The Effect of the Humic Acid and Herbal Additive Supplement on Production Parameters of Broiler Chicken

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Abstract

In this study the effect of humic acids and dietary herbal additive (clove (*Syzygium aromaticum),* lavender (*Lavendula angustifolia)* and black pepper (*Piper nigrum* L.) on production parameters of broiler chicken were studied. A total of 60 Ross 308 broiler chicken were divided into 3 treatments (n=20). The control group of chickens was fed with complete feed mixtures without any additives. Chicken in treatment T1 were fed a diet containing 1% of humic acid and drank a water containing 150 mg/l of herbal additive. Chicken in treatment T2 were fed with complete feed mixture without any additives and drank a water containing 150 mg/l of herbal additive. The body weight, feed intake and feed conversion were evaluated. The results shout that the body weight was significantly higher ($P \leq 0.05$) in treatments groups compared to the control group (the order of the groups: 1796.4±188.1; 2052.9±197.9 and 2140.4±300.4, g±SD). The feed intake was in the control group 3.11 kg, in the treatment T1 3.00 kg and in the treatment T2 3.12 kg. Feed conversion for the entire fattening period was in control group 2.19 kg/kg complete feed mixture, in the treatment T1 1.83 kg/kg complete feed mixture and in the treatment T2 1.84 kg/kg complete feed mixture with no significant different ($P \geq 0.05$) compared to control group. In conclusion, supplement by humic acid and herbal additive can improve production parameters of broiler chicken.

Keywords: broiler chicken, herbal additive, humic acid, production parameters.

1. Introduction

The use of most antibiotic growth promoters has been banned in many countries, because it is risky due to cross resistance amongst pathogens and residues in tissues. Humic acids, one of the potential substances alternatives to antibiotics in the diet of poultry, are formed from decayed plant matter with the aid of living bacteria in the soil [1]. Humic acids are known for their antidiarrheic, analgesic, immunostimulant and antimicrobial properties [2]. Ozturk et al. (2010) [3] found that the humic acids had positive effect on growth, meat quality, carcass characteristics, selected parameters determined in the blood and in the gastrointestinal tract. The other alternatives to antibiotics as growth promoters are phytogenic feed additives [4]. Beneficial effects of herbs or botanicals in farm animals may arise from activation of feed intake and secretion of digestive secretions, immune stimulation, antibacterial, coccidiostatic, anthelmintic, antiviral or antiinflammatory activity and inhibition or particularly antioxidant properties [5].

The aim of this study was to determine the effect of humic acid with dietary herbal additive (clove, black pepper and lavender) and dietary herbal additive on production parameters of broiler chicken of hybrid Ross 308.

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2. Materials and methods

Animal and diets

The experiment was realized at the Department of Poultry Science and Small Farm Animals in the experimental poultry house on College farm in Kolíňany.

In every experiment a total 60 one-day-old ROSS 308 meat hybrid chicken was included. Chickens were randomized into three groups, each containing 20 birds. Chickens in individual groups were stabled on deep budding, with a maximum occupation of the breeding areas 33 kg.m^2. During the fattening period, the light regimen based on 23 h of light and 1 h of dark was used. The temperature at the beginning of the experiment was 31-33 °C and decreased to 20-22 °C during the experiment. The temperature was maintained using electronic hen-like devices providing radiant heat.

The fattening lasted 42 days. The feeding program included three phases: starter (1-21 days of age), grower (22-35 days of age), and finisher (36-42 days of age). Feed and water were supplied *ad libitum*. Composition of complete feed mixtures is presented in Table 1.

Table 1. Composition of starter, grower and finisher diets

Ingredient	Feed mixture		
	Starter	**Grower**	**Finisher**
Wheat (%)	35.00	35.00	36.82
Maize (%)	35.00	40.00	37.00
Soybean meal (%)	21.30	18.70	20.00
Fish meal 71 % (%)	3.80	2.00	0.00
Limestone (%)	1.00	1.05	1.10
Monocalcium phosphate (%)	1.00	0.70	1.00
Salt (%)	0.10	0.15	0.20
Lysine (%)	0.05	0.07	0.29
Methionine (%)	0.15	0.22	0.29
Premix (%)	0.50	0.50	0.50
Chemical composition			
Metabolic energy (MJ)	12.01	12.03	12.37
Crude protein (g)	210.76	190.42	170.58
Crude fiber (g)	30.18	29.93	30.54
Crude ash (g)	24.24	19.93	38.49
Lysine (g)	11.30	9.89	9.95
Methionine(g)	4.96	5.21	5.46
Ca (g)	8.15	7.27	7.37
P (g)	6.75	5.70	6.00

