https://doi.org/10.48047/AFJBS.6.14.2024.6122-6125

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Effectiveness of Phytoadditive ”Vitlöksflörte“ in Poultry Nutrition

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Volume 6, Issue 14, Aug 2024

Received: 15 June 2024

Accepted: 25 July 2024

Published: 15 Aug 2024

doi: 10.48047/AFJBS.6.14.2024.6122-6125

Abstract— We have studied replacing ways of broiler welfare, unified health and quality products with phytogenetic additives. To solve the problem, phytoadditive of Swedish production ”Vitlöksflörte“ has been selected, which includes: garlic (Allium Sativum), parsley (Petroselinum crispum), basil (Ocimum basilicum), rosemary (Salvia rosmarinus), origanum (Origanum vulgare), common thyme (Thymis Vulgaris), lemon zest and salt. *The experiments had been conducted in two absolutely different conditions, namely in Sweden (Södertälje) and Georgia (Kvemo Kartli, Teleti). In order to strengthen immunity, in the conditions of possible viruses, today, more than ever, rational nutrition and healthy environment are important. The role of phytoadditives in this direction is infinitely great. Phytogenetic resource of our country is unique and richest, it can be successfully used in this direction and take a significant place in the world market.*

Under the experimental conditions, the effect of ”Vitlöksflörte“ on the unified health and welfare of broilers has been investigated. During the entire period of the experiment, the obtained results (body temperature, heart and pulse rate, blood serology, bacteriological analysis) varied within the physiological norm typical for poultry, and the meat productivity of broiler chickens, as shown by their live mass before slaughter, the yield of carcass and fresh meat, is positively indicated by the phytoadditive ”Vitlöksflörte“ affected.

Use of phytoadditive ”Vitlöksflörte“ is a prerequisite for the production of high-quality food raw materials and food under the conditions of the use of properly selected compositions of phytogenetic resources. Creation and wide use of such compositions is an important direction for the implementation of the principles of animal and poultry welfare and unified health and modern requirements.

Keywords—*Broiler, Meat production, Phytoadditive, Unified health, Welfare*.

I. INTRODUCTION

Poultry meat and eggs are the most popular animal products in the world. According to the regulations developed by the World Organization for Animal Health, the poultry for meat and egg production must be healthy, have a comfortable space, safe and good nutrition, be able to express natural behavior and be free from pain, stress and fear.

The combination of all these issues are included in the continuous chain of what is called " Unified Health" and welfare. Thus, determining parameters of poultry welfare, searching for alternative ways of obtaining it, and simultaneously increasing desired productivity, in order to supply the population with healthy products, is a very urgent issue.

II. AIMS AND OBJECTIVES

The aim of our research was to develop such a broiler welfare scheme by adding natural components to the feed,

thus making it possible to replace antibiotics and integrate it into the common health issue in the European Union.

For the present study, the phytoadditive "Vitlöksflörte“ of Swedish production has been selected, which includes garlic (*Allium sativum*) 43%, parsley (*Petroselinum crispum*), basil (*Ocimum basilicum*), rosemary (*Salvia rosmarinus*), origanum (*Origanum vulgare*), common thyme (*Thymis Vulgaris*), lemon zest and salt. It is worth noting that this phytoadditive has been recommended by the Swedish pharmacy in recent years against the background of the widespread COVID-19 pandemic to increase the overall health and resistance of a person. At the same time, it has not been tested in productive animal husbandry, and we believe that it would be very interesting to use it in broiler nutrition based on the principles of unified health.

To achieve this goal, it had been planned to implement the following tasks:

We studied the effect of this particular additive on broiler welfare parameters and their productivity under different climatic conditions. The first step of study has been carried out in Sweden, namely in Stockholm, Södertälje region, and the second step - in Georgia, in Kvemo Kartli region, namely in Teleti. Methodologically, it has been planned to study parameters from hatching of chicks from the 2nd , 4th and 6th week.

