Asian J. Med. Biol. Res. 2017, 3 (2), 211-215; doi: 10.3329/ajmbr.v3i2.33571

Asian Journal of Medical and Biological Research
ISSN 2411-4472 (Print) 2412-5571 (Online)
www.ebupress.com/journal/ajmbr

Article

Effect of dietary supplementation of ginger extract on growth, carcass characteristics and haematological parameters in broilers

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Received: 07 June 2017/Accepted: 22 June 2017/ Published: 29 June 2017

Abstract: This study evaluated the effect of ginger on the growth performance, carcass quality of broiler chickens. 20 broiler chickens were randomly selected into two treatment groups identified as T1 and T2 with a positive control and a negative control group. Each treatment contained with five birds. Birds on T1 were treated with 1% ginger extract and T2 was treated with 2% ginger extract via drinking water. Significant variations ($p<0.05$) existed between the control and other treatments in mean final body weight, dressed weight, daily feed intake and feed conversion ratio. At the end of experiment (35^{th} day) for 1% ginger extraction treatment the live body weight is 1746gm ($p<0.05$), dressing weight 1106.4 ($p<0.05$) and FCR is 1.67($p<0.05$). The usage of the test ingredients had a significant effect ($p<0.05$) on dressing percentage. Supplementation of ginger improves the performance of broilers when added at the rate of 1% of broiler ration and can be a possible alternative to antibiotic growth promoter in the feeding of broiler chicken.

Keywords: ginger; broilers; growth promoter; carcass characteristics; hematological parameters; alternative antibiotic

1. Introduction

Nowadays, Poultry meat is a good source of animal protein and can contribute immensely in boosting the consumption level of animal protein. The prohibitive increase in the cost of input especially that of feed is among the constraints in commercial broiler production (Madubuike and Ekenyem, 2001). Ensuring more net return and minimizing high expenditure for feed are the main challenges, for which many research strategies have been trying to address through the inclusion of feed supplements and feed additives in the diets of broiler chicken.

A major feed additive that has been extensively used is in poultry feed is antibiotics. Antibiotics use in livestock is the use of antibiotics for any purpose in the husbandry of livestock, which include not only the treatment or prophylaxis of infection but also the use of sub-therapeutic doses in animal feed to promote growth and improve feed efficiency in contemporary intensive animal farming (Ogle, 2013).

Incidentally, their use in animal feed has shown several side effects such as resistance towards the drug and evidence of resistant strains that become zoonotic (Wegener *et al*., 1999). Furthermore, the residue of antibiotics could be end up in human food chain if the with drawl period is not maintained.

Natural medicinal products originating from herbs and spices have been used as feed additives for farm animals (Guo, 2003). The efficacy and importance of a particular feed ingredient in poultry production is evaluated from its effect on the production performance/traits of the birds. Furthermore, valuable information can be obtained from the study of the haematological parameters. This stems from the fact that the blood serves as an important index of physiological, pathological and nutritional status of an animal.

Ginger, *Zingiber officinalis*, is a perennial herbaceous plant that is a part of the *Zingiberaceae* family. Ginger as a carminative, diuretic, tonic and disinfectant compound contains glucosinolate, sterols and triterpenes (Al-Yahya, 1986). Different researchers have examined the effect of ginger on growth performance in broilers, and variable results were reported. For example, Taylor (2001) showed that the use of ginger and ginger powders significantly increased body weight and improved feed conversion compared to birds fed with control diet. In contrast, Zhang *et al.* (2009) examined the effect of processed ginger with different size on growth performance and showed that the ginger additive had no significant effect on the feed efficiency, while body weight and daily weight gain of birds fed with ginger supplements were higher than control group. It is also reported that serum cholesterol levels in broilers can be decrease 0.4 or 0.6% ginger powder.

The use of ginger as substitute for antibiotic growth promoters is desirable for greater productivity of poultry, increased palatability of feed, nutrient utilization, appetite stimulation, increase in the flow of gastric juice and piquancy to tasteless food (Owen and Amakiri, 2012).The present study was carried out to evaluate the growth performance, carcass quality and haematological indices of broiler chicks fed aqueous extract of ginger.

2. Materials and Methods

2.1. Study location

Collected birds were kept at poultry shed of department of pharmacology, Bangladesh Agricultural University, which is located at 24°43´10.02´´N, 90°25´35.42´´E, and elves 45 feet. The study was lasted for 35 days started at early December 2016 and continued until mid-January 2017.

