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Effect of Ginger (*Zingiber officinale*) on Performance and Blood Serum Parameters of Broiler

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Abstract: This study was carried out at the Poultry of Animal Resource, College of Agriculture, Tikrit University. The present study was conducted to explore the usage of different levels of ginger at concentration of 0.1 and 0.2% respectively supplemented to diets on the Performance and blood serum traits of the Broiler Chickens. 180 (ROSS) 3 weeks old broiler chicks raised to 6 weeks of age. The birds were distributed into 3 treatment groups with three replicates per treatment (20 birds per replicate + 10 females). Ginger (*Zingiber officinale*) was supplemented at the rate 0.1 and 0.2% in the diets to treatments T2 and T3 respectively while treatment one served as control. The result of performance parameter showed significant difference between treatments. However body weight, weight gain, FCR and feed intake showed a significant differences ($p<0.05$) between T2 (0.1% ginger) and T3 (0.2% ginger) and control. The total protein didn't differ significantly between the treatment groups. Serum cholesterol, triglyceride and glucose level was a significantly lower in the 0.1 and 0.2% of ginger ($p<0.05$) than control. Findings of the research study indicated that groups receiving ginger at the rate of 0.1 and 0.2% of the diets showed better performance and serum profiles in broiler.

Key words: Ginger, broiler, performance

INTRODUCTION

Many types of feed additives are being used in broiler rations to improve its performance. Spices are very common to be useful additives in broiler diets (Zhang *et al*., 2009). Plant active principles are chemical compounds present in the entire plant or in specific parts of the plant that confers them therapeutic activity or beneficial effects (Martins *et al*., 2001). the supplementation of spices and herbs could have many benefits to broilers health and performance such as having antioxidative potential (Hui, 1996), antimicrobial activity (Dorman and Deans, 2000), enhancing digestion by stimulating endogenous enzymes (Brugalli, 2003). Ginger (*Zingiber officinale*) is widely used in many countries as a food condiment and as a medicinal herb (Chrubasik *et al*., 2005). The main important compounds in Ginger (*Zingiber officinale*) are gingerol, gingerdiol and gingerdione which have the ability to stimulate digestive enzymes, affect the microbial activity and having antioxidative activity (Dieumou *et al*., 2009) when used in broiler diets, Ginger (*Zingiber officinale*) supplementation improved antioxidant and broiler chickens blood serum (Zhang *et al*., 2009). *Zingiber officinale* has been reported for its various medicinal properties such as analgesic, antiemetic, Antiulcer, antipyretic and cardio depressant among others (Mascolo *et al*., 1989; Philips *et al*., 1993; Jana *et al*., 1999) antioxidant and reducing free radicals damage, increase production and reproduction and improve animals health (Bosisio *et al*., 1992).

MATERIALS AND METHODS

180 of three weeks old broiler chicks (ROSS) to 6 weeks of age. At 21st day of age chicks were randomly assigned to 9 different pens, Three treatments were applied, each treatment consisted of three replicates and 20 broilers per replicate (10 males + 10 females). The experiment was conducted over a period of 21 day with performance evaluation. The Feed Conversion Ratio (FCR) for each pen was calculated from body weight gain and feed intake Chicks were fed a corn-soyabean based starter diet contained 22% crude protein and 3079 kcal/kg ME to 21 days of age, finisher diets were fed from 22 to 42 days of age (Table 1) fortified with minerals and vitamins. Ginger (*Zingiber officinale*) rhizomes were purchased from local markets and grounded to be used in dietary treatments, treatment 1: Control (no additive), Treatment 2: 0.1% of ginger and Treatment 3: 0.2% of ginger added to the experimental diets. At the end of the treatments, two birds from each replicate randomly picked up for slaughter (6 per treatment), were slaughtered and Blood samples were collected and centrifuged for 15 min at 3000 rpm to separate the serum. The serum samples

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Table 1: Composition of the broiler diet

Ingredients	Starter	Finisher
Corn	48.20	58.70
Wheat	8.00	7.50
Soybean meal (40%)	28.50	20.50
Protein concentration (50%)	10.00	10.00
Vegetable oil	4.00	2.50
Salt	1.00	0.50
Vit + Min mix*	0.30	0.30
Total	100.00%	100.00%
Calculated composition**		
ME (kcal/kg)	3079.00	3102.60
Crude protein	22.06	19.37
Lys.	1.21	1.03
Meth + Cyc.	0.82	0.75
Ca (%)	1.20	0.95
P (%)	0.44	0.42

*Vitamins and minerals mixture provide per kilogram of diet: Vitamin A (as all-trans-retinly acetate); 12000 IU; vitamin E; 10IU; k3 3 mg; Vit. D3, 2200 ICU; riboflavin, 10 mg; Ca pantothenate, 10 mg; niacin, 20 mg; choline chloride, 500 mg; vitamin B12, 10 Ug; vitamin B6, 105 mg.; thiamine (as thiamine mononitrate), 2.2 mg; folic acid, 1 mg; D-biotin, 50 ug. Trace mineral (milligrams per kilogram of diet): Mn, 55; Zn, 50; Fe, 30; Cu, 10; Se, 1 and Ethoxyquin 3 mg.

