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## Effect of dietary supplementation of garlic (*Allium sativum*) powder on performance of broiler chicken

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### Abstract

One hundred and thirty-five broilers in three replications were offered standard diet (SD); standard diet plus garlic powder @ 2 percent (G2) and standard diet plus garlic @ 3 percent (G3). The BW gain and FCR was significantly affected due to supplementation of 3 percent garlic powder. The muscle and total cholesterol, LDL and triglycerides were significantly reduced due to supplementation of either levels of garlic. The increased lymphoid organ weights in treatment groups indicated the effect of garlic on immunity. It was concluded that the supplementation of 3 percent as well as 2 percent garlic in broiler diet helps in reducing the levels of muscle and serum cholesterol and improves the immunity.

**Keywords:** Broilers, garlic, cholesterol

### Introduction

Garlic (*Allium sativum*), one of the oldest cultivated plant (Moyer, 1996) <sup>[18]</sup>, widely used as either flavouring agent for food or as a medicinal agent for the treatment of variety of diseases. Garlic has been found to contain different compounds of which more than 30 are known to influence body functions. Due to allicin, an active compound, the sulphur containing compound garlic has strong antibacterial, anti-fungal and lipid lowering effects. Garlic shows inhibition of platelet aggregation (Apitz- Castro *et al.*, 1983) <sup>[4]</sup>, reduction in arterial blood pressure (Mc Mohan and Vargas, 1993) <sup>[16]</sup>. The oil and odourous components of garlic lowers cholesterol in poultry (Qureshi *et al.*, 1983) <sup>[22]</sup>. Several components of garlic and garlic extracts have been shown to have antioxidant properties to both meat- type and egg-type chicken (Chowdhury *et al.*, 2002) <sup>[9]</sup>. Therefore, considering the herbal growth promoter, immunomodulator and hypocholesterolemic activity of garlic, the present study was undertaken.

### Materials and Methods

One hundred and thirty-five day old broilers in three replications were offered standard diet (SD); (G2) standard diet plus garlic powder @ 2% and (G3) standard diet plus garlic powder @ 3%. The feed ingredients and mash feed were analyzed as per AOAC (1995) <sup>[3]</sup>. The body weight was recorded weekly and feed consumption daily. The blood samples collected at 6<sup>th</sup> week were analyzed for LDL cholesterol, HDL and total cholesterol (Tietz, 1995) <sup>[31]</sup> and triglycerides (Bablok, 1988) <sup>[5]</sup>. The dressing percentage and muscle cholesterol (Wybenga and Pileggi, 1970) <sup>[32]</sup> was determined at the end of experiment. The immunologically lymphoid organ weights were determined. The data collected during the experiment were analyzed statistically as per Snedecor and Cochran (1994) <sup>[30]</sup>.

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**Table 1:** Composition of Broiler diet

Particulars	Starter Diet	Finisher Diet
<b>Composition of diet</b>		
Maize	60.00	67.00
Soybean meal	36.20	29.75
DCP	1.20	1.00
Calcite	1.20	1.00
Salt	0.30	0.30
Trace minerals	0.10	0.10
Vitamin Mix	0.10	0.10
Choline chloride	0.10	0.10
Methionine	0.25	0.20
Lysine	0.50	0.40
Coccidiostat	0.05	0.05
<b>Proximate composition</b>		
DM	95.5	94.80
CP	22.05	19.88
EE	6.20	5.80
CF	5.00	4.25
NFE	61.88	65.03
Total Ash	4.87	5.04

## Results and Discussions

**Table 2:** Performance of broilers on supplementation of garlic powder

Parameters	SD	G2	G3	SEM
Initial live BW, kg	45.35	45.69	45.60	0.25
Final live BW*, kg	2442.59 <sup>a</sup>	2437.29 <sup>a</sup>	2071.49 <sup>b</sup>	2.84
Total feed consumption*, kg	4787.92 <sup>a</sup>	4800.11 <sup>ab</sup>	4809.93 <sup>b</sup>	32.66
Feed conversion ratio	1.94	1.94	2.32	0.09
Breast muscle cholesterol**, mg%	68.79 <sup>b</sup>	49.60 <sup>a</sup>	46.62 <sup>a</sup>	1.13
Thigh muscle cholesterol**, mg%	99.31 <sup>b</sup>	90.12 <sup>a</sup>	86.48 <sup>a</sup>	1.27
Serum total cholesterol**, mg/dl	157.77 <sup>b</sup>	125.05 <sup>a</sup>	114.91 <sup>a</sup>	2.27
Serum HDL cholesterol*, mg/dl	73.91 <sup>a</sup>	83.34 <sup>b</sup>	89.09 <sup>c</sup>	0.76
Serum LDL cholesterol**, mg/dl	66.21 <sup>c</sup>	25.52 <sup>b</sup>	11.24 <sup>a</sup>	1.01
Serum triglycerides, mg/dl	88.24 <sup>c</sup>	80.92 <sup>b</sup>	72.90 <sup>a</sup>	1.06
Dressing percentage	65.09	63.23	63.09	0.96
Weight of bursa*, % BW	0.15 <sup>a</sup>	0.24 <sup>b</sup>	0.25 <sup>b</sup>	0.03
Weight of thymus, % BW	0.55	0.55	0.56	0.02
Weight of spleen*, % BW	0.11 <sup>a</sup>	0.13 <sup>b</sup>	0.14 <sup>b</sup>	0.01

abc in the row differ significantly (\*\* $p < 0.01$ , \* $p < 0.05$ )

