EFFECT OF FEEDING A PEAT FEED ADDITIVE ON THE PERFORMANCE OF LAYING HENS

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Abstract. Poultry farming represents a significant sector of agriculture, playing a crucial role in ensuring high-quality produce while efficiently utilizing feed resources. The industrial development of this sector aims to achieve high yields in egg and meat production through the utilization of high-productivity poultry hybrids. The success of this approach largely depends on providing poultry with optimal feed rations that consider their physiological needs and biological characteristics. Adequate feeding plays a crucial role in achieving maximum productivity and product quality. Therefore, the development and implementation of scientifically-based approaches to poultry feeding are important strategic tasks for further poultry farming development. In this research, the influence of adding peat to the diet on the productivity and quality of eggs from laying hens was studied. The experiment was conducted on an industrial poultry farm with *Hy-Line Brown W-36* laying hens.

Our study has revealed that the use of a peat-based feed additive in the diet of laying hens has a positive impact on various productivity aspects, such as poultry live weight, viability, and egg-laying frequency. The application of peat-based feed meal, ranging from 0.5 to 1.25 kg per ton of feed for laying hens, resulted in increased egg mass compared to the control group: egg mass in Experimental Group 1 increased by 2.60%, in Experimental Group 2 by 2.90%, in Experimental Group 3 by 3.18%, and in Experimental Group 4 by 1.41% ($P \leq 0.95$). Thus, the utilization of peat-based feed meal demonstrated a positive impact on poultry live weight, viability, egg mass, and overall egg production yield.

Keywords: laying hens, peat-based feed additive, egg-laying performance, egg

INTRODUCTION

Industrial poultry farming stands as one of the few specialized sectors within the industrial complex capable of generating significant volumes of output within tight timeframes, regardless of the season. It constitutes a comprehensive system encompassing all processes from poultry reproduction to the marketing of eggs and poultry meat. Economic benefits can be achieved through the optimization of feeding costs by utilizing additional feed components, including both traditional and non-traditional ones. Such an approach aims to enhance production metrics, such as increased productivity and poultry viability, ultimately contributing to improved economic efficiency in poultry farming (Nadtochiy and Zabolotskiy, 2016).

One of the primaries focuses in agricultural poultry feeding research revolves around finding cost-effective yet readily available feed resources that offer high biological value. This pursuit is crucial because the quality of feed directly impacts the health, growth, and productivity of poultry, which, in turn, influences the profitability and sustainability of poultry farming operations. By identifying affordable feed options with optimal nutritional content, researchers aim to enhance the overall efficiency and viability of poultry production systems. This includes

exploring alternative feed ingredients, optimizing feed formulations, and evaluating their impact on poultry health and performance. Ultimately, the goal is to develop feeding strategies that not only meet the nutritional requirements of poultry but also contribute to maximizing productivity while minimizing production costs (Shpynova et al., 2017; Makarenko et al., 2018; Mazanko et al., 2018).

Special attention is given to methods optimizing the utilization of natural organic resources such as peat, sapropel, lake sediments, and sulfide-mud, which are natural renewable resources. These materials are widely used in their natural state as organic additives in agriculture. A promising research direction involves utilizing these natural components to create functional products, opening up new opportunities for their application in animal nutrition to enhance their health and production efficiency (Baranova, 2016).

The utilization of natural feed additives has been shown to yield numerous benefits across animal husbandry. Firstly, these additives can enhance animal productivity by optimizing nutrient absorption and metabolism, leading to improved growth rates and higher yields of meat, milk, and eggs. Additionally, they contribute to the overall health and well-being of the animals, reducing the occurrence of diseases and enhancing immune function. This not only improves the quality of the end products but also reduces the need for antibiotics and other medications, thereby promoting sustainable and environmentally friendly farming practices. Furthermore, natural feed additives can enhance the nutritional profile of animal products, making them more desirable to consumers who prioritize health and quality. Overall, the positive effects of natural feed additives extend throughout the entire production chain, from animal welfare to consumer satisfaction, highlighting their importance in modern agriculture (Gorlov, 2010; Gorlov, 2013).

MATERIAL AND METHOD

To assess the effectiveness of using peat-based feed additive in the feeding of laying hens, a scientific and economic experiment was conducted. The aim of the research was to evaluate the productivity and quality of eggs from laying hens against the backdrop of utilizing non-traditional feed additives in their feed.

The object of the study was laying hens from a single-age commercial flock of the Hy-Line Brown cross, which were housed in production facilities equipped with battery cages during the laying period. The experiments were conducted using an analog method, with five groups of laying hens formed (one control and four experimental), each consisting of 96 hens (Imangulov, et al., 2004).

According to the recommendations for working with the breed, the necessary microclimate parameters were maintained in the facilities. During the experiment, the laying hens were fed with the same compound feed according to the recommended feeding standards (Nadtochiy, 2016). The diets of experimental poultry were developed taking into account the recommendations of VNITIP [2003] regarding energy nutrition and content of major nutrients.

All groups of laying hens received the same basic mixed fodder, except that the experimental groups were supplemented with the studied Peat-Based Feed Meal (PBFM). The dosage of the PBFM varied from 0.5 to 1.25 kg per ton of feed (Table 1).