2.2. Test ingredients

The fresh ginger was purchased from KR Shopping centre, Bangladesh Agricultural University campus. The ginger was peeled, cut into small pieces and dried at oven at 40^{o}C for 24 hours. The dried ginger was crushed by grinder (Jaipan-CM/L-7360065) and aqueous extract was prepared by Soxhletextraction as described by (Dieumou *et al.*, 2012). After getting the extraction 1% and 2% solution of ginger was freshly prepared for each day.

2.3. Experimental bird's management

A total of 40 day-old Cobb 500 broiler chicks were purchased from Nourish Poultry & Hatchery Limited, Gazipur, Bangladesh. The chicks were kept for nine days for acclimatization and were fed commercial broiler starter feed (Nourish poultry Feed, Nourish poultry feed limited, Gazipur, Bangladesh) only and given plain drinking water. The brooding temperature was maintained at 35°C during 1st week. It was then gradually lowered by 3°C every week until it reached to room temperature (i.e. 25±1°C). Mean initial weight of the chicks was 35.94 gm at the start of experiment. Chicks were vaccinated with Newcastle disease vaccine (Baby Chick Ranikhet Disease Vaccine-BCRDV, Livestock Research Institute, Mohakhali, Dhaka, Bangladesh) intraocularly on 4th day and 21thday.

On day 7th, 40 chicks weighing average body weight of 91g were randomly allotted to four treatments and a positive and negative control group in a completely randomly design (CRD). The birds were reared in iron cage of 5 × 4 × 3.5 feet. Four experimental groups were identified as T_1 (1% ginger), T_2 (2% ginger), NC (negative control: only feed and water) and PC (positive control: antibiotic (Ciprofloxacin, Renaflox®, Renata Animal Health, Dhaka, Bangladesh), Vitamin B-complex (B-comvit®, Square agrovet and pesticide, Dhaka, Bangladesh), supplied as pharmaceuticals recommended dose).

2.4. Data collection

Bird's weight of all groups was recorded every day. At the end of treatment, blood sample was collected from the wing vein of each bird using disposable plastic syringe and needle with an EDTA. After sacrificed dressing percentage were taken and offal's weight such as the liver, heart, pancreas, gizzard and spleen were recorded.

2.5. Haematological assay

The Packed Cell Volume (PCV), Total Erythrocyte Count (TEC) and Haemoglobin concentrations were done as described by Lamberg SL and Rothstein R (1977).

2.6. Statistics and data analysis

The data were analyzed using general linear model procedure of Statistical Package For Social Science(SPSS) IBM 20and comparison of means tested using Duncan's multiple range test and significance was considered at $p<0.05$ (Dieumou *et al.*, 2012).

3. Results and Discussion

The effects of feeding different concentration of dietary ginger on daily body weight gain are shown in Table 1. All groups had initial body weight 90.75±1.35g. No mortality was detected in all treatment groups throughout the study period. Feed Conversion Ratio (FCR) is shown in Table 2, where significant variation was evident in T_1. Dressed weights of birds are shown in Table 3. No significance variation was found in offal's weight (Table 4). Significant increases of PCV, Hb and TEC are shown in Table 5.

2.1. Growth performance

Daily body weight gain was collected in record log book. In Table 1, average weight gain from day 7 to day 35 is shown with 7 days interval. Best weight gained was observed in T_2group at day 35 followed by T_2, Pc and lowest in Nc.

Table 1. Live body weight of birds from day 7 to day 35.

Groups	Body weight gain (g)				
	Day 7	Day 14	Day 21	Day 28	Day 35
T_1	89.4±5.09 [a]	309.6±23.86[a]	754.2±56.20[ab]	1351.6±83.84[b]	1746.0±159.37[a]
T_2	90.6±5.09 [a]	332.8±23.86[a]	702.0±56.20[ab]	1227.2±83.84[ab]	1602.0±159.37[a]
Pc	91.0±5.09 [a]	311.2±23.86[a]	704.0±56.20[ab]	1349.0±83.84[b]	1748.2±159.37[a]
Nc	92.0±5.09 [a]	314.8±23.86[a]	621.6±56.20[a]	1119.0±83.84[a]	1520.8±159.37[a]

Ginger extract given in broiler diets have significant ($p<0.05$) influence on body weight gains especially after 14 to 35 days of age. It was observed that 1% ginger was better than 2% as a supplementation to increase body weight. Farinu *et al*. (2004) reported slight improvement in the growth performance of broilers value (27.50%) with ginger supplementation. On the other hand, Al-Homidan (2005) reported reduced least mean value (5.98 g/dl), while those on diet growth rate of broiler starters fed ginger at the rate of 20containing 1.00% garlic and 0.50% ginger mixture had higher growth rate. Javed *et al.* (2009) reported that broilerchicks given aqueous extract of ginger showed an improved body weight gain. Dieumou *et al.* (2009) found that there were no differences among the ginger oil diets and the control in terms of feed intake, body weight gain and feed conversion ratio who fed ginger essential oils to broilers. Herawati (2010) reported that hubbard strain broilers fed 2% supplemental red ginger in the diet had significantly higher final body weight than those on the control diet.

