MON -46

Carcass Yield and Internal Organ Weights of Broiler Chickens Fed Diets Containing Garlic, Ginger and Garlic-Ginger Mixture

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Abstract

This study was conducted to evaluate carcass yield and internal organ weights of broiler chickens fed garlic, ginger and garlic-ginger mixture. Four experimental broiler starter and finisher diets were formulated such that the diets contained 1.0% ginger (T_2), garlic (T_3) and garlic-ginger mixture (0.5 ginger + 0.5 garlic) (T_4), respectively. The control diet (T_1) contained no garlic or ginger or their mixture. The diets were fed toone hundred and twenty (120) day old Cobb broilers in a 56- day feeding trial. The diets were randomly assigned to fourgroups of 30 birds in a complete randomized design (CRD) replicated 3 times. Each replicate contained 10 birds. Broiler starter and finisher diets were fed for 0-28 and 29-56 day of age, respectively. Carcass yield and internal organ weights werecomparable for the treatments but dietary ginger, garlic and garlic-ginger mixture resulted in 4.06, 3.47 and 1.87% increase in carcass yield accompanied by a reduction of 0.47, 0.81 and 0.34% in abdominal fat, respectively. The increase in carcass yield materialized in additional net profit. In conclusion, the results confirm the beneficial effect of ginger, garlic and garlic-ginger mixture on broilers which manifested in additional profit to broiler processors. Ginger, garlic, and their mixture should be considered an effective phytogenic feed additive in poultry ration formulation.

Keywords: Garlic, ginger, broiler, internal organs, carcass yield

Introduction

The ban on the use of antibiotic growth promoters in livestock and poultry nutrition by the European Union has generated interest in the search for an alternative. This has given rise to the use of different feed materials in poultry feed formulations to enhance growth rate, improve feed efficiency and utilization (Abbas and Ahmed 2010; Raeesi *et al.,* 2010; Oleforuh-Okoleh *et al.,* 2014). Phytogenic feed additives are currently used in livestock and poultry production because of their positive properties including; anti-inflammatory, antiseptic, sedative, bactericidal, gut functions, fungicidal, antiviral, antioxidant, growth-promoting efficacy, dietary palatability, immune stimulating, stimulation of digestive enzyme and absorption of nutrients (Cross *et al.,* 2007; Ertas *et al.,* 2005; Steiner, 2009; Puvaca *et al.,* 2013).

These plant-derived compounds which include; herbs, spices and essential oils or oleoresins, are normally incorporated into diets for improved productivity in livestock and poultry. A variety of these phytogenic feed additives including ginger and garlic have been widely used as alternatives to synthetic antimicrobial growth promoters in livestock and poultry rations. Ginger (*Zingiber officinale*) and garlic (*Allium sativum*) are widely used species in various foods and beverages and in medicine (Chrubasik *et al.,* 2005). Ginger contains; gingerol, gingerdiol and gingerdione which have the ability to stimulate digestive enzymes, affect microbial activity, anti-oxidative, anti-inflammatory, antiseptic, anti-parasitic and immune modulatory properties when used in poultry diet (Zhang *et al*., 2009; Mohamed *et al*., 2012; Akintobi *et al.,* 2013, Zomrawi *et al.,* (2013). On the other hand, garlic contains sulphur compounds; allin, diallysulphide, allyldisulphide and allicin (Chang and Cheong, 2008; Kumar and Berwal, 1998).Oleforuh-Okoleh *et al.* (2014), Eltazi (2014) and Raeesi *et al.* (2010) report no significant effects on carcass weight, dressing percentage, heart weight and abdominal fat of broiler chickens fed ginger and garlic. However, there is little or no information on lower dietary inclusion levels of ginger, garlic and their mixture in broiler diets.

The aim of this work therefore, is to determine the carcass yield andorgan weights of broilers fed diets containing 1% ginger, garlic and ginger-garlic mixture, respectively.

Materials and Methods

This experiment was conducted at the Poultry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Nigeria. Owerri is located in the South-East agro-ecological zone of Nigeria. It lies between latitude $4^{0}4^{1}$ and $6^{0}31$Nand longitude $6^{0}15^{1}$ and $8^{0}15^{1}$E with mean annual rainfall, temperature and relative humidity of 2250mm, 26.5-27^{0}C and 70-80%, respectively (Adeyemi, 2011). Ginger and garlic used for the experiment were procured fresh from a market in Owerri. The light scaly leaves on garlic were removed and the bulb separated into cloves. Both ginger and garlic were then sliced into 3-4 slices, sun-dried for 5 - 7 days depending on the intensity of the sun, ground into meals using an attrition mill and stored for use in broiler diets. Four experimental broiler starter and finisher diets were formulated such that diet 1(control) contained none of test materials. Diets 2, 3 and 4 contained 1.0% ginger, garlic and mixture (0.5 ginger + 0.5 garlic), respectively. The ingredient composition of the experimental diet is shown in table1.

One hundred and twenty (120) day-old broiler chicks of Cobb strains were used for the trial. The birds were divided into 4 groups of 30 birds each. Each group was sub-divided into 3 replicates of 10 birds each and housed in a 1.4 x 1.4 m compartment in the cemented floor, covered with wood shavings as the litter material in an open-sided poultry building. The pens were covered with black polythene for the first two weeks to control wind and heat. Each pen contained a feeder, drinker and a stove (to supply heat) for the first two weeks. Three pens were randomly assigned to an experimental diet in a complete randomized design. Feed and water were provided *ad libitum.* The starter and finisher diets were fed for 0 – 28 day and 29 – 56 day of age, respectively. Routine medications and other routine poultry management practices were maintained. At the end of the feeding trial, the birds were weighed and 3 birds were selected from each treatment, starved of feed but not water for 16 hours, slaughtered and eviscerated.