**Calculated composition was according to NRC (1994)

were stored at -20°C for the analysis of serum glucose (Coles, 1986), total protein (Wotton, 1964) cholesterol and triglycerides (Franey and Elias, 1986) using Randeox and Biomerinx kits. All data were analyzed using the CRD (Completely Randomized Design) of (SAS, 1992). Duncan's multiple range tests were used to compare differences among treatment means (Duncan, 1955).

RESULTS

All broilers appeared healthy and no mortality occurred throughout the entire experimental period (data not shown). Overall live weight of birds was significantly ($p>0.05$) higher by the addition of ginger and was at 6 weeks of age 1875, 2020, 2075 gm for T1 (control), T2 (0.1% ginger), T3(0.2% ginger) respectively. However no differences were noticed for body weight for the first 3 weeks of experiment. Birds fed with the experimental diets T2(0.1% ginger) and T3(0.2% ginger) had a better ($p>0.05$) weight gain (Table 2) compared to birds fed with control diets (0% ginger) over all the experiment. From Table 2 we can notice that feed intake rate didn't differ between treatments for the first period of the experiment, but the experimental diets birds, T2(0.1% ginger) and T3(0.2% ginger) had less ($p>0.05$) feed intake for the last period and overall the experiment compared with the control birds. In Table 1 we can see that the numbers came to reality (because FCR came from weight gain and feed intake rates) with significantly improved feed conversion ratio by the supplementation of ginger to the diets. T2 (0.1% ginger) and T3(0.2% ginger) had the best FCR for the last week and overall the experiment, 1.98 and 1.90 respectively while that of control was 2.25. Table 3 showed that the supplementation of ginger to the diets lowered the serum cholesterol, triglycerides and glucose significantly. But it had no effect on total blood protein.

DISCUSSION

The minute level of ginger used in this study shown a very weak impact on the body at the first three weeks of the experimental period. While it did give a significant raise ($p>0.05$) when the T2 (0.1% ginger) and T3 (0.2% ginger) exceeded the control treatment at the last week of the experiment and overall the experiment. This indicates the cumulative effect of ginger on the birds live weight. These results are consistent with those reported by Ademola *et al*. (2009) and Onimisi *et al*. (2005) who found that ginger supplementation to the diets can increase body weight when supplemented up to 2% level. This result didn't agreed those of Ghazaiah *et al*. (2007) and Tollba (2003). The addition of gingers

Table 2: Performance parameters of the broiler fed different levels of Ginger (*Zingiber officinale*)

		Periods (Weeks)			
Parameters	Treatments	3	4	5	6
Body weight (g)	T_1	$585.83^{a}\pm1.23$	$981.75^{a}\pm2.40$	$1467.30^{a}\pm1.30$	$1875.00^{b}\pm1.22$
	T_2	$584.04^{a}\pm1.11$	$908.37^{a}\pm2.03$	$1443.57^{a}\pm1.09$	$2020.83^{a}\pm2.00$
	T_3	$607.58^{a}\pm1.09$	$965.37^{a}\pm1.89$	$1471.07^{a}\pm2.00$	$2075.90^{a}\pm2.10$
		3-4	4-5	5-6	3-6
Weight gain (g)	T_1	$395.92^{a}\pm3.21$	$485.55^{b}\pm2.42$	$407.70^{b}\pm1.71$	$1289.17^{c}\pm13.10$
	T_2	$324.33^{a}\pm3.34$	$535.20^{ab}\pm2.09$	$577.26^{a}\pm1.80$	$1436.79^{b}\pm11.12$
	T_3	$357.75^{a}\pm3.13$	$505.74^{a}\pm2.18$	$603.93^{a}\pm1.11$	$1467.42^{a}\pm11.08$
Feed consumption (g)	T_1	$764.33^{a}\pm3.48$	$925.33^{a}\pm7.26$	$1220.00^{a}\pm9.10$	$2909.62^{a}\pm10.12$
	T_2	$751.00^{a}\pm5.20$	$973.33^{a}\pm4.43$	$1128.33^{b}\pm6.80$	$2852.66^{b}\pm11.01$
	T_3	$758.33^{a}\pm4.55$	$946.67^{a}\pm5.33$	$1086.67^{b}\pm3.95$	$2791.67^{c}\pm8.54$
Feed Conversation Ratio (FCR)	T_1	$1.93^{a}\pm0.12$	$1.90^{a}\pm0.01$	$2.99^{a}\pm0.12$	$2.25^{a}\pm0.09$
	T_2	$2.41^{a}\pm0.13$	$1.81^{a}\pm0.03$	$1.95^{b}\pm0.02$	$1.98^{a}\pm0.04$
	T_3	$2.11^{a}\pm0.11$	$1.87^{a}\pm0.01$	$1.79^{b}\pm0.03$	$1.90^{b}\pm0.03$