Recipe of the main compound feed for laying hens from 17 to 34 weeks was as follows: corn - 54%, wheat - 5%, soybean meal - 13%, sunflower meal -9%, PL -68 -2,5%, DL-68 - 2,5%, meluza - 9%, premix -2%, soybean oil - 0,5%, bran -5%.

For experimental poultry of all groups in 100g of basic fodder contained: exchangeable -275 kcal, digestible protein - 16,33%, crude fat - 2,45%, crude fiber - 5,20%.

Table 1. Experimental design

Groups	Number of Heads	Feeding peculiarities
CG	96	Basic Compound Feed (BCF)
EG1	96	BCF + 0.50 kg/ton Peatmeal
EG2	96	BCF + 0.75 kg/ton Peatmeal
EG3	96	BCF + 1.0 kg/ton Peatmeal
EG4	96	BCF + 1.25 kg/ton Peatmeal

During the experiment were studied:
- Live weight of poultry was measured monthly.
- The percentage of livestock preservation was calculated based on daily records of deceased hens within each group.
- Daily feed consumption in the experimental groups was determined by weighing the provided feed and its residues throughout the experiment. This data was then converted to one kilogram of egg mass and ten pieces of laying hens' eggs.
- Egg productivity of hens was assessed daily by recording the number of eggs laid in each group.
- The economic efficiency and feasibility of incorporating peat feed additives into the poultry diet were evaluated.
- The collected numerical data was subjected to biometric analysis using "Microsoft Excel 2010" software, following the method outlined by Plokhinsky N.A. (1969). The differences between the variables were tested for significance using the Student's criterion with a confidence level of three.

The experimental part of the study was conducted at the poultry farm of "Florenı" JSC and in the laboratory of the Department of Livestock Resources and Product Quality Control, Technical University of Moldova, in 2022.

RESULTS AND DISCUSSION

Body weight is a crucial aspect in poultry farming and is of particular interest in both production and scientific research. This physiological parameter is closely associated with various economically valuable traits of the poultry and plays a pivotal role in determining its reproductive capacity prior to sexual maturity. Therefore, incorporating peat-based feed additive into the diet of laying hens promotes an increase in their live weight. This tendency was observed across all experimental groups. The most

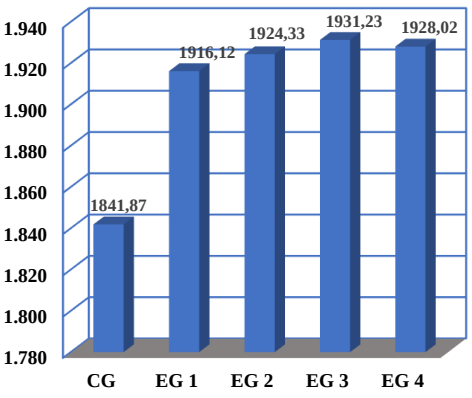

Figure 1. Live weight of Hy-Line laying hens at 34 weeks of age, g

favorable results in terms of live weight were observed in laying hens from the third experimental group (where the level of peat-based feed additive added was 1.0 kg/ton). It is also worth noting that moderate doses (0.75-1 kg/ton) of the additive had a greater impact on the live weight of laying hens, while the higher dose (1.25) did not contribute to muscle mass gain in the hens. (Table 2).

Table 2. Viability of Hy-Line laying hens during the research period

Parameters	Laying Hen Group				
	CG	EG1	EG2	EG3	EG 4
The number of heads at the beginning of the experiment	96	96	96	96	96
The number of heads at the end of the experiment	92	94	96	96	95
Survival rate, %	95.8	97.9	100.0	100.0	98.9

It is important to note that survival rate not only reflects the conditions of housing and nutrition but also serves as a key indicator of laying hens' welfare and health. Improving this metric directly impacts production parameters, such as egg-laying performance. Research indicates that hens provided with optimal housing conditions and supplementary nutrition exhibit higher egg-laying rates.

The use of peat-based feed additive in poultry feeding contributes to enhancing the viability of the hens, leading to an increase in survival rates and, consequently, overall productivity. Such an approach not only positively impacts egg production efficiency but also promotes a high level of hen health and welfare.

The main product produced by hens is eggs. One of the key indicators of egg production efficiency in laying hens is their egg-laying rate, which is determined by the number of eggs they lay over a certain period of time. This metric is directly influenced by various factors, both external (such as housing conditions) and internal (such as genetic traits).

The process of feeding poultry plays a significant role in this regard, as it impacts the external environment and aids in uncovering the genetic potential of the laying hens and their egg-laying capability (Fedorova, 2006).

Chicken egg is a cheap and nutritious product that the human body absorbs almost completely - at a level of 97-98%. This indicates its high biological value and importance in the diet, as its nutrients are easily and efficiently absorbed, contributing to maintaining health and providing the body with essential nutrients (Vereshchagina and Kuzyakina, 2015). The conducted research demonstrates that adding peat supplement to the diet of laying hens significantly increases the intensity of egg-laying processes.