It has been studied: 1. pulse, 2. body temperature. 3. Bacteriological analysis of raw chicken meat, 4. Number of dead individuals for a given period, 5. Total live weight and live weight according to test periods, 6. Live weight before slaughter, 7. Slaughter output, 8. Efficiency of using phytoadditive in terms of additional cost incurred and by analyzing the obtained results.

III. MATERIALS AND METHODS

Based on the research objectives, we studied the following parameters:

1. Body temperature is one of the physiological parameters that should be evaluated during the broiler health monitoring. The standard veterinary cloacal digital thermometer DT has been used to measure temperature. The measurement range and DT resolution were 30.0 - 43.9 °C and 0.1°C, respectively. Body temperature has been measured on the first day and then every 2nd, 4th and 6th week, at the same time in the morning on 5-5 chicken in each experimental group.
2. The poultry weighing method was developed according to the Aviagen guideline, which is recommended for manual weighing with an electric scale. Broiler chicks were weighed at the same time in all groups, randomly from three locations per group. An electric balance (with an accuracy of ± 1 g) has been used, which was regularly calibrated for accuracy and repeatability.

Weighing of 0-21 days has been done by determining the single mass of broiler individually in the independent group. From the 21st to the 28th day, it has took place in a self-contained group with individual weighing.

Each time five chickens have been weighed in a self-contained group.

3. The pulse rate has been measured by the proposed model of E.W.HENDERSON and H.E.HATHAWAY;
4. Laboratory diagnostics have been carried out according to ISO 7218, which describes the methods of laboratory research in detail.

Laboratory studies have been carried out using the following proven methods:

5. Pathogenic microorganisms, including Salmonella in 25 g of the product; ISO 6579-1:2017/2019
6. E.coli 1g; ISO 16649-1:2001;
7. Number of colonies of aerobic microorganisms <100 000 8000; ISO 4933; 2013/15;
8. Pathogenic microorganisms, including salmonella in 25 g of product; ISO 6579-1:2017/2019;
9. Mortality (the number of dead individuals for a given period) - the number of dead individuals for a given period have been calculated.

To evaluate the productive data, the following have been studied:

10. Total live mass and live mass according to test periods - total live mass was determined by the weight of chick and pre-slaughter live mass, live mass according to periods has been determined by weighing individuals according to test periods;
11. Pre-slaughter live weight was determined - by weighing immediately before slaughter;
12. The output of slaughter has been was established;
13. The effectiveness of using the phytoadditive has been determined by analyzing the additional cost incurred and the results obtained.

IV. RESEARCH SCHEME

150 chicks have been separated into three equal groups: T control, T_1 and T_2 experimental to conduct the research under the production farm conditions. All three groups have been under the identical maintenance conditions characteristic of the farm. In addition, T control received only on-farm forage, T1 experimental phytoadditive with 0.5% (11.76 g/kg), and T2 experimental 1.5% (36.11g/kg) of phytoadditive “Vitlöksflörte”.

In order to achieve of set goals, we compiled a research scheme as a result of the analysis of literary sources and researches in other countries of the world.

Since the content of garlic in phytoadditive “Vitlöksflörter” is 43%, in the case of 0.5% there was an addition of 11.76 grams per 1 kilogram, and in the case of 1.5% - 36.14 g / kg. 150 broiler`s chiks variety Ross 308 have been selected for the study, which were divided into three groups - 50 chick each. The experiment lasted 49 days.

V. DISCUSSION

In order to correctly determine the effectiveness of phytoadditive “Vitlöksflörter” and to determine the dose to be added to the feed, we studied results of research carried out by other researchers and the effect of plants included in the additive on birds.

