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Effect of Dietary Supplemental Ginger on Broiler Performance, Carcass Characteristics and Blood Profile

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Abstract

A study using one hundred unsexed day-old broiler chicks (Ross 308), 25 birds/treatment was conducted to evaluate the effect of ginger powder as natural feed additives on the growth performance, carcass traits and blood parameters of broiler chickens. Four dietary treatments were formulated to meet the nutrient requirements of broiler chicks containing ginger powder at levels 0%, 0.2%, 0.4% and 0.6%. The results showed that no significant differences were recorded in body weight and body weight gain between different experimental groups. Birds fed diets supplemented with ginger exhibited better feed conversion (P>0.05) and lower feed intake than control birds. The measurements of carcass traits, hematological values and serum biochemical parameters showed no marked variation between the treated groups. It could be concluded that ginger powder at the used levels in this experiment has not potential to be used as a growth promoter in broiler chicks.

Keywords: Ginger, Growth performance, Carcass traits, Blood parameters, Broilers

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Introduction

Feed additives are nutritive and non-nutritive compounds that are included in poultry ration to improve feed efficiency and weight gain in broilers (Fadlalla et al., 2010, Abouelfetouh and Moussa, 2012, Al-Mashhadani, 2014, Mohamed et al., 2018). In the past, antibiotics were the most commonly used feed additives. However, these days the use of antibiotics have been prohibited in many countries due to their effect on natural gut microflora and drug resistance in humans. As a result, to substitute them without country affecting the health and performance of birds, natural growth promoters such as probiotics, prebiotics, symbiotic, organic acids, enzymes, antioxidants, pellet-binder, herbs and spices can be used (Zhang et al., 2009, Karangiya et al., 2016). Herbs are used worldwide to mitigate or treat illness and elevate the overall wellness. Estimated 60% of world's use herbal as a remedy (Astin, 1998). Herbs and spices and their constituents are generally known to be safe and being an opulent source of secondary bimolecular which exhibit considerable pharmacological impacts (Craig, 1999). Ginger is the rhizome of the plant *Zingiber officinale*, consumed as a medicine, delicacy or spice. The main remarkable components in ginger are gingerdione, gingerdiol and gingerol, which when used in broiler diets have the ability to activate digestive enzymes and affect the microbial activity (Dieumou et al., 2009).The active compounds in ginger have been reported to possess antioxidant, antimicrobial, Immuno-modulatory, anti-tumorigenic, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, anti-lipidemic and antiemetic properties (Al-Amin et al., 2006, Ali et al., 2008, Morakinyo et al., 2011). Therefore, the present research was conducted to evaluate the growth performance, carcass composition, serum biochemical parameters and hematology of broilers fed diets containing different levels of ginger as feed additive up to 42 days of age.

Materials and methods

Experimental birds and diets

A Total of one hundred one day old (Ross 308) broiler chicks were purchased from local hatchery and randomly distributed into four groups, each of 25. A basal starter and finishing diets were in mash form and formulated to meet the nutrient requirement guidelines of National Research Council (1994). The experimental groups were as follows: T1: control, T2:2.0 g ginger/kg), T3:4.0 g ginger/kg) and T4: 6.0 g ginger/kg). The ginger was purchased from the local herbal market as a powder. The birds were fed with starter diet until 21 days of age, followed by finishing diet until 42 days of age. Feed and water were provided for ad libitum consumption. Birds were vaccinated against infectious bronchitis, Newcastle and Gambaro diseases, but no medications were administered during the whole experimental period. All the chickens were maintained at a symmetric temperature and lighting control programme during the whole study period.

Measurements

Performance and carcass traits

Body weights of the chicks were measured at 1, 7, 15, 28, 35and 42 days and average daily feed intake was determined for different experimental periods. Feed conversion ratio was calculated as feed intake: body weight gain at the end of each experimental period. At the end of the experiment, three birds from each group were randomly chosen, slaughtered and the carcass weight, the edible inner organs (heart, liver, gizzard) and lymphoid organs (spleen, thymus and bursa of Fabricius) were weighed and expressed as a percentage of live body weight.