The egg-laying intensity of hens in the experimental groups increased by 2.03% in EG1, by 9% in EG2, by 16.38% in EG3, and by 15.03% in EG4 compared to the control. This indicates higher productivity of laying hens in these groups, especially in EG2 and EG3. The egg mass was also higher in the experimental groups by 97.8 kg (21.0%), 143.3 kg (30.9%), 200.5 kg (43.2%), and 185.8 kg (40.0%) respectively compared to the corresponding control values. This indicator represents the total mass of all produced eggs in each group. Once again, the experimental groups demonstrate a higher egg mass yield compared to the control group.

Table 3. Egg-laying intensity of laying hens under the influence of using peat feed additive

Parameters	Experimental groups				
	CG	EG1	EG2	EG3	EG 4
Average number of laying hens, head	94	95	96	96	95,5
Total eggs produced, pcs.	7236	8737	9623	10502	10338
Average egg production per laying hen	79.97	91.96	100.00	109.39	108.25
Egg-laying intensity, %	69.00	71.03	78.00	85.38	84.03
Average eggs weight, g	61.29±0.37	62.91±0.31	63.07±0.34	63.24±0.27*	62.16±0.32**
Egg mass yield, kg	463.6	561.4	606.9	664.1	649.4
Feed consumption, kg	1578.7	1478.6	1455.2	1400.3	1358.5
per kilogram of egg mass	3.40	2.63	2.39	2.10	2.09
per ten eggs	2.08	1.65	1.51	1.33	1.30

The average egg mass of hens in the control group was 61.29 grams, whereas in the experimental groups, this indicator exceeded that of the control group by 1.62 grams (2.6%) in EG1, 1.78 grams (2.9%) in EG2, 1.95 grams (3.18%) in EG3, and by 0.87 grams (1.41%) in EG4, respectively. These data indicate a statistically significant increase in egg mass in hens supplemented with peat feed additive. This result may be interpreted as a consequence of the enhanced nutritional value of diets enriched with this additive, contributing to the improvement of egg quality in poultry farming (Fig. 1).

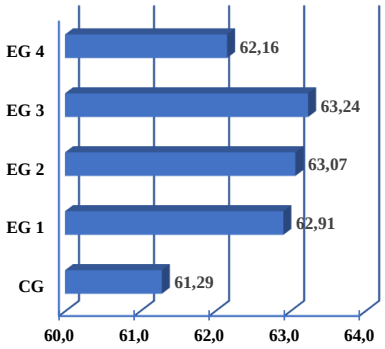

Figure 1. Average egg mass of laying hens, g

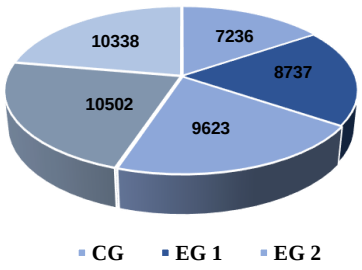

Figure 2. Total eggs produced, pcs.

Farm poultry of experimental groups (EG1, EG2, EG3, EG4) showed a significant increase in the total number of eggs produced compared to the control group. The best results were observed in EG2 (9623 eggs) and EG3 (10502 eggs) where an increase in egg production was observed. These results emphasize the effectiveness of adding peat feed additive to the diet of laying hens to increase their egg production (Fig. 2).

Feed costs per unit of production in the experimental groups were lower than in the control. Feed costs per 1 kg of egg mass in the control group amounted to 3.40 kg, EG1-2.63 kg, and were lower than in the control by 0.77 kg (22.6%), in EG2 - 2.39 kg, which is lower, than in the control group by 1,01 kg (29,7%), EG3 - 2,10 kg, which is lower than in the control group by 1,30 kg (38,2%), OG4-2,09 kg, which is lower than in the control group -1,31 kg (38,5%).

The cost of mixed fodder per 10 eggs in the control group was 2.08 kg, in EG1 - 1.65 kg, and was lower than the control by 20.67%, in EG2 - 1.51 kg, which is lower than the control group by 27.40%, EG3 - 1.33 kg, which is lower than the control group by 36.06%, and in EG4 - 1.30 kg, which is lower than the control by 37.5%.

When using peat-based feed additives in the amount of 1 to 1.25 kg per ton in the diets of laying hens EG3 and EG4, more efficient use of feed resources per unit of production is achieved.

CONCLUSIONS

The inclusion of peat feed additive in the diet of laying hens has significant benefits for poultry production. A 4.2% increase in poultry survival rate and a 43.2% increase in egg production are significant gains. This not only increases egg production but also improves the overall productivity of poultry production.

The use of peat-based feed additive in the diets of laying hens EG3 and EG4 in the specified dosages (from 1 to 1.25 kg per ton) not only contributes to feed savings, but may also have additional positive effects. Peat contains various bioactive components, such as humic substances and trace elements, which can favorably affect poultry health and improve digestion. In-depth analysis of these additives may also include evaluation of their effects on parameters such as growth rate, egg quality and poultry health. This result highlights the potential of peat supplementation in optimizing production and improving product quality in the poultry industry.

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