The mechanisms of phytoadditive “Vitlöksflörter“ components` action have been interestingly arranged:

Garlic (*Allium Sativum*) is a perennial herbaceous plant from the *Alliaceae* family. Garlic contains thioglycosides and sulfur-containing essential oil 0.4%. In the essential oil,

there is a phytoncide compound with high reactivity - allicin. Garlic bulbs contain a large amount of Phytoncides. It also contains polysaccharides 30%, vitamins B and C, phytosterols, fatty oils, micro elements, including Se, Ge, Si, adenosine, nucleic acid. This plant is also known as a source of vitamin C, magnesium, selenium and vitamin B6 (pyridoxine). In addition, it contains a large amount of elements necessary for proper metabolism, such as potassium, iron and copper.

Parsley (*Petroselinum crispum*) contains ascorbic acid, complex essential oils 0.1%, aromatic oils, protein, fats, starch, cellulose, pectin substances, flavonoids, mineral salts, vitamins - B1, B2, C, K, PP, phytocins, macroelements - K, Ca, Mg, Fe. Micro elements - Mn, Cu, Zn, Co, Cr, Al, Ba, V. Raw leaves contain the so-called Parsley camphor or apiol, as well as tannin and pinene.

Basil (*Ocimum basilicum*) - about 150 species of basil are known. It is a herb rich in nutrients, rich in protein, iron and vitamins. According to the USDA, its composition includes vitamins A, C, B group. Also minerals such as magnesium, potassium, copper and iron.

Rosemary (*Salvia rosmarinus*) - contains many beneficial compounds, including rosmarinic acid, ursolic acid, betulinic acid, carnosic acid and carnosol. Rosemary essential oil contains 10-20% camphor. It performs antiseptic, cleansing, digestive, spasmolytic, diuretic, hypotensive functions.

Origanum (*Origanum vulgare*) is one of the widely used medicinal, aromatic, spice and dye plant. It is the most powerful natural antibiotic ever studied and has been found to contain the substance carvacrol and is more effective than many synthetic antibiotics currently in use. Carvacrol is also found in thyme. This substance promotes the health of the digestive system, increasing food intake and efficiency by absorbing nutrients. Carvacrol also causes an increase in live weight and has been found to be beneficial in feeding broiler chickens.

Common Thyme (*Thymis Vulgaris*) is a valuable spicy, the content of essential oils determines its use in phyto-cooking. It contains vitamins, essential oils, calcium and iron salts, which are well absorbed by the human. In recent years, there has been increased interest in the use of common thyme and origanum essential oils as poultry feed to promote broiler growth. Common thyme and origanum essential oils are considered promising ingredients that may replace antibiotics as growth promoters.

Lemon is rich in vitamin C and other antioxidants that help the heart to function properly. Vitamin C protects cells of the living organism from the harmful effects of free radicals. Lemon also contains micro elements, potassium, vitamin B6 and thiamine. It is a fairly low-calorie product. Its main nutritional value comes from vitamin C, although it is also a good source of phenolic compounds and carotenoids. These antioxidants protect cells of the living organism from oxidative stress and chronic diseases.

Analyzing results of experiments, it has been determined that the overall health of chick under the observation was satisfactory throughout the trial period. The body temperature of the broiler in both climatic zones of the experiment was within the physiological norm and was 39 °C at the beginning of the experiment, and 41 °C already in the later periods of the experiment.

In both climatic zones, pulse frequency of chicks of all test groups did not differ from each other, at the age of 1 day it was 240 beats per second. It increased along with the age of individuals and for the age of 42 days it was 300 beats per second, which is within the physiological norm.

As can be seen from the reviewed data, the unified health status of the broiler chicks in the trial was quite satisfactory, which indicates their satisfactory welfare parameters and presence of low stress factors.

Table 1.

Percentage gain in live weight between experimental groups, Georgia/Sweden

	Sweden		Georgia	
Age	T_1 (0.5%)	T_2 (1.5%)	T_1 (0.5%)	T_2 (1.5%)
14	0%	8.45%	0%	7.14%
28	0%	-0,62%	0%	5%
42	0%	16,46%	0%	6,66%

At the age of 49 days, the pre-slaughter live weight of the control group in the Swedish farm was 2436 g, and in the Georgian control group it was 3350 g. In the Swedish T_1 experimental group, this data was 2482 g, and in Georgia - 3570 g. As for the T_2 experimental group, this data was 3800 g in Georgia, and 2810 g in Sweden.

