



ISSN: 2456-2912

VET 2024; 9(1): 1423-1426

© 2024 VET

www.veterinarypaper.com

Received: 24-11-2023

Accepted: 25-12-2023

GG Sewatkar

Department of Animal Nutrition
Nagpur Veterinary College,
Nagpur, Maharashtra, India

AP Dhok

Department of Animal Nutrition
Nagpur Veterinary College,
Nagpur, Maharashtra, India

AD Deshmukh

Department of Animal Nutrition
Nagpur Veterinary College,
Nagpur, Maharashtra, India

SR Lende

Department of Animal Nutrition
Nagpur Veterinary College,
Nagpur, Maharashtra, India

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

GG Sewatkar, AP Dhok, AD Deshmukh and SR Lende

DOI: <https://dx.doi.org/10.22271/veterinary.2024.v9.i1t.1146>

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) ^[18], 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) ^[4], reduction in arterial blood pressure (Mc Mohan and Vargas, 1993) ^[16]. The oil and odourous components of garlic lowers cholesterol in poultry (Qureshi *et al.*, 1983) ^[24]. 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) ^[9]. 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) ^[3]. The body weight was recorded weekly and feed consumption daily. The blood samples collected at 6th week were analyzed for LDL cholesterol, HDL and total cholesterol (Tietz, 1995) ^[29] and triglycerides (Bablok, 1988) ^[5]. The dressing percentage and muscle cholesterol (Wybenga and Pileggi, 1970) ^[30] 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) ^[28].

Corresponding Author:

AP Dhok

Department of Animal Nutrition
Nagpur Veterinary College,
Nagpur, Maharashtra, India

Table 1: Composition of Broiler diet

Particulars	Starter Diet	Finisher Diet
Composition of diet		
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
Proximate composition		
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 ^a	2437.29 ^a	2071.49 ^b	2.84
Total feed consumption*, kg	4787.92 ^a	4800.11 ^{ab}	4809.93 ^b	32.66
Feed conversion ratio	1.94	1.94	2.32	0.09
Breast muscle cholesterol**, mg%	68.79 ^b	49.60 ^a	46.62 ^a	1.13
Thigh muscle cholesterol**, mg%	99.31 ^b	90.12 ^a	86.48 ^a	1.27
Serum total cholesterol**, mg/dl	157.77 ^b	125.05 ^a	114.91 ^a	2.27
Serum HDL cholesterol*, mg/dl	73.91 ^a	83.34 ^b	89.09 ^c	0.76
Serum LDL cholesterol**, mg/dl	66.21 ^c	25.52 ^b	11.24 ^a	1.01
Serum triglycerides, mg/dl	88.24 ^c	80.92 ^b	72.90 ^a	1.06
Dressing percentage	65.09	63.23	63.09	0.96
Weight of bursa*, % BW	0.15 ^a	0.24 ^b	0.25 ^b	0.03
Weight of thymus, % BW	0.55	0.55	0.56	0.02
Weight of spleen*, % BW	0.11 ^a	0.13 ^b	0.14 ^b	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) ^[12] who reported less body weight on 1% garlic in broilers. Konjufca *et al.*, (1997) ^[15] found decreased ($p < 0.01$) body weight gain when broilers were supplemented with 1.5% of garlic powder. Qureshi *et al.*, (1983) ^[24] reported lower weight gains with increasing level of garlic in broilers. Onibi *et al.*, (2009) ^[21] found no significant difference in final live body weight due to dietary garlic supplementation (5,000 mg/kg diet). Ademola *et al.*, (2009) ^[1] 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) ^[26] 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) ^[22] 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) ^[2] found that hens fed garlic in diets consumed significantly more feed than the control. El Afify (1997) ^[10] observed increase in feed consumption when

broiler fed garlic or garlic residue supplemented ration. Khan *et al.*, (2008) ^[14] 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) ^[6] and Oladele *et al.*, (2012) ^[19].

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) ^[13] who found decreased serum total cholesterol in groups receiving garlic powder @ 0.2 and 0.4%. Mottaghtalab and Taraz (2004) ^[17] 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) ^[23] 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) ^[8], Rahimi *et al.*, (2011) ^[25] and Ademola *et al.*, (2009) ^[1]. 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)^[13] 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)^[23] 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)^[25] and Choi *et al.*, (2010)^[8]. 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)^[24] 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)^[13] 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)^[25] also reported reduced serum levels of LDL and triglycerides due to supplementation of garlic. Prasad *et al.*, (2009)^[23] also observed significant decrease in serum triglycerides of broilers when feed supplemented with garlic @ 1.5% and 3%. Ologhobo *et al.*, (2008)^[20] 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)^[24]. Konjufca *et al.*, (1997)^[15] 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)^[25] 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.

