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Original Article

The Effect of Dietary Ginger Root Powder (Zingiber officinale) on Broiler Chicks Performance, Carcass Characteristic and Serum Constituents

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Abstract

An experiment was conducted to determine the effect of ginger root powder as natural feed additives on growth performance and blood chemistry of broiler chicks. One hundred and sixty unsexed one day-old (Hubbard) broiler chicks were divided randomly into four group, each represented a treatment (40 birds/treatment) with 4 replicates in a completely randomized design. The experimental basal rations were formulated to meet requirement for essential nutrients for broiler chicks according to NRC (1994) recommendation. Four graded levels of ginger root powder 0%, 1%, 1.5% and 2% were used. The experiment lasted for six weeks. Blood chemistry and carcass characteristics were measured. Results showed Significant decrease ($P < 0.05$) in feed intake (2170, 2178) and weight gain (996.5, 938.2) for birds fed 1.5% and 2% ginger root powder respectively, and no significant differences were observed in feed conversion ratio among all dietary treatments. Treatments had significant decreased ($P < 0.05$) in pre-slaughter weight for birds fed 2% ginger root powder (1151.9g), and lower dressing percentage was recorded for control (71.1%) and 2% ginger root powder diet (71.5%). Moreover, dietary treatments had no effect ($P > 0.05$) on Hb, PCV, RBcs, MCV, MCH and MCHC percentage. However, there was significant ($P < 0.05$) decrease in MCH (16.48pg) for birds fed 2% ginger root powder diet. No significant differences ($P > 0.05$) were observed in serum triglyceride, creatinine and inorganic phosphorus, meanwhile significant ($P < 0.05$) decreased were obtained on serum glucose (144.5mg/dl), total protein (1.75g/dl), cholesterol (184.25mg/dl) and calcium (6.68mg/dl) for birds received 2% ginger root powder. Inclusion of ginger root powder at level 2% in the diet had lowering effect on cholesterol levels, but it had adverse effect on growth performance.

Key words: Broiler chicks, blood chemistry, feed additive.

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Introduction

Feed additives are added in animal feed to improve their nutritive value, boost animal performance by increasing their growth rate, better feed conversion efficiency, greater livability and lowered mortality in poultry birds. Herbs could be expected to serve as feed additives due to their suitability and preference, reduced risk of toxicity and minimum health hazards (Devegowda, 1996). Moreover, there is a great phobia in using antibiotic as feed additives because of public concern about antibiotic residues in animal products and the potential evolving of antibiotic resistant bacteria. Recent research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality and increased livability in poultry birds (Kumar, 1991; Babu et al., 1992; Mishra and Singh, 2000; Deepak et al., 2002; Jahan et al., 2008). Ginger (Zingiber officinale) is spice which is used for cooking and is also consumed whole as a delicacy or medicine. It have been reported to posses useful pharmacological potent chemical substances for use in poultry (Akhtar et al., 1984), this is due to its antioxidants, antibacterial, anti-inflammatory, antiseptic, anti-parasitic and immunomodulatory properties. Positive effect of ginger on blood circulation, gastric secretion, and enterokinesia were reported by Ali et al. (2008); Incharoen and Yamauchi (2009). In addition, ginger has been found to enhance digestive enzyme activities (Platel and Srinivasan, 1996, 2000). All of these have favorable effects on animal productivity. So, using ginger as natural feed additives in broiler nutrition may be of great benefit and value. The objectives of this study were to evaluated the influences of ginger root powder as natural feed additive on growth performance, carcass characteristic and blood parameters of broilers.

Materials and Methods

Experimental diets

Dried ginger used in this experiment was obtained from the local market then ground into powder. Four experimental diets were formulated according to the recommended nutrient requirement standard of broiler chicks as outlined by National research council (1994). In addition to the control diet 0% ginger root powder, three diets were formulated to contain 1% ginger root powder 1.5% ginger root powder and 2% ginger root powder. The ingredient composition and calculated analysis of the experimental diets is shown in table (1).

Experimental birds and management

One hundred and sixty unsexed day old commercial broiler chicks (Hubbard) were used in this study. They were randomly selected, weighed and distributed into four treatments (40 birds/treatments) with four replicates using Completely Randomized Design (CRD). The birds were raised in an open sided house. In order to boost their immunity they were vaccinated against Newcastle disease and infectious bronchitis on the eighth and 28th days of age, while Gumboro vaccine was administered on the 14th day of the experiment. Water and feed were provided *ad-libitum*. Weekly body weight and feed intake were recorded. Mortality was recorded throughout the period of the study as it occurred. Feed conversion ratio (FCR) was calculated. At the end of the experiment 2 birds per replicate (8 birds/treatment) were randomly selected, leg banded, weighed and slaughtered for carcass evaluation. Pre-slaughter weight, dressing weight were obtained to calculated dressing percentage for each bird. Blood samples were taken from jugular vein during slaughtering, three birds from each replicate (12 birds/treatment) and collected into tubes and allowed to clot, and sera separated by centrifugation at 3000 rpm for 5 minutes. Clear serum was stored at 20˚C pending analysis for glucose, total protein, triglyceride, cholesterol, creatinie calcium, and phosphorus. .