Although the Swedish control group achieved a 25.17% increase in live weight, this data of the T1 experimental group was 1.88% higher than the control group, and in Georgia this difference was 6.56%.

A similar picture has been observed between the T_2 experimental and control groups, where the highest difference was achieved by the T_2 experimental group. In Sweden it was 15.35%, and in Georgia it was 13.43%.

Among the control groups, the Swedish group showed the highest percentage increase in live weight, where the T_2 control group at the age of 49 days was 16.46% higher than T_1 group, and as for Georgia, this difference was 6.66%.

In the broiler industry, output of carcass meat is the most important factor.

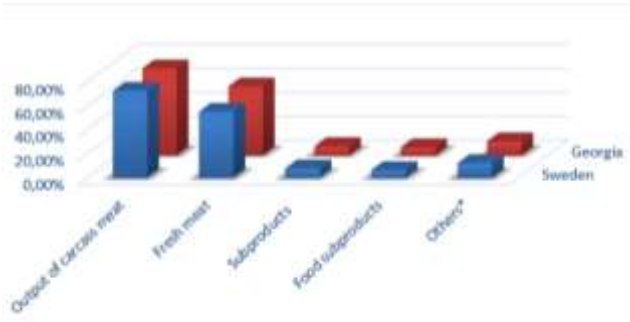

Diagrama 1. Output of slaughter (Georgia, Sweden)

As it can be seen from the obtained data, output of carcass meat in each chicken group in Sweden has been 72.94% and 55.43% of this was pure meat. Subproducts, which are divided into two groups, edible and non-edible products, totaled 27.06%.

The output of the carcass meat in the control group has been 1776.81 g, which has been 33.56 g less than the first experimental (T_1) group, whose meat have been 1810.37 g. The second experimental group that received the phytoadditive of 1.5% had a yield of 2049.61 g, which is significantly ahead of both groups.

The output of fresh meat in the control group has been 1350.27 g and in the T_1 group receiving 0.5% phytoadditive - 1375.77 g. In T_2 group, this indicator has been 1557.58 g.

Output of slaughter in the control group has been 2445.5 g, which is 160.6 g. less compared to the first experimental (T1) group, whose output have been 2606.1 g. In the second experimental group, which received a phytoadditive of 1.5%, the output of slaughter has been 2774 g.

The amount of fresh meat in the control group has been 1943 g and in the T1 group receiving 0.5% phytoadditive - 2070.6 g. The output of fresh meat in T2 group has been 2204 g. Which we consider to be quite a good indicator and indicates the effectiveness of the tested phytoadditive.

VI. CONCLUSION

1. As it can be seen from the reviewed data, use of phytoadditive "Vitlöksflörte" in broiler nutrition is characterized by a rather high efficiency, which is confirmed by the actual data on the unified health, welfare and meat productivity of the experimental poultry.
2. The results of conducted research allow for the future to plan and implement creation of new food phytoadditive compositions for production of products of all directions and types of animal husbandry in accordance with European standards.
3. The conducted studies have clearly shown us that world policy is aimed at increasing production of poultry meat and eggs. In addition, it envisages development of new technologies, new policies and practices that will protect physical health of poultry and provide an opportunity to express behavioral needs, which allows for effective management of unified health and welfare while producing a healthy product.
4. Use of phytoadditive "Vitlöksflörte" is a prerequisite for production of high-quality food raw materials and food under the conditions of use of properly selected compositions of phytogenetic resources. Also, creation and wide use of such compositions is an important direction for implementation of principles of animal and bird welfare and unified health and modern requirements.
5. Thus, we would like to point out that since Georgia is rich in local phytogenetic resources, one of the important components in these processes will be the rational use of these resources.

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