EFFECT OF FEEDING HUMIC SUBSTANCES ON THE PRODUCTION PARAMETERS AND PRODUCT QUALITY OF BROILER CHICKENS

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ABSTRACT

Besides the scale of production, the success of livestock farming is also affected by the level of input prices. Feed is one of the more expensive items. The aim is to use the feed components in the feeding process as rationally and efficiently as possible, by increasing their attractiveness in terms of intake, by increasing the digestibility and utilization of nutrients. These effects can also be achieved with the help of additives, which include humic substances. In this work, the influence of humic subtances on the production parameters of broilers and on the quality of poultry products was studied. The experimental group of broiler chickens received a feed mixture with the addition of HumacNatur in a concentration of 0.7 %. At the end of the experiment, the control group of broilers reached an average weight of 2606.4 g and the experimental group 2349.0 g. Feed conversion was 1.63 in the control group and 1.74 in the experimental group. The carcass yield of the control group after dissection was 73.2 % and the experimental group after dissection was 75.1 %. The carcass yield of the pectoral muscle of the control

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group was 27.8 % and of the experimental group was 28.4 %. The carcass yield of the thigh muscle was 28.8 % and the experimental group was 29.1 %. Furthermore, the content of water, dry matter, protein and fat in the pectoral and thigh muscles was determined. The results show that the use of HumacNatur at a concentration of 0.7 % did not have a significant effect on the monitored parameters in broilers.

Keywords: humic compounds; growth rate; poultry nutrition

INTRODUCTION

Humic substances (HS) are natural organic compounds formed through the chemical and biological decomposition of plant and animal residues and the synthetic activity of microorganisms. HS naturally occur in soils, peat, brown coal, and lignin. They are formed through a process called humification, which involves a series of anaerobic enzymatic and biochemical processes (Pivokonský et al., 2010; Trčková et al., 2005). They are classified into three types: humic acids, fulvic acids, and humins (Stevenson, 1994).

The use of HS in poultry nutrition as an alternative feed additive has gained increasing importance, especially after the ban on antibiotics in feed as growth promoters. Humic substances act as growth promoters in the nutrition of both broilers and layers. They improve feed conversion and increase weight gain. Adding HS to drinking water or feed improves most production parameters, such as daily weight gain, in addition to increasing the carcass yield of broilers (Maguey-González, 2022; Karaoglu et al., 2004; Ozturk et al., 2012).

Supplementation of humic acids in the diet of broilers affects the physicochemical and organoleptic properties of meat (Semjon, 2020).

Adding humic substances to broiler feed increased the activity of digestive enzymes (amylase, lipase, and protease), meat protein content, total polyunsaturated fatty acid content, activity of superoxide dismutase and glutathione peroxidase, and serum levels of IgG, IgM, and IgA. It also reduced fat content in meat and malondialdehyde levels compared to broilers that did not have HS in their feed (Mao, 2019).

The aim of this experiment was to study the effect of humic substances on the production parameters and product quality of broiler chickens.

MATERIAL AND METHODS

This study was conducted using 60 one-day-old ROSS 308 broiler chicks. The chicks were randomly divided into two groups: a control group and an experimental group, with 30 birds in each group. The chicks were raised on deep litter under controlled conditions in accordance with the technological guidelines for ROSS 308. They were fed a complete feed mixture, whose main components were wheat meal, corn meal, soybean meal, and a premix of supplements. The feed did not contain antibiotic growth promoters, GMOs, anticoccidials, or meat-and-bone meal. For the experimental group, the feed mixture was supplemented with 0.7% of the natural humic preparation HUMAC® Natur AFM. The control group was fed a standard broiler feed mixture without the additive. The chicks had ad libitum access to water and feed. The composition of the feeds used during the experimental periods is shown in Table 1. The feed was analyzed for dry matter, nitrogenous substances, fat, fiber, starch, and ash according to AOAC (2001).

The weight of each broiler was measured weekly, and feed consumption was recorded daily. Feed conversion was calculated based

on feed intake. At the end of the fattening period (day 42), the animals were weighed, stunned, killed by cervical dislocation, and bled. After bleeding and carcass processing, the broilers were weighed, dissected, and the yield and percentage of breast and thigh muscle, wings, carcass, and abdominal fat were calculated. Meat quality was assessed by determining the content of dry matter, protein, and fat in the breast and thigh muscle.

Data obtained from this experiment were evaluated using GraphPad Prism 3.0 and expressed as mean ± standard deviation (X ± SD). Individual results between groups were statistically compared using a paired t-test, and a P-value < 0.05 was considered a statistically significant difference.

