

The Effect of the Humic Substances, Garlic (*Allium sativum* L.), Wormwood (*Artemisia absinthium*) and Walnut (*Juglans regia*) on Carcass Parameters of Broiler Chickens

Veronika Pistová*, Henrieta Arpášová, Cyril Hrnčár, Ján Weis

Slovak University of Agriculture, Faculty of Agrobiological Sciences, Department of Poultry and Small Animal Husbandry, Tr. A. Hlinku 2, 949 76 Nitra, Slovak republic

Abstract

In this study the effect of humic substances, garlic (*Allium sativum* L.), wormwood (*Artemisia absinthium*) and walnut (*Juglans regia*) on carcass parameters of broiler chickens were studied. Broiler chickens Ross 308 (n=60) were divided into 3 groups (n=20). The chickens of the control group were fed with complete feed mixtures without any additives. Chickens in the first experimental group E1 were fed a diet containing 1.5% of humic substances, 0.4% of garlic powder and 0.1% of wormwood. Chickens in the second experimental group E2 were fed a diet containing 1.5% of humic substances, 0.4% of garlic powder and 0.1% of walnut. The carcass weight, weight of heart, liver, gizzard, carcass yield and EPEF were evaluated. The carcass weight was in both experimental groups higher, but not statistically significant ($P > 0.05$) in compare with the control group (values in the order of the groups: 1246.93 ± 172.61 ; 1352.16 ± 139.89 and 1308.30 ± 166.17 g \pm SD). In the first experimental group E1 were weight of heart (12.15 ± 2.29 g \pm SD) and weight of gizzard (41.58 ± 7.44 g \pm SD) significantly higher ($P < 0.05$) compared to the control group (9.99 ± 1.82 ; 33.62 ± 5.03 g \pm SD).

Key words: broiler chickens, carcass parameters, humic substances, garlic, walnut, wormwood.

1. Introduction

The ban on the use of antibiotics as growth promoters in the European Union and the potential for a ban in most part of the world prompted the search for alternative feed supplements in animal production [1]. Humic substances are one of the potential substances alternatives to antibiotics in the diet of poultry [2]. There is an opinion that supplemental of humic substance as a growth promoting agent has multiple health effects and nutritional

benefits for domestic animals. This knowledge has resulted primarily from studies on the use of humic acids to improve the immune system of calves, to treat digestive disorders and diarrhoea of cats and dogs and on humates, including those in feed and water of poultry, to promote growth, carcass yield and characteristics, and egg production [3]. The other alternatives to antibiotics as growth promoters are phyto-genic feed additives [4].

Phyto-genic feed additives are a new class of growth promoters, originating from herbs, spices and their products, which have gained widespread attention in the feed industry in recent years [5]. It has been reported that the essential oils extracted from herbs and spices can play a significant role in health and performance of birds by stimulation of feed

* Corresponding author: Veronika Pistová,
vpistova@uniag.sk

intake, secretion of endogenous enzymes, antioxidant status, and antibacterial effect [6]. The aim of this study was to determine the effect of humic substances with the combination garlic (*Allium sativum* L.) with wormwood (*Artemisia absinthium*), and garlic (*Allium sativum* L.) with walnut (*Juglans regia*) on carcass parameters of broiler chickens Ross 308.

2. Material 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 Koliňany.

A total 60 unsexed one-day-old Ross 308 meat hybrid chicken were randomized into three groups, each containing 20 chickens. Chickens in individual groups were stabled on deep litter with housing density 33kg.m². During the fattening period, the light regimen based on 23h of light and 1h of dark was used. The temperature at the beginning of the experiment was 31-33 °C and weekly fell by 2°C to 20-22 °C. Heating 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. In control group were used complete feed mixture without any additives. The first experimental group (E1) of chickens was fed a diet containing 1.5% of humic substances (humic acids 65%; fluvic acids 5%; Ca 42 278 mg/kg, Mg 5111 mg/kg, Fe 19 046 mg/kg, Cu 15 mg/kg, Zn 37 mg/kg, Mn 142 mg/kg, Co 1.24 mg/kg, Se 1.67 mg/kg, V 42.1 mg/kg, Mo 2.7 mg/kg; humidity 15% from Humic Acid Manufacturer Co., Košice, Slovakia), 0.4% of garlic powder and 0.1% of milled dried leaves of wormwood (Vetservis s.r.o., Nitra, Slovakia). The second experimental group (E2) of chickens was fed a diet containing 1.5% of humic substances (humic acids 65%; fluvic acids 5%; Ca 42 278 mg/kg, Mg 5111 mg/kg, Fe 19 046 mg/kg, Cu 15 mg/kg, Zn 37 mg/kg, Mn 142 mg/kg, Co 1.24 mg/kg, Se 1.67 mg/kg, V 42.1 mg/kg, Mo 2.7 mg/kg; humidity 15% from Humic Acid Manufacturer Co., Košice, Slovakia), 0.4% of garlic powder and 0.1% of milled dried leaves walnut (Vetservis s.r.o., Nitra, Slovakia).