In control group we used complete feed mixture without any additives. Group of chickens marked as treatment 1 (T1) was fed a diet containing 1% of humic acid and drank water containing 150 mg/l of commercially herbal additive. The group marked as treatment 2 (T2) was drank water containing 150 mg/l of commercially herbal additive. Dietary herbal additive contains a blend of high-quality active substances of clove flower (*Syzygium aromaticum*), medical lavender (*Lavendula angustifilia*) and black pepper (*Piper nigrum* L.).

Performance parameters

Performance parameters as body weight, feed intake and feed conversion were recorded weekly, mortality was recorded daily.

Statistical analysis

All data were analyzed by analysis of variance using the general linear model procedure of the software program Statistical Analysis System. Differences between the indicators were tested using one-way analysis of variance by Duncan's test. Significance was considered at $P \leq 0.05$.

3. Results and discussion

The objective of the present study is to investigate the effect of humic acid with dietary herbal additive and herbal additive to body weight, feed intake and feed conversion of broiler chicken. We presumed that potential synergistic effects between humic acid and herbal additive could result in beneficial effect on the growth performance. Humic acid were given in complete feed mixture and herbal additive were given in drinking water to avoid potential interactions among the active substances. The effect of humic acid with herbal additive and dietary herbal additive on body weight is presented in Table 2. Broiler chickens fed a diet containing 1% of humic acid and drank water containing 150 mg/l of dietary herbal additive (T1) showed significantly higher ($P \leq 0.05$) body weight at the age of 14, 21, 28, 35 and 42 days compared to control group (C). The group of chicken drank water containing 150 mg/l of herbal additive (T2) showed significantly higher ($P \leq 0.05$) body weight at the age of 14, 28, 35 and 42 days compared to control group (C). Positive effects of the humic acids in diet on growth of broiler chickens were obtained by other researcher [6,7]. We used dietary herbal additive contains substances of clove flower (*Syzygium aromaticum* L.), medical lavender (*Lavendula angustifilia*) and black pepper (*Piper nigrum* L.). These substances investigated in experiments Marcinčák et al. (2011) [8], Petrovič et al. (2012) [9], Cardoso et al. (2012) [10] and Abou-Elkhair et al. (2014) [11]. Average weights of chicken during the whole fattening period were higher, but no significant differences, in experimental groups with 1% clove in the feed and 0,2% agrimony extract into water [8]. In contrast with Marcinčák et al. (2011) [8] in our experiment, we observed significant difference in body weight. Cardoso et al. (2012) [10], contrary in our experiment recorded, that black pepper did not promote significant effects in the production indexes in the initial and growing periods. In the final period, from 36 to 42 days of age, the broilers receiving the diet supplemented with 60 mg.kg‑1 of piperine showed better weight gain.

Feed intake and feed conversion is presented in Table 3. Feed intake and feed conversion of broiler chicken fed a diet containing 1% of humic acid and drank water with 150 mg/l of dietary herbal additive (T1) and chicken drank water containing 150 mg/l of herbal additive (T2) was not a significant different ($P \geq 0.05$) compared to control group (C). This is in accordance to results obtained by Petrovič et al. (2012) [9] and Cardoso et al. (2012) [10], who introduced that the clove powder and black pepper added into broiler feed had not significantly effect on feed intake and efficiency.

Table 2. Body weight of broiler chicken (g)

Age/day	Group		
	C	T1	T2
1	39.4	38.3	39.5
7	153 ± 18.75	158.1 ± 14.67	160.1 ± 19.75
14	358.2 ± 55.73	337.1 ± 42.26 *	337.2 ± 47.93 *
21	665.9 ± 112.53	684.5 ± 62.40 *	684.0 ± 96.64
28	965.5 ± 159.25	1015.4 ± 107.44 *	1076.2 ± 155.58 *
35	1405.7 ± 155.19	1518.5 ± 167.95 *	1626.5 ± 213.29 *
42	1796.4 ± 188.06	2052.9 ±197.96 *	2140.4 ± 300.36 *

Mean * with the superscript are significantly different at ($P \leq 0.05$)
Mean ± Standard deviation