Haematological parameters and blood leucocyte profiles

To evaluate the effects of different dietary treatments on blood haematology at 42 days, blood samples were collected from three birds in each treatment into

EDTA-anticoagulant treated vials. The red blood cell (RBC) and white blood cell (WBC) counts were determined by a haemocytometer method using Natt Herrick solution; haematocrit and haemoglobin values were measured by microhaematocrit and

cyanmethaemoglobin methods respectively **(**Kececi et al., 1998). To determine the leucocyte profiles, one hundred leucocytes per samples were counted by an optical microscope for heterophil to lymphocyte separation according to the protocol described by Lucas and Jamroz (1961).

Serum biochemistry

At 35 days of the experiment, 2 ml of blood was collected from the brachial vein from three birds from each group to obtain serum by centrifugation at 3000 rpm for 15 minutes. Serum samples were assayed for estimation of total protein, albumin, globulin and uric acid by spectrophotometer using commercial test kits (Spectrum, Cairo, Egypt).

Statistical analysis

The collected data was analyzed by one-way ANOVA procedure using the statistical computer Program SPSS 16.00 Software (SPSS Inc., Chicago, IL, USA). Means were compared by Duncan's test when a significant difference was found.

Table (1) : Dietary composition of experimental starter and finisher broiler diets

Ingredients %	Starter Diet (1-21days)	Finisher Diet (22-42 days)
Yellow corn	54.53	61.37
Soya Bean meal	36.96	31.59
Sun Flower oil	4.83	3.85
Lime stone, ground	1.20	1.29
Dicalcium phosphate	1.74	1.26
Salt	0.30	0.30
Methionine	0.14	0.04
Premix*	0.30	0.30
Total	100	100
Calculated analysis		
Kcal ME/Kg diet	3195	3199
Crude protien %	22.92	20.99
Calcium %	1.00	0.90
Phosphorus available %	0.45	0.35
Methionine	0.50	0.38
Lysine	1.32	1.16

*Each3 kg contains: Vit. A, 1200000 IU; Vit. D_3, 300000 IU; Vit. E, 700 mg; Vit. k_3, 500 mg; Vit. B_1, 500 mg; Vit. B_2, 200 mg; Vit. B_6, 600 mg; Vit. B_{12}, 3 mg; Vit. C, 450 mg; Niacin, 3000 mg; Methionine, 3000 mg; Pantothenicacid, 670 mg ; Folicacid 300 mg; Biotin, 6 mg; Choline chloride, 10000 mg; Magnesiumsulphate, 3000 mg; Copper sulphate, 3000 mg;Ironsulphate, 10000 mg; Zinc sulphate, 1800 mg; Cobalt sulphate,300 mg.

Results

The effect of ginger on body weight and weight gain of broilers chicks are presented in Table 2&3. The obtained results indicated that, inclusion of ginger in broiler diets had no significant effect on body weight and gain throughout the whole study period. The highest body weight (2150 g) were observes in T2 group compared to control (2132 g). The obtained results (Table 4) cleared that, feeding ginger to broilers numerically decrease the total feed intake compared to the control group**.** The feed intake appeared to be the lowest (P>0.05) on diet with 0.6 % ginger. Regarding the effect of dietary inclusion of ginger on feed conversion ratio (FCR) of broilers during the experiment (Table 5), the obtained results indicated that, the supplementation of ginger in the diet of broiler chickens does not exert any significant effect on FCR as compared to control. Although, better FCR was observed in T3 group followed by T4 and T2 groups. The effect of ginger on carcass traits of broilers is presented in Table 6. The obtained data revealed that, there were no significant differences in live weight, dressing weight and percentage and relative weights of liver, heart, gizzard, spleen, bursa of Fabricius and thymus between different

treated groups. Data presented in table 7 showed that, no significant differences were recorded in the average values of hematological indices and serum biochemical parameters between different experimental groups.

