

PERFORMANCE CHARACTERISTICS AND SERUM BIOCHEMICAL INDICES OF BROILER CHICKEN FED GARLIC (*ALLIUM SATIVUM*) POWDER BASED DIET

Odukoya, S. O., Yahaya, M. O., Awodola-Peters, O. O. and Saka, A. A.

¹Federal College of Animal Health and Production Technology, P. M. B. 5029, Moor Plantation, Ibadan.