Chemical analysis

Hemoglobin Concentration (Hb) was determined using Hemoglobin –Drabkin Kit. The Packed Cell Volume% (PCV) of Erythrocytes of whole blood was measured using a microhaematocrict centrifuge (Hawksley,London). The Erythrocytes (RBC) were counted using Hayems solution. Mean Corpuscular Volume (MCV), Mean Corpusular Heamoglobib (MCH) and Mean Corpuscular Haemoglobin Concentration

(MCHC)% also were calculated. Plasma glucose and cholesterol were determine by enzymatic calorimetric methods using Kit GOD-PAP (Randox Labratoty Ltd. London). Plasma total protein was determined as shown by (King and Wootton, 1965). Plasma triglyceride was determined by the methods described by Buccolo et al., (1973). Creatinine was determined using commercial kits (Biosystem Reagents and Instruments). Calcium was determined by colorimetric method described by Gindler and King (1972). Phosphorous was determined by the method described by (Gamst and Try, 1980), (Farrell and Kaplan et a*l*., 1984).

Statistical Analysis

All the data obtained were subjected to analysis of variance. The software used was the statistical package for social science (SPSS) version 11.5. Differences of means determined by the Duncan Multiple Range Test as described by Steel and Torrie (1980).

Results and Discussion

Table 2 shows the overall growth performance of broilers chicks fed graded levels of ginger root powder. Feed intake was significantly ($P < 0.05$) decreased for birds fed 1.5% and 2% ginger root powder (2170g and 2178g) respectively, compared to control group (2351g). Body weight gain and feed conversion ratio were not affected by the dietary treatments. The highest pre-slaughter weight was observed for birds received 1% ginger root powder (1438.1g) followed by control (1320.6g) and 1.5% ginger root powder (1265.6g) while the lowest weight obtained by group fed 2% ginger root powder (1151.9g). Birds fed 1% ginger root powder achieved higher dressing percentage (73.7%) than control (71.1%) and other groups. Mortality rate was not affected by the treatments.

Blood parameters results are presented in Table 3. Parameters includes hemoglobin concentration (Hb), packed cell volume (PCV)%, erythrocytes (RBC), mean corpuscular volume (MCV) and mean corpuscular hemoglobin concentration (MCHC)% were not affected by dietary treatments. But the mean corpuscular hemoglobin (MCH) was significantly ($P < 0.05$) influenced by the dietary inclusion of ginger root powder, the MCH value was decreased by increasing the level of ginger root powder in the diet

Table 4 shows the serum constituents results of broilers. Serum triglyceride, creatinine, and phosphorus were not affected by the dietary treatments. Serum glucose was significantly ($P < 0.05$) lower for birds fed 2% ginger root powder (144.5mg/dl) compared with control (183.5mg/dl) and 1.5% ginger root powder (176mg/dl). Serum total protein and cholesterol levels were significantly ($P < 0.05$) lower for birds fed 2% ginger root powder (1.75g/dl and 184.25mg/dl) respectively, and higher for birds fed 1% ginger root powder (2.25g/dl and 456.75mg/dl) respectively. Birds received 1.5% ginger root powder were significantly ($P < 0.05$) recorded higher calcium level (11.4mg/dl) compared to other groups.

The results of feed intake that obtained in the current study are congruence with Herawati (2006) who mentioned that birds fed with 1.5 - 2% ginger consumed less amount of feed and agree with the Herawati (2010) who reported that broiler fed 2% dried supplementary red ginger meal had significantly lower feed intake than those on the control diet while Doley et al. (2009) revealed that no differences in feed intake for broilers fed with ginger extract for 6 weeks period. Body weight gain was not showed any adverse effect by the treatment groups while the pre-slaughter weight was affected. Garcia et al. (2007) and Al-Homidan (2005) found an increased in weight gain of broiler when fed 2% and 6% ginger. Feed conversion ratio were not affected among all groups, the present results agree with findings of Wafaa et al, (2012) who reported that no difference among birds fed on 0.5%, 1% and 1.5% ginger root powder in feed conversion ratio. On other hand authors Herawati (2006); Tollba (2003); Herawati (2010); Moorthy et al. (2009) and Onimisi et al. (2005) they illustrated that birds fed with diets containing ginger up to 2% recorded better feed conversion ratio than un-supplemented one. The higher dressing percentage of birds received 1% ginger root powder and those obtained lower percentage for group fed 2% ginger root powder may attributed to the coincided effect of

these levels in feed intake and weight gain. Haematological parameters were not influenced by treatment diets except MCH also serum triglyceride, creatinine and phosphorus hadn't affected by dietary treatment.