The significantly decreased body weight gain was observed due to supplementation of 3 percent garlic and corroborates Fritz *et al.*, (1995) <sup>[12]</sup> who reported less body weight on 1% garlic in broilers. Konjufca *et al.*, (1997) <sup>[15]</sup> found decreased ( $p < 0.01$ ) body weight gain when broilers were supplemented with 1.5% of garlic powder. Qureshi *et al.*, (1983) <sup>[26]</sup> reported lower weight gains with increasing level of garlic in broilers. Onibi *et al.*, (2009) <sup>[23]</sup> found no significant difference in final live body weight due to dietary garlic supplementation (5,000 mg/kg diet). Ademola *et al.*, (2009) <sup>[1]</sup> who found no significant difference ( $p < 0.05$ ) in average live weight of broiler chickens fed garlic at 5,000 mg/kg diet. Shendare (2006) <sup>[26]</sup> found non-significant effect of 0.5 and 1% garlic supplementation on body weight in White Leghorns. However, observed highest body weight in group receiving 1% garlic in broilers. Prasad and Pandey (1994) <sup>[24]</sup> also found increased body weight in group receiving 1% garlic in cockerels.

Feed consumption was higher in G3 group followed by G2 group, which are confirmed by Shi *et al.*, (1999) who recorded highest feed intake in group receiving garlic in broilers. Alm El-Dien (1999) <sup>[2]</sup> found that hens fed garlic in diets consumed significantly more feed than the control. El Afify (1997) <sup>[10]</sup> observed increase in feed consumption when

broiler fed garlic or garlic residue supplemented ration. Khan *et al.*, (2008) <sup>[14]</sup> found increased in feed consumption with increasing level of garlic in the diet of desi native laying hens. The observations on FCR are supported by Bidura (1999) <sup>[6]</sup> and Oladele *et al.*, (2012) <sup>[20]</sup>.

The serum total cholesterol reduced ( $p < 0.01$ ) in G2 and G3 as compared to control (SD). However, lowest serum total cholesterol was found in G3 group supplemented with 3% garlic and are consistent with the Issa and Omar (2012) <sup>[13]</sup> who found decreased serum total cholesterol in groups receiving garlic powder @ 0.2 and 0.4%. Mottaghitlab and Taraz (2004) <sup>[17]</sup> also observed lowest serum cholesterol level in group supplemented with 0.5 per cent garlic powder as compared to control in laying hens. Prasad *et al.*, (2009) <sup>[25]</sup> observed similar findings and attributed to the mechanism of hypocholesterolemic and hypolipidemic action of garlic which depresses the hepatic activities of lipogenic and cholesterogenic enzymes. The observations are supported by Choi *et al.* (2010) <sup>[8]</sup>, Rahimi *et al.*, (2011) <sup>[27]</sup> and Ademola *et al.*, (2009) <sup>[1]</sup>. Further the significant increase ( $P < 0.05$ ) in serum HDL cholesterol was also reported in treatment groups than control. However, significant difference was also recorded between the garlic supplemented groups. The group receiving 3% garlic showed highest serum HDL cholesterol

amongst experimental groups. Issa and Omar (2012)<sup>[13]</sup> could also find increase serum HDL cholesterol in broilers due to dietary supplementation of garlic powder, which is analogous to the observations of serum HDL cholesterol in the present study. Similarly Prasad *et al.*, (2009)<sup>[25]</sup> also observed significant increase in HDL cholesterol in group receiving 3% garlic as compared to control group. Similar observations of increase in serum HDL cholesterol in broilers due to garlic supplementation have been reported by Rahimi *et al.*, (2011)<sup>[27]</sup> and Choi *et al.*, (2010)<sup>[8]</sup>. However, serum LDL cholesterol was significantly decreased ( $p<0.01$ ) due to supplementation of garlic @ 2 and 3% in the diet. The findings are supported by Qureshi *et al.*, (1983)<sup>[26]</sup> who found decreased serum LDL cholesterol in odourless water soluble garlic supplemented group as compared to control group in broiler chicken. Issa and Omer (2012)<sup>[13]</sup> also observed a significant decrease in the level of LDL cholesterol in birds fed with garlic powder as compared to the control group birds.

Rahimi *et al.*, (2011)<sup>[27]</sup> also reported reduced serum levels of LDL and triglycerides due to supplementation of garlic. Prasad *et al.*, (2009)<sup>[25]</sup> also observed significant decrease in serum triglycerides of broilers when feed supplemented with garlic @ 1.5% and 3%. Ologhobo *et al.*, (2008)<sup>[21]</sup> reported that garlic has reducing effect on triglycerides level and the best result was obtained in 2% of garlic in the basal diet. The breast muscle cholesterol and thigh muscle cholesterol concentration was also found to be reduced significantly ( $p<0.05$ ) due to supplementation of garlic. This reduction may be attributed to the organic tellurium compounds which are found in high concentration in garlic buds, which may inhibit enzymes in the synthetic pathway of cholesterol according to Qureshi *et al.*, (1983)<sup>[26]</sup>. Konjufca *et al.*, (1997)<sup>[15]</sup> also found reduced breast muscle cholesterol in garlic supplemented group in broilers.

The weight of bursa and spleen in garlic supplemented groups were found to be significantly ( $p<0.05$ ) higher than the control group. The trend of increase in weight of spleen and bursa by supplementation of graded level of garlic may be due to increase in activity of lymphoid organ, in term increase in immunity. Rahimi *et al.*, (2011)<sup>[27]</sup> found significant increase in weight of bursa in the garlic group as compared with other groups, while relative weight of spleen was unaffected by treatments.

It was concluded that the supplementation of 3 percent as well as 2 percent garlic in broiler diet helps in reducing the levels of muscle and serum cholesterol and improves the immunity.

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