Table 1. Composition of starter, grower and finisher feed mixture

Ingredient	Unit	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
Dried blood	%	1.25	1.25	-
Limestone	%	1.00	1.05	1.10
Monocalcium phosphate	%	1.00	0.70	1.00
Salt	%	0.10	0.15	0.20
Sodium	%	0.15	0.20	0.25
Palm oil	%	0.70	0.16	2.50
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

Performance parameters

In 42 day of fattening, 10 chickens from each group were selected (5 male and 5 female) and were slaughtered. In the laboratory of the Department of Poultry Science and Small Farm Animals in Slovak University of Agriculture in Nitra analysis of samples of chickens was realized. Carcass weight, weight of heart, liver and gizzard were weighed and calculate the carcass yield and EPEF. The following equation was usef for the evaluation of results usin European Production Efficiency Factor (EPEF): $EPEF = (\text{liveability in \%} \times \text{live weight in kg} / \text{length of fattening period in days} \times \text{feed conversion in kg}) \times 100$

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 this study was to investigate the effect humic substances with garlic (*Allium sativum* L.), wormwood (*Artemisia absinthium*) and walnut (*Juglans regia*) on carcass weight, weight of edible offal, carcass yield and EPEF of broiler chickens. Carcass weight in both experimental groups was higher compared to the control group, but with no statistically significant different ($P > 0.05$).

Table 2. Effect of humic substances, garlic, wormwood and walnut on carcass parameters of broiler chickens

Parameter	Unit	Group		
		C	E1	E2
Carcass weight	g	1246.93±172.61	1352.16±139.89	1308.30±166.17
Weight of heart	g	9.99±1.82	12.15±2.29 *	10.80±2.20
Weight of liver	g	47.52±9.96	55.35±11.33	51.57±10.91
Weight of gizzard	g	33.62±5.03	41.58±7.44 *	35.10±9.86
Carcass yield	%	70.81±2.98	70.00±1.86	71.50±4.03
EPEF	points	213.95	256.94	258.14

C-control group; E1-complete feed mixture+ 1.5% humic substances+0.4% garlic+0.1% wormwood; E2-complete feed mixture+1.5% humic substances+0.4% garlic+0.1% walnut; EPEF-European Production Efficiency Factor; n=60; Mean * with the superscript are significantly different at ($P \leq 0.05$); Mean ± Standard deviation

The positive effect of the humic substances on carcass parameters of broiler chickens was obtained by other researcher [7, 3]. Ozturk et al. [3] reported that 1.5g/kg of humic substances has significantly ($P \leq 0.05$) positive effect on carcass weight. Similarly Issa et al. [8] reported that 0.2 or 0.4% of garlic powder in broiler diet had positive effect on carcass weight of broiler chicken. Diet had significant effect ($P \leq 0.05$) on weight of heart and weight of gizzard in the first experimental group (E1) compared to the control group (C). Weight of liver was in both experimental groups higher, however there were no differences ($P > 0.05$) compared to the control group (C). This is not in accordance to results obtained by Rath et al. [2], who introduced that 1.0 and 2.5% of humic substances added into broiler feed had significantly ($P \leq 0.05$) positive effect on liver of

broiler chickens. Similarly [9-11] found that supplement of garlic powder had significantly ($P \leq 0.05$) positive effect on weight of liver, which is contrary to our findings.

In the group of broiler chickens, where were fed a diet containing 1.5% of humic substances, 0.4% of garlic powder and 0.1% of milled dried wormwood leaves (E1) were found a lower carcass yield to compare with the control group (C). Contrariwise in the group of broiler chickens, where were fed a diet containing 1.5% of humic substances, 0.4% of garlic powder and 0.1% of milled dried walnut leaves (E2) were found a higher carcass yield to compare with the control group (C). But in both results were no statistically differences ($P > 0.05$) between groups. According Raeesi et al. [11], diets supplemented with 1% of garlic powder had higher carcass yield than those which received 0.5%. This

agrees with Mahmood et al. [12], who shows that a basal diet containing 0.5% of garlic failed to produce positive effect on carcass yield.

As show Table 2 the supplement of humic substances, garlic (*Allium sativum* L.), wormwood (*Artemisia absinthium*) and walnut (*Juglans regia*) had positive, but no significant effect ($P>0.05$) on the European Production Efficiency Factor (EPEF) of broiler chickens Ross 308 in this experiment.

Also Demeterova et al. [13] reported that broiler chickens with humic substances in diets had positive effect on EPEF compared to the control group. This agrees with Brzoska et al. [10], who found that broiler chickens with basal diet containing 1.00; 1.50 and 2.25 ml of garlic extract had higher values of EPEF.

4. Conclusion

The effect of humic substances, garlic (*Allium sativum* L.), wormwood (*Artemisia absinthium*) and walnut (*Juglans regia*) on carcass parameters of broiler chickens Ross 308 was studied. Based on the obtained results, it can be concluded that the use of these additives has no positive effect on carcass weight, weight of liver and carcass yield. Positive effect was found only in broiler chickens fed a diet containing 1.5% of humic substances, 0.4% of garlic powder and 0.1% of milled dried wormwood leaves (E1), who showed statistically significantly higher ($P\leq 0.05$) weight of heart and weight of gizzard compared to the control group (C).

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