Table 1: The ingredients composition and calculated analysis of the experimental diet

Ingredients	Levels of ginger root powder%**			
	0	**1**	**1.5**	**2**
Sorghum	67.05	66.05	65.55	65.27
Groundnut meal	25.3	25.3	25.3	25.13
Wheat brand	0.6	0.6	0.6	0.6
Super concentrate*	5	5	5	5
Di-calcium	1.35	1.35	1.35	1.35
Salt	0.25	0.25	0.25	0.25
Lysine	0.05	0.05	0.05	0.05
Methionine	0.15	0.15	0.15	0.14
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
ME(kcal/kg)	3114	3105	3101	3100
Crude protein%	22	22.02	22.03	22
Crude fat%	3.91	3.91	3.91	3.90
Crude fiber%	4.3	4.41	4.5	4.51
Calcium	0.99	0.99	0.99	0.99
A. phosphorus%	0.49	0.49	0.49	0.49
Methionine%	0.52	0.51	0.51	0.50
Lysine%	1.12	1.11	1.12	1.11

*****Super concentrate per kg = 40%Cp**,** 1950 kcal ME, 1.44% Crude fibre, 3.9% CF, 10% Ca, 6.4% Av. P, 12% Lysine, 3% Methionine, 3% Methionine+ cystine
**Ginger analysis = 2601mj/kg, 89.29 DM%, 15,5 CP%,2.55 EE%, 13.56 CF%, 59.78 NFE%,8.6 Ash%.

Table 2: Effect of dietary ginger root powder on growth performance of broiler chicks

Parameters	Levels of ginger root powder%					
	0	1	1.5	2	SEM	Sig
Feed intake (g/bird)	2351^{a}	2298^{ab}	2170^{b}	2178^{b}	51.45	*
Weight gain (g/bird)	1113.7	1086	996.5	938.2	54	NS
Feed conversion ratio	2.11	2.12	2.22	2.34	0.09	NS
Pre-slaughter weight (g/bird)	1320.6^{ab}	1438.1^{a}	1265.6^{ab}	1151.9^{b}	65.4	*
Dressing %	71.1^{b}	73.7^{a}	71.9^{ab}	71.5^{b}	0.71	*
Mortality %	1.5	0.25	0.25	0.75	0.39	NS

a, b = mean with different superscripts along rows are significantly different ($p < 0.05$).
NS=Non-significant difference ($p > 0.05$) .
SEM = standard error of treatment means.

Our results in the current study observed lower values of serum glucose, total protein and cholesterol for birds fed 2% ginger root powder agree with the findings of Al-Homidan (2005) and Ademola et al. (2009) who found a significant decrease in blood serum glucose, total protein and

cholesterol when feeding chicks up to 6% ginger, similar observation reported by Wafaa et al., (2012) who pointed that feeding chicks ginger root powder at levels 0.5% and 1% decreased serum cholesterol levels.

Table 3: Effect of dietary ginger root powder on some hematological parameters of broiler chicks

Parameters	Levels of ginger root powder%					
	0	1	1.5	2	SEM	Sig
TRBcs (x106/µL)	4125000	3950000	4450000	4525000	293506.1	NS
Hb	7.9	8.65	8.8	7.4	0.78	NS
PCV%	27.75	26	26.25	25.25	1.72	NS
MCV(fl)	70.22	65.87	58.54	57.27	5.67	NS
MCH(pg)	19.19^{ab}	21.94^{a}	19.56^{ab}	16.48^{b}	1.28	*
MCHC%	28.73	33.20	33.48	29.35	2.14	NS

a, b = mean with different superscripts along rows are significantly different ($p < 0.05$)

Table 4: Effect of dietary ginger root powder on serum constituents of broiler chicks.

Parameters	Levels of ginger root powder%					
	0	1	1.5	2	SEM	Sig
Glucose mg/dL	183.5^{a}	168.25^{ab}	176^{a}	144.5^{b}	9.68	*
Total protein g/dL	2.13^{ab}	2.25^{a}	2.03^{ab}	1.75^{b}	0.13	*
Triglyceride mg/dL	56.75	58.5	43.75	54.5	7.17	NS
Cholesterol mg/dL	430.25^{a}	456.75^{a}	271^{b}	184.25^{c}	55.56	*
Creatinine mg/dL	0.52	0.47	0.59	0.46	0.05	NS
Calcium mg/dL	8.18^{b}	8.5^{b}	11.4^{a}	6.68^{c}	0.61	*
Phosphorus* mg/dL	9.83	10.9	10.15	10.68	0.98	NS

a, b, c =mean with different superscripts along rows are significantly different ($p < 0.05$).
*Inorganic phosphorus

Conclusion

It seem that inclusion of ginger root powder in the broiler chicks diet at level of 1% improved performance, although level 2% ginger root powder decreased serum cholesterol concentration and it had adverse effect on performance and blood constituents .The chicks tolerate ginger root powder up to 1.5%.

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