein.

It is safe to say that when feeding quails, the addition of chlorella to compound feed has a positive effect on increasing their live weight, egg production and viability.

Table 2. Egg Biometrics (chlorella suspension)

№	By egg weight	Control	1-experience (chlorella suspension)	2-Experience (multivitamins)
1	Total weight (g)	10,12 ± 0,12	12,14 ± 0.14	12,33 ± 0.03
2	Egg white weight (g)	4,05 ± 0,05	6,06 ± 0.06	6,07 ± 0.01
3	Egg yolk weight (g)	4,04 ± 0,04	4,05 ± 0.05	5,01 ± 0.01
4	Eggshell weight (g)	2,03 ± 0,03	2.03 ± 0.03	2.55± 0.01

REFERENCES

[1] Бреславец Ю. П. Рост, развитие и мясные качества свиней при скармливании им суспензии хлореллы дисс… на соискание ученой степени кандидата сельскохозяйствен ных наук Белгород (2015).

[2] Мещерякова Ю.В. Культивирование микроводоросли хлорелла. Наука в Центральной России, №2, 2013.

[3] Фролова (Мелихова) Мария Викторовна Поволжский научно-исследовательский институт производства и переработки мясомолочной продукции.

[4] Богданов И.И. Суспензия хлореллы в рационе сельскохо зяйственных животных.- Волгоград (2007).

[5] Л.Н. Медведева, О.В. Зорькина, М.В. Московец Разведение перепелов в личных подсобных хозяйствах с включением в рацион питания Chlorella vulgaris Вестник РУДН. Серия: Агрономия и животноводство 2022; 17 (4): 499-513 http://agrojournal.rudn.ru.

[6] Н. Хужаева, Н.Д. Ходжаева ХЛОРЕЛЛА – ПРЕДСТАВИТЕЛЬ ЗЕЛЕНЫХ ВОДОРОСЛЕЙ Вестник ветеринарии и животноводства №2 doi:http://dx.doi.org/ 10.5281/zenodo.0000000 (2023).