T_1 served as control while T_2 and T_3 were kept on feed containing 0.1 and 0.2% ginger, respectively.

Values (Mean±SD) of each experimental day in each column followed by different letters differ significantly ($p\leq0.05$).

Table 3: Blood serum parameters of the broiler fed different levels of Ginger (*Zingiber officinale*)

	Treatments		
Parameters	T_1	T_2	T_3
Cholesterol (mg/dl)	126.40[a]±4.610	119.30[b]±4.410	115.89[b]±3.380
Triyglisride (mg/dl)	116.10[a]±1.920	108.20[b]±1.180	107.42[b]±1.880
Glucose (mg/dl)	164.21[a]±1.040	153.56[b]±1.090	150.21[b]±1.070
Total protein (g/dl)	5.66[a]±0.058	5.38[a]±0.139	5.40[a]±0.216

T_1 served as control while T_2 and T_3 were kept on feed containing 0.1 and 0.2% ginger, respectively.
Values (Mean±SD) of each experimental day in each column followed by different letters differ significantly ($p \leq 0.05$)

to diets increased weight gain significantly for the last two weeks and overall the experiment. Al-Homidan (2005) found a similar result when fed the broilers with 2% and 6% ginger. This result was contrary to that done by Garcia *et al*. (2007). Ginger containing diets had an overall lower feed intake ($p>0.05$) compared to control diets which had significantly the highest feed intake rate. this result was contrary to that reported by Doley *et al*. (2009) who observed no differences in feed intake for broilers fed with ginger extract for 6 weeks period, while its agreed with the results from Herawati (2006) who mentioned that birds fed with 1.5-2% ginger consumed less amount of feed. In this study, birds fed with 0.1 and 0.2% ginger had better FCR ($p>0.05$) for the last weeks and overall the experiment. This result agrees with the result from Herawati (2006); Tollba (2003) and Herawati (2010) who scored significantly lower FCR for birds fed with diets containing ginger up to 2%. Birds fed with T2(0.1% ginger) and T3(0.2% ginger) scored the lowest ($p>0.05$) serum glucose, triglycerides and cholesterol compared with those of control treatment birds, while ginger supplementation didn't affect the total blood protein. These findings are similar those of Al-Homidan (2005) and Ademola *et al*. (2009) who found a significant decrease in blood serum glucose and cholesterol when feeding chicks up to 6% ginger.

It is obvious that ginger had a significant effect on performance and many blood serum traits. The very minute amounts of ginger had a very strong impact as antilipdemic effect on serum cholesterol and triglycerides plus its positive effect on total body weight, weight gain and FCR. Ginger had many active compounds such as atsiri oil, bornoeol, kamfen, limonene, humulen, gingibrol, gingiberen and gingerdiol (Rismunandar, 1988), all these compounds improves feed digestion and stimulate its enzymes and thus enhancing feed conversion ratio which lead to increase of body weight gain as we noticed in this study (Conley, 1997). The hypolipidemic action of ginger supplementation can be used to lower risk factor of the cardiovascular diseases and cancer either in animals or human (Ademola *et al*., 2009). The supplementation of ginger reduced cholesterol levels in blood serum because of its antioxidative action which also a mechanism could be used as anti-stress approach (Jang *et al*., 2007). The hypocholesterol action may be done by ginger acting as a potential inhibitor of cholesterol synthesis (Said *et al*., 2010).

However, ginger have a positive effect on broiler's performance and lowering effect on blood serum cholesterol, triglycerides and glucose, which can refer to strong anti-oxidative action and potential anti stress action.

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