RESULTS AND DISCUSSION

Based on the results of weighing the broilers and the feed consumed, the average weights of the broilers were calculated. The evaluation of these results showed smaller weight gains in the experimental group compared to the control group. The addition of humic substances to the feed throughout the monitored period did not significantly affect or improve the weight gains of the experimental animals. Some researchers have found that supplementation with humic acids has no impact on the live body weight of broilers (Marcinčáková, 2015; Kaya and Tuncer, 2009; Nagaraju et al., 2014). On the contrary, Rath and colleagues (2006) found that treatment with humic acid significantly reduced the body weight of broiler chickens, particularly at higher concentrations. However, many studies have demonstrated that supplementation with humic substances positively affected the live

body weight of broiler chickens (Eren et al., 2000; Karaoglu et al., 2004; Ozturk et al., 2012).

The feed conversion ratio for the entire experimental period was statistically insignificantly higher in the experimental group (control group – 1.63; experimental group – 1.74). The results of this study are consistent with the findings of other researchers who reported a deterioration in feed conversion in the experimental group (Hudák et al., 2020; Rath et al., 2006; Demeterová, 2009). However, Jaďutová et al. (2019) stated that the application of humic substances in amounts of 0.8% and 1.0% in the feed mixture resulted in improved final body weight of broilers and feed conversion ratio.

Table 1. Average weights and average gains of chickens

	Average weight (g)		**Average gain (g)**	
Day	**Control group**	**Experimental group**	**Control group**	**Experimental group**
0.	37.4 ±0.53	37.3 ±0.51	-	-
7.	153.1 ±7.81	150.2 ±5.66	16.5	16.1
14.	403.4 ±40.14	388.9 ±34.24	35.7	34.1
21.	873.9 ±82.98	777.3 ±79.94	41.1	47.3
28.	1328.3 ±145.03	1270.2 ±141.61	76.2	63.4
35.	1952.3 ±198.79	1788.1 ±202.2	76.2	83.2
42.	2606.4 ±289.02	2349.0 ±271.89	85.8	70.3

The eviscerated yield was 73.2% in the control group and 75.1% in the experimental group. The experimental group showed a higher yield of breast and thigh muscle and a lower yield of wings and carcass compared to the control group. The differences are not statistically significant ($P < 0.05$). In thigh muscle, there were minimal differences

between the measured values of dry matter, protein, and fat in the control and experimental groups. All observed parameters did not show any statistically significant differences between the groups ($P > 0.05$). Pistová et al. (2017) and Karaoglu et al. (2004) did not find a positive effect on carcass weight and yield in poultry experiments with the addition of humic substances.

Table 2. Yield of body parts after evisceration (%)

	Control group	**Experimental group**
Eviscerated yield	73.2±1.8	75.1±1.7
Breast muscle yield	27.8±2.0	28.4±1.4
Thigh muscle yield	28.8±1.8	29.1±1.4
Wing yield	10.8±0.8	10.3±0.6
Carcass yield	32.6±1.0	32.0±1.0
Abdominal fat yield	0.5±0.3	0.5±0.2

The breast muscle in the experimental group had a 1.7% higher dry matter content. The protein content was slightly higher in the breast muscle of broilers from the experimental group (by 0.57%). A statistically significant difference ($P < 0.05$) was registered in the fat content. The fat content in the experimental group was 1.48% higher than in the control group.

In the experiment, we observed minimal differences in the content of dry matter, water, protein, and fat in chilled breast and thigh muscle. A significant difference was observed only in the higher fat content of the breast muscle of broilers in the group with added humic substances. Conversely, the fat content in the thigh muscle of the group with the

additive was lower by 1.17%, but not statistically significantly different.

Table 3. Chemical composition of meat (%)

	Breast muscle		Thigh muscle	
	Control group	**Experimental group**	**Control group**	**Experimental group**
Dry matter	25.66	27.36	25.62	25.52
Water	74.34	72.64	74.38	74.48
Proteins	22.01	22.58	20.54	22.05
Fat	1.9	3.38	4.34	3.17

Results from the study conducted by Hudák et al. (2021) indicate that a 0.7% addition of HS in both natural and acidified forms to broiler feed significantly affected the composition and quality of breast meat. The addition reduced the meat's fat content and pH and resulted in a lighter color. The authors also noted a significant impact of adding HS to the feed mixture on meat quality during storage. The oxidative stability and sensory properties of the meat were better compared to the control. When evaluating the natural and acidified forms of HS on the quality of breast muscle meat, they observed a comparable effect. The enhanced effect of the acidified form of HS on growth parameters and meat quality was not confirmed. The addition of 0.7% natural HS preparation shows good potential for significantly improving the quality of produced meat as well as potentially improving the growth parameters of poultry.

CONCLUSION

The results achieved with the 0.7% concentration of humate in the feed mixture indicate that this concentration did not have a significant impact on production parameters and product quality. No negative impact on animal health was observed during the experiment. Further research should focus on testing other concentrations of humic substances, their combinations with other supplements, and the optimal timing for their use in fattening.

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