Table 3. Feed intake and feed conversion (kg)

	C	T1	T2
Average feed intake per 1 chicken (kg)	3,12	3,00	3,12
Average feed conversion (kg)	2,19	1,83	1,84

We not recorded mortality in the group of chickens fed a diet containing 1% of humic acid and drank water containing 150 mg/l of dietary herbal additive (T1). In the control group (C) and the group of chicken drank water with 150 mg/l of dietary herbal additive (T2) we recorded low mortality, particularly one dead chicken in the group. Deaths were examined by a veterinarian, they were the deaths at the beginning of the experiment due to the low weight of the chicken and carelessness of nurse.

4. Conclusions

Based on the obtained results, it can be concluded that the humic acids and dietary herbal additive, has positive effect on production performances. Broiler chickens fed a diets containing 1% of humic acid and drank water containing 150 mg/l of herbal additive (T1) showed significantly higher ($P \leq 0.05$) body weight compared to control group (C). The group of chickens drank water with 150 mg/l of herbal additive (T2) showed also significantly higher ($P \leq 0.05$) body weight compared to control group (C).
Mortality, feed intake and feed conversion of broiler chicken fed a diets containing 1% of humic acid and drank water containing 150 mg/l of dietary herbal additive (T1) and chicken drank water with 150 mg/l of dietary herbal additive (T2) was not a significant different ($P \geq 0.05$) compared to control group (C).

Acknowledgements

This study was supported by Grant Agency for Science, KEGA of Slovak Republic, Grant No.035SPU-4/2015.

References

1. Nagaraju, R., Reddy, B.S., Gloridoss, R., Suresh, B.N., Ramesh, C., Effect of dietary supplementation of humic acids on performance of broilers. Indian Journal of Animal Sciences, 2014, 84, 447–452
2. Rath, N.C., Huff, W.E., Huff, G.R., Effects of humic acid on broiler chickens, Poultry Science, 2006, 85, 410-414
3. Ozturk, E., Ocak, N., Coskun, I., Turhan. S., Erener, E., Effects of humic substances supplementation provided through drinking water on performance, carcass traits and meat quality of broilers, Journal of Animal Physiology and Animal Nutrition, 2010, 94, 78-85
4. Puvača, N., Ljubojevic, D., Kostadinovic, L. J., Spices and herbs in broilers nutrition: Effects of garlic (*Allium sativum* L.) on broiler chicken production, Worlds Poultry Science Journal, 2015, 71, 533-538
5. Wenk, C., Herbs and botanicals as feed additives in monogastric animals, Asian-Australasian Journal of Animal Sciences, 2003, 16, 282-289
6. Ozturk, E., Ocak, N., Turan, A., Cankaya, S., Performance, carcass, gastrointestinal tract and meat quality traits, and selected blood parameters of broilers fed diets supplemented with humic substances, Journal of the Science of Food and Agriculture, 2012, 92, 59-65
7. Islam, K. M. S., Schuhmacher, A., Ellenberger, C., Effect of dietary humic acid on the performance and health status of broiler chicks, Indian Journal of Animal Sciences, 2008, 78, 873-877
8. Marcinčák, S., Popelka, P., Zdolec, N. et al., Effect of supplementation of phytogenic feed additives on performance parameters and meat quality of broiler chickens, Slovenian Veterinary Research, 2011, 48, 27-34
9. Petrovič, V., Marcinčák, S., Popelka, P., et al., The effect of supplementation of clove and agrimony or clove and lemon balm on growth performance, antioxidant status and selected indices of lipid profile of broiler chickens, Journal of Animal Physiology and Animal Nutrition, 2012, 96, 970-977
10. Cardoso, V. S., Ribeiro de Lima, C. A., Freire de Lima, M. E. et al., Piperine as a phytogenic additive in broiler diets, Pesquisa Agropecuaria Brasileira, 2012, 47, 489-496
11. Abou-Elkhair, R., Ahmed, H. A., Selim, S., Effects of Black Pepper (Piper Nigrum), Turmeric Powder (Curcuma Longa) and Coriander Seeds (Coriandrum Sativum) and Their Combinations as Feed Additives on Growth Performance, Carcass Traits, Some Blood Parameters and Humoral Immune Response of Broiler Chickens, Asian-Australasian Journal of Animal Sciences, 2014, 27, 847-854.