References

- Ademola SG, Farina GO, Babatunde GM. Serum lipid, growth and haematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agriculture Sciences*. 2009;5:99-104.
- Alm E I-Din AK. Physiological studies on cholesterol in laying hens. *M.Sc. Thesis*, Faculty of Agriculture Animal Reproduction Department Cairo University, Giza, Egypt; c1999.
- AOAC. Official Methods of Analysis, 16th Edn. Association of Official Analytical Chemists., Washington DC; c1995.
- Apitz-Castro R, Cabrera S, Cruz MR, Ledezma E, Jain MK. Effects of garlic extracts and of three pure components isolated from it on human platelet aggregation, arachidonate metabolism, release reaction and platelet ultra-structure. *Throm Research*. 1983;32:155-169.
- Bablok W. General regression procedure for method transformation. *Journal of Clinical Chemistry Biochemistry*. 1988;26:783-790.
- Bidura NG. The effect of garlic (*Allium sativum*) leaf meal in diets on performance of growing indonesian ducks, *Majalah Ilmiah Peternakan (Indonesia)*. 1999;2:48-53.
- BIS. Indian Standards poultry feeds, Specifications, Bureau of Indian Standards. (4th version) Is: 1374, Manak Bhavan, New Delhi, India; c1992.
- Choi IH, Park WY, Kim YJ. Effects of dietary garlic powder and alpha-tocopherol supplementation on performance, serum cholesterol levels and meat quality of chicken. *Poultry Science*. 2010;89:1724-1731.
- Chowdhury SR, Chowdhury SD, Smith TK. Effects of dietary garlic on cholesterol metabolism in laying hens. *Poultry Science*. 2002;81:1856-1862.
- El-Afify SF. Nutritional studies on onion and garlic supplementation to poultry feed. Ph. D. Thesis, Animal Production Department, Faculty of Agriculture, Ainshams University; c1997.
- Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clinical chemistry*. 1972;18:499-502.
- Fritz Z, Schleichler A, Kinal S. Use of selected herbs or garlic in feed mixtures for broiler chickens. *Biuletyn Naukowy Przemyslu Paszowego*. 1995;34:25-33.
- Issa KJ, Omar JMA. Effect of garlic powder on performance and lipid profile of broilers. *Journal of Animal Sciences*. 2012;2:62-68.
- Khan SH, Hasan S, Sardar R, Anjum MA. Effects of dietary garlic powder on cholesterol concentration in native desi laying hens. *American journal of Food technology*. 2008;3:207-213.
- Konjufca VH, Pesti GM, Bakalli RI. Modulation of cholesterol level in broiler meat by dietary garlic and copper. *Poultry Science*. 1997;76:1264-1271.
- Mac Mohan FG, Vargas R. Can garlic lower blood pressure? A Pilot Study. *Pharmacotherapy*. 1993;19:406-407.
- Mottaghitalab M, Taraz Z. Garlic powder as blood serum and egg yolk cholesterol lowering agent. *Journal of Poultry Science*. 2004;41:50-57.
- Moyer S. Garlic in health, history and world cuisine. Sun coast Press St. Petersburg, FL; c1996, p. 1-36.
- Oladele OA, Emikpe BO, Bakare H. Effects of dietary garlic (*Allium sativum* Linn.) supplementation on body weight and gut morphometry of commercial broilers. *International Journal of Morphology*. 2012;30:238-240.
- Ologhobo AD, Adebisi FG, Adebisi OA. Effects of long term feeding raw and sun-dried garlic (*Allium sativum*) on performance and lipid metabolism of broiler chicks. Conference on International Research on Food Security, Natural Resource Management and Rural Development University of Hohenheim; c2008.
- Onibi G, Adebisi OE, Fajemisin AN, Adetanji AV. Response of broiler chicken in terms of performance and meat quality to garlic (*Allium sativum*) supplementation. *African Journal of Agriculture Research*. 2009;4:511-517.
- Prasad J, Pandey RC. Effect of different levels of garlic inclusion in the ration of cockerels in their growth rate

- and feed conversion ratio. Poultry Adviser. 1994;27:39-41.
23. Prasad R, Rose MK, Virmani M, Garg SL, Puri JP. Lipid profile of chicken (*Gallus domesticus*) in response to dietary supplementation of garlic (*Allium sativum*). International Journal of Poultry Science. 2009;8:270-276.
 24. Qureshi AA, Abuirmeileh N, Din ZZ, Elson CE, Burger WC. Inhibition of cholesterol and fatty acid biosynthesis in liver enzymes and chicken hepatocytes by polar fractions of garlic. Biomedical Life Sciences. 1983;18:343-348.
 25. Rahimi S, Zadeh ZT, Torshizi MAK, Omidbaigi R, Rokoni H. Effects of the three herbal extracts on growth performance, immune systems, blood factors and intestinal selected bacterial population in broiler chickens. Journal of Agricultural Science and Technology. 2011;13:527-539.
 26. Shendare RC. Modulation of cholesterol concentration in chicken egg through dietary supplementation of garlic (*Allium sativum*) in commercial layers. M.V.Sc. thesis, submitted to Maharashtra Animal and Fishery Sciences University, Nagpur; c2006.
 27. Shim KS, Park GH, Choi CJ, Na CS. Decreased triglyceride and cholesterol levels in serum, liver and breast muscle in broilers by supplementation of dietary *Codonopsis lanceolata* root. Asian-Australasian Journal; c2004.
 28. Snedecor GW, Cochran WG. Statistical Methods, 8th Edn., Oxford and IBH Publ. Co. New Delhi; c1994
 29. Tietz NW. Clinical Guide to Laboratory Tests 3rd Ed. Sander Co. Philadelphia; c1995, p. 238.
 30. Wybenga DR, Pileggi VJ. Direct manual determination of total serum cholesterol with a single stable reagent. Clinical Chemistry. 1970;16:980-984.