Data on carcass yield and organ weights were collected and expressed as percent live weight. Data collected were subjected to statistical analysis using the General Linear Models (GLM) procedure of SAS® and the Student Newman-Keul's test $p< 0.05$.

Table 1: Ingredient and nutrient composition of the experimental starter and finisher broiler diets

	Starter				Finisher			
Ingredient	T_1 (0%) Control	T_2 (1%) Ginger	T_3 (1%) Garlic	T_4 (0.5+0.5%) Ginger+Garlic	T_1 (0%) Control	T_2 (1%) Ginger	T_3 (1%) Garlic	T_4 (0.5+0.5%) Ginger+Garlic
Maize	48.00	48.00	48.00	48.00	58.00	58.00	58.00	58.00
Soybean Meal	26.00	26.00	26.00	26.00	19.00	19.00	19.00	19.00
PKC	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00
Wheat Offal	4.00	3.00	3.00	3.00	3.00	2.00	2.00	2.00
Spent Grains	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00
Fish Meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Bone Meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L-Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
L-Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vit/Tm Premix+	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ginger	-	1.00	-	0.50	-	1.00	-	0.50
Garlic	-	-	1.00	0.50	-	-	1.00	0.50
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Chemical Analysis(%DM)								
Crude Protein	23.13	22.64	22.71	22.50	18.65	18.46	18.58	18.84
Crude Fibre	6.05	7.85	5.80	6.33	4.57	5.16	4.81	5.09
Esther Extract	6.88	5.26	3.19	1.93	5.57	5.61	5.25	5.99
Ash	10.39	10.78	9.99	10.00	13.42	12.33	12.58	13.12
NFE	53.54	55.47	58.31	59.54	57.79	59.54	59.18	56.96
ME (Kcal/kg)	3268.30	3110.95	3106.95	3025.00	3148.95	3168.70	3153.90	3162.20

Results and Discussion

Data on the carcass yield and organ weights of broilers fed diets containing ginger (T_2), garlic (T_3) and ginger-garlic mixture (T_4) is shown in table 2. Carcass yield and organ weights were comparable for the treatments but dietary ginger, garlic and ginger-garlic mixture resulted in 4.06, 3.47 and 1.87% increase in carcass yield accompanied by a reduction of 0.47, 0.81 and 0.34% in abdominal fat, respectively. Pourali *et al.* (2010) and Javendel *et al.,* (2008) reported no differences on carcass traits among birds fed garlic powder in the range of 0-2%, which tended to agree with the finding in this work. The finding is also in line with those reported for ginger root and garlic-ginger mixture (Eltazi, 2014; Elmakki *et al.,* 2013), garlic or ginger essential oil as natural growth promote r(Elmakki, 2013; Zomrawi *et al.*, 2012) on carcass yield of broilers. Oleforuh-Okoleh *et al.* (2014) and Raeesi *et al.* (2010) report no significant effects on carcass weight, dressing percentage and abdominal fat of broiler chickens fed ginger and garlic which in agreement with the result of this work. However the percentage increase in carcass yield and reduction in abdominal fat are indicators of the positive effect of the test materials in poultry diets.

The organ weights were unaffected by the treatments. Eltazi (2014) and Valiollahi *et al.* (2014) reported no negative effect on the heart weight but significant effects on live weight, abdominal fat, liver and gizzard weights of broiler chicks fed ginger or garlic and their mixture powder as a natural feed additives contrary to the result of this study. Elmakki *et al.* (2013) also reported differences on dressed carcass and liver weights of broilers fed ground ginger root additive. The variations in the results

may be due to variations in dietary levels and age of birds which may have varied from one experiment to the other. However, the result of this clearly showed that the three products had no negative effects on the internal organs of broilers.

Table 2: Carcass and organ characteristics of broilers in different treatment groups

Parameters	T_1(0%) Control	T_2(1%) ginger	T_3(1%) garlic	T_4(0.5+0.5%) Ginger+garlic	SEM
Live weight (g)	2533.33	2550.00	2483.33	2600.00	27.41
Dressed weight (g)	1742.00	1856.33	1794.33	1838.00	29.33
Dressing percentage	68.78	72.84	72.25	70.65	0.91
Heart (%LW)	0.49	0.38	0.46	0.43	0.02
Liver (%LW)	1.71	1.49	1.67	1.74	0.07
Lungs(%LW)	0.58	0.60	0.59	0.50	0.03
Spleen(%LW)	0.11	0.08	0.09	0.10	0.01
Abdominal fat(%LW)	2.20	1.73	1.39	1.86	0.19
Full gizzard (%LW)	2.88	2.81	3.07	2.80	0.08
Empty gizzard (%LW)	2.08	2.12	2.15	2.20	0.05
Pancreas (%LW)	0.20	0.18	0.20	0.18	0.02

Conclusion

It is therefore concluded that 1.0% dietary inclusion of ginger, garlic and ginger-garlic mixture in broiler diets, respectively, increased the yield of ready to cook carcasses at market age and showed beneficial effects in decreasing the accumulation of abdominal fat in broilers.

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