2.2. FCR of birds

FCR was calculated in every 7 days interval where best FCR was found in T_1 group at 35th day, followed by Pc, T_2 and lees feed conversion was observed in Nc group.

Table 2. Feed Conversion Ratio (FCR) of birds on weekly basis.

Groups	Feed Conversion Ratio (FCR)				
	Day 7	Day 14	Day 21	Day 28	Day 35
T_1	1.15	2.02	1.57	1.51	1.67
T_2	1.13	1.91	1.69	1.67	1.83
Pc	1.13	1.69	1.78	1.58	1.70
Nc	1.11	1.71	2.01	1.91	1.88

Significant ($P<0.05$) difference were revealed for FCR in all the treatments from 7 days to 35 days of age. Poor FCR was observed in negative control group and better FCR was observed in 1% garlic group. According to Moorthy *et al.* (2009) and Onimisi *et al.* (2005) the FCR of broiler with ginger supplementation has better effect on FCR.

2.2. Dressed weight

After dressing of each bird at day 35, they were individually weighted. Among the groups $T_1$and Pc obtained highest dressed weight followed by T_2 and lowest dressed weight was in Nc group (Table 3).

Table 3. Dressed weight of birdsafter dressing at day 35.

Group	Weight of dressed birds (g)
T_1	1106.4±112.21 [ab]
T_2	927.40±112.21 [a]
Pc	1138.0±112.21 [ab]
Nc	976.8±112.21[ab]

*Different letters denotes significant variation among the groups

2.3. Offal's weight of birds

Individual bird's liver, gizzard, hear, spleen and pancreas weight was taken and no statistical significance was observed (P<0.05).

Table 4. Offal's weight of birds after dressing at day 35.

Groups	Offal's weight of birds (gm.)				
	Liver	**Gizzard**	**Heart**	**Spleen**	**Pancreas**
T1	48.64±0.65 [a]	9.14±1.04[a]	20.85±2.69[a]	3.60±0.28 [ab]	2.66±0.35[a]
T2	58.66±0.66 [c]	9.06±1.04[a]	22.01±2.69[ab]	3.37±0.28 [ab]	2.63±0.35[a]
Pc	51.61±0.66 [a]	9.99±1.04[a]	20.48±2.69[a]	3.11±0.28[a]	2.42±0.35[a]
Nc	47.52±0.68 [b]	10.22±1.04[a]	19.07±2.69[a]	3.43±0.28 [ab]	2.30±0.35[a]

*Different letters denotes significant variation among the groups

The results indicated no significant differences (P<0.05) between all treatment groups in offal's(liver, gizzard, heart, spleen and pancreas) weight of bird.

2.4. Haematological assay

After collection of blood with anticoagulant (EDTA), TEC, Hb and PCV were performed at department of Physiology, Bangladesh Agricultural University, Mymensingh. No significance variation was found but significance increase was found among the groups but 2% ginger treated birds show relatively high PCV with least standard deviation and other hematological parameters are almost similar as positive control.

Table 5. Hematological data.

Group	Mean			Standard Deviation		
	TEC (million/cm^3)	**Hb (g)**	**PCV (%)**	**TEC (million/cm^3)**	**Hb (g)**	**PCV (%)**
T_1	2.62	7.00	23.33	0.14	0.20	0.58
T_2	2.86	7.33	27.00	0.05	0.12	1.73
Pc	2.33	7.27	23.78	0.17	0.30	3.79
Nc	2.28	7	21	0.17	0.31	3.79

Saeid *et al* (2010) observed that aqeous extract of ginger significantly reduced the level of cholesterol in the blood of broilers. Bhandari *et al.* (1998) and Akhani *et al.* (2004) also reported that ginger treatment significantly decreased serum cholesterol. The present experiment didn't check cholesterol level in the blood of broiler.

4. Conclusions

On the basis of the performance of broilers in respect to feed intake, body weight gain, FCR and hematological data it is observed that ginger supplementation was useful in comparison to positive and negative treatment group. Although hematological data was less significant in ginger supplement group but it has significantly higher FCR and dressing percentage value as compared to other groups. Therefore, it is concluded that supplementation of ginger improves performance of broilers when added at the rate of 1% of broiler ration and can be a better alternative to antibiotic growth promoter in the feeding of broiler chicken.

Conflict of interest
None to declare.

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