Effect of long term feeding of raw and sun-dried garlic (allium sativum) on performance and lipid metabolism of broiler chicks

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Introduction

Garlic (allium sativum) and its preparations have been widely recognized as agents for prevention of various metabolic disorders such as atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes. Several clinical reports have shown that garlic has cholesterol-lowering effect in humans and animals due to the presence of sulphur- containing bioactive compounds in its homogenates (Neil et al 1996, Chowdhury et al 2002). When raw garlic bulb is chopped or crushed, the enzyme allinase activates alliin, a non-protein amino acid present in the intact garlic, to produce allicin (allyl 2-propenethiosulphinate or dially thiosulphinate). Other important sulphur-containing compounds present in garlic homogenates are allyl methyl thiosulphonate, I-propenyl allyl thiosulphonate and y-L-glutamyl-S-alkyl–L-cysteine (Banerjee Maulik 2002)

Many studies have suggested that the hypocholesterolaemic effects of garlic is dependent on its mode of preparation, the duration of the study and the bioactive components of the garlic cloves. (Amagase et al 2001).

This study was therefore designed to investigate the effects of raw and sun-dried garlic on lipid metabolism and hematological parameters in broiler chicks

Materials and Methods

Source and Preparation of Garlic

Locally produced garlic bulbs were purchased from a commercial market in Northern Nigeria and ground with the husk into a paste. A portion of the paste was thinly spread on a glass ware and sun-dried for two days and the dried substance was ground again to obtain dry garlic powder. The garlic paste and garlic powder were incorporated into broiler starter and finisher diets at 0, 1, 2, and 3% levels . The raw garlic was also included at1, 2 and 3% levels (the inclusion level was calculated to exclude moisture content). The composition of the starter's diet is shown in Table 1.

Table 1: Gross Composition of Experimental Diets for Broiler Starter

Ingredients (%)	0% Garlic Powder (1)	1% Garlic Powder (2)	2% Garlic Powder (3)	3% Garlic Powder (4)	1% Garlic Paste (5)	2% Garlic Paste (6)	3% Garlic Paste (7)
Maize	51.0	52.0	52.5	53.0	52.0	52.5	53.0
PKC	8.0	6.0	5.0	3.5	6.0	5.0	3.5
Wheat Bran	4.0	3.0	2.0	1.0	3.0	2.0	1.0
GNC	10.0	11.0	11.0	11.5	11.0	11.0	11.5
Soya Bean	20.5	20.5	21	21	20.5	21	21
Sun-Dried Garlic	0	1	2	3	0	0	0
Ingredients*(%)	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Raw Garlic	0	0	0	0	1	2	3
M.E (kcal/kg)	2903.44	2901.98	2892.2	2880.6	2901.98	2892.2	2880.6
Protein (%)	22.49	22.51	22.42	22.34	22.51	22.42	22.34

*Ingredients: Fish Meal -3%, Bone Meal -1.5%, Oyster Shell -1.2%, Salt -0.25%, Premix - 0.25%, Methionine - 0.15%, Lysine -0.15%

Feeding and Management of Birds.

One hundred and forty seven Anak day-old broiler chicks were randomly distributed into seven dietary treatments of twenty-one birds each. Each dietary treatment consisted of three replicates of seven birds each. The management of the birds was as outlined by Oluyemi and Robert (1979). The trial lasted for 56 days.

Experimental Parameters Measured

The weekly feed intake and weight gain were recorded. Feed conversion ratio was calculated during the 8 weeks experimental period.

Blood collection

Blood used for the analysis of haematological parameters and serum lipids were collected through the jugular vein using needles and syringes from three birds per replicate on days 14, 28, 42 and 56 of the experimental period.

Table 2: Influence of dietary garlic on feed intake, body weight gain and feed conversion ratio

	Treatments						
	1	2	3	4	5	6	7
Average. feed intake gm/bird/day)	77.9±13.03	78.4±10.27	85.4±2.88	86.2±6.73	82.6±2.44	82.8±7.62	90.0±3.77
Average. weight gain (gm/bird/day)	22.1±5.65	21.7 ±5.10	27.5±2.74	24.5±3.24	27.0±0.57	27.9±4.23	26.5±0.04
Feed conversion ratio	3.6±0.30	3.7±0.42	3.1±0.44	3.5±0.32	3.1±0.06	3.0±0.36	3.4±0.15

p >0.05 No significant difference

Analysis of serum lipids

The serum samples were analyzed for Total cholesterol, Triglycerides and High Density Lipoprotein using Randox kit. The Low Density Lipoprotein was calculated using Friedewald formula.

Analysis of Data

All data collected were subjected to analysis of variance of completely randomized design using the SAS (1999) package and the means were separated using Duncan multiple range test of the same software. Values are expressed as mean±SEM. The level of statistical significance was $p<0.05$.F

Results and Discussion

Inclusion of raw garlic paste and sun-dried garlic powder in the diets of starter and finisher broilers at 1, 2 and 3% had no significant effect on the feed intake, weight gain and feed conversion ratio averaged over the eight week period (Tables 2).

Serum Lipids

There was a significant decrease in the values of Total Cholesterol, Triglycerides and Low Density Lipoprotein Cholesterol concentration as the inclusion levels of both raw and sun-dried garlic increased in the diets.

The highest reduction of TC was observed in birds fed 2% raw garlic. A similar pattern was observed in the values of TG and LDL.

The significant reductions observed in Total Cholesterol, Triglycerides and LDL-Cholesterol in this study were probably due to the effect of garlic on the activities of lipogenic and cholesterogenic enzymes such as malic enzyme, fatty acid synthase, glucose-6-phosphate dehydrogenase and 3-hydroxy-3-methyl-glutary-coA(HMG CoA reductase.

This present study also showed that the inclusion of raw and sun-dried garlic significantly increased the value of HDL-Cholesterol.

Table 4: Effect of sun-dried garlic powder and raw garlic on serum lipid

ameters g/(dL)	Treatments 1	2	3	4	5	6	
glycerides	68.7±19.96^{a}	63.3±15.20^{b}	53.3±18.85^{d}	56.8±18.38^{c}	60.8±20.02^{b}	56.8±18.15^{c}	57.6±
olesterol	116.5±6.69^{a}	108.4±8.87^{b,c}	105.4±9.61^{c}	106.4±8.43^{b,c}	110.8±6.28^{b}	96.1±7.76^{d}	106.4
L-Cholesterol	25.3±4.97^{a}	31.5±5.37^{b}	36.9±4.91^{d,e}	35.1±6.08^{c,d}	32.1±5.86^{b}	37.7±5.95^{e}	34.8±
L-Cholesterol	77.5±8.21^{a}	64.2±9.17^{b,c}	57.9±11.10^{d}	59.9±9.25^{c,d}	66.9±7.43^{b}	47.0±6.92^{e}	60.1±

Means with the same superscript (a,b,c,d are not significantly different at p value <0.05

Conclusion

This study showed that raw and sun-dried garlic powders exert hypocholesterolemic effect in broiler chicks but have no negative effect on the performance of birds.

Refrences

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