Table (2): Effect of dietary ginger powder on body weight (g) of broilers

Exp. period (week)	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
Initial	51.80±1.39	51.75±1.47	52.27±1.35	51.08±0.92
1	197.13±4.62	195.08±6.70	195.85±2.60	195.91±5.61
2	474.13 ±11.88	473.49±12.51	466.93±9.99	456.82±22.90
3	918.05±22.83	914.74±16.28	895.76±23.06	912.82±38.84
4	1362.63±35.60	1363.90±31.43	1359.92±48.73	1393.32±45.50
5	1760.13±53.36	1772.06±67.24	1783.00±49.10	1743.90±78.45
6	2131.80±64.40	2149.66±111	2133.00±66.93	2125.56±1.05

T1: control, T2: basal diet plus 0. 2% of ginger powder, T3: basal diet plus 0. 4% of ginger powder, T4: basal diet plus 0. 6% of ginger powder.

Table (3): Effect of dietary ginger powder on weight gain (g) of broilers

Exp. period (week)	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
1	145.33±3.22	143.33±5.88	143.58±1.16	144.83±5.23
2	277.00±11.11	278.41±12.59	271.08±9.58	260.91±23.91
3	443.92±12.98	441.25±5.12	428.83±13.84	456.00±44.09
4	444.58±23.06	449.16±46.71	464.16±43.68	480.50±21.78
5	397.50±21.69	408.16±26.87	423.08±37.32	350.58±64.23
6	371.67±16.61	377.60±41.04	350.00±28.05	381.66±17.41

Table (4): Effect of dietary ginger powder on feed intake (g) of broilers

Exp. period (week)	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
1	190.38	193.50	195.27	207.11
2	498.60	523.41	485.23	495.73
3	834.57	745.71	746.16	898.32
4	978.08	1190.27	1197.53	879.32
5	1077.23	1053.05	1049.24	978.12
6	1040.68	928.90	822.50	1003.77
Total	4619.54	4634.84	4495.93	4462.37

Table (5): Effect of dietary ginger powder on feed conversion ratio of broilers

Exp. period (week)	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
1	1.31	1.35	1.36	1.43
2	1.80	1.88	1.79	1.90
3	1.88	1.69	1.74	1.97
4	2.20	2.65	2.58	1.83
5	2.71	2.58	2.48	2.79
6	2.80	2.46	2.35	2.63
Average	2.11±0.23	2.10±0.21	2.05±0.19	2.09±0.21

Table (6): Effect of dietary ginger powder on carcass traits of broilers

Parameters	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
liver weight (g)	2150.00±0.28	2195.00±0.06	2116.70±0.11	2293.30±0.06
Dressing weight, g	1585.34±50.81	1631.50±113.35	1580.12±109.94	1750.12±29.02
Dressing (%)	73.48±5.26	74.10±3.40	74.65±1.02	73.32±0.81
Liver (%)	1.99±0.11	1.83±0.23	1.91±0.03	1.83±0.13
Heart (%)	0.44±0.06	0.39±0.07	0.53±0.04	0.55±0.07
Gizzard (%)	1.63±0.04	1.62±0.44	1.58±0.09	1.72±0.11
Spleen (%)	0.09±0.02	0.13±0.001	0.09±0.01	0.12±0.001
Bursa of Fabricius (%)	0.08±0.07	0.09±0.01	0.08±0.01	0.09±0.03
Thymus (%)	0.25±0.01	0.26±0.063	0.31±0.07	0.27±0.03

Table (7): Effect of dietary ginger powder on hematological indices and serum biochemical response of broilers

Item	Treatments			
	Control group	Ginger groups		
	T1	T2	T3	T4
Haemoglobin (g/dl)	7.80±0.53	7.20±0.06	7.57±0.17	6.90±0.12
WBCs (x10^3/mm^3)	12.23±0.64	11.40±0.87	11.57±0.77	12.95±2.02
RBCs (x10^6/mm3)	4.43±0.24	4.25±0.03	4.40±0.15	3.90±0.20
PCV%	22.63±1.47	20.95±0.14	21.97±0.47	20.15±0.32
MCV (fl)	71.10±0.59	69.35±0.72	70.10±1.36	77.15±2.40
MCH (pg)	16.95±0.26	17.60±0.26	16.83±0.59	18.20±0.78
MCHC %	34.43±0.09	34.35±0.03	34.43±0.03	34.25±0.03
Heterophils%	20.50±3.60	20.00±0.01	23.33±2.67	22.50±4.91
Lymphocyte%	80.00±4.00	77.00±1.44	71.67±1.67	76.50±4.91
Monocyte%	10.00±1.00	9.65±1.44	11.25±1.00	10.15±0.01
Total protein g/dl	5.84±0.55	5.05±0.18	5.67±0.30	5.46±0.27
Albumin g/dl	3.89±0.14	3.4±0.15	3.57±0.21	3.87±0.11
Globulin g/dl	1.95±0.41	1.65±0.06	2.10±0.15	1.59±0.16
Uric acid mg/dl	48.00±0.80	50.40±0.85	49.39±0.56	49.88±1.40

Discussion

The results of body weight and weight gain are consistent with those of Mohammed and Yusuf (2011), Bamidele and Adejumo (2012), Shanoon et al. (2012), Zomrawi et al. (2013), Ahmed et al. (2014) who did not observe any significant improvements in body weight and gain of broilers fed on a diet containing ginger powder as compared to the control group. However, Al-Mashhadani (2014), Ebrahimmezhad et al. (2014), Karangiya et al. (2016), Sadeghi and Moghaddam (2018) concluded that, inclusion of ginger in broiler diets had positive effect on the body weight and weight gain. Ademola et al. (2009), Zomrawi et al. (2012) stated that, inclusion of ginger in broiler diets has negative effect on body weight gain. The present results concerning the feed intake are agreed with those reported by Herawati and Marjuki (2011), Saleh et al. (2014) who recorded that, feed intake was decreased in birds fed ginger supplemented diets. Our results disagreed with that found by Onu and Aja (2011), Tekeli et al. (2011), Valiollahi et al. (2014) who reported that, ginger supplementation in broiler diets had a positive effect on feed consumption with respect to the control one. The decreasing in feed intake due to the higher level of ginger may be attributed to the adverse effect of taste of ginger on the feed palatability in the diets of broiler chickens. The insignificant improvement in FCR in this study may be attributed to that ginger has ability to increase the digestive and absorptive capacity of the small intestine of commercial broilers by increasing the cryptal depth as well as the intestinal absorptive surface area i.e. villi length and width (Karangiya et al., 2016). The results of FCR are in harmony with the results recorded by Moorthy et al. (2009), Herawati (2010), Sadeghi and Moghaddam (2018) who demonstrated that, inclusion of ginger in poultry diet had positive effect on feed conversion ratio. In addition, Wafaa et al. (2012), Fakhim et al. (2013) who reported that, inclusion of ginger in broiler diets did not exert any effect on FCR as compared to control. In contrast, Iqbal et al. (2011), Saleh et al. (2014) observed that, dietary inclusion of ginger increased the value feed conversion ratio compared to control one. In the present study, dietary inclusion of ginger had no marked effect on dressing percentage and the relative weight of internal organs. In agreement with our findings, Najafi and Torki (2010), Onu (2010), Rahimi et al. (2011), Habibi et al. (2014) noted that supplemental ginger in feed or drinking water for broilers chicken had no significant effect on dressing percentage and the relative weight of liver, heart and gizzard. Feeding on ginger reported no significant effect on the hematological indices. The same results were recorded by Nasiroleslami and Torki (2010), Habibi et al. (2014) who found that no effect of ginger on hematological parameters of broilers. However, AL-Moramadhi (2010), Onu and Aja (2011) found that, inclusion of ginger in broiler diets significantly increased the hemoglobin concentration, packed cell volume and white blood cells.

The results of serum metabolites could be supported by the findings of Arkan et al. (2012), Mohamed et al. (2012) which revealed that, the serum protein, albumin, globulin and uric acid did not affect by inclusion of ginger in broiler diets. However, Rehman et al. (2011), Rafiee et al. (2013) reported that, inclusion of ginger in broiler diets increased the serum concentration of total protein, albumin and globulin.

Conclusion

It could be concluded that ginger powder at the levels used in this work has no significant effect on growth performance of broiler chicks. Ginger at the 0.6% level had no side effect on bird's health as detected by the normal physiological blood profile. Additionally, more studies should be proceeded to evaluate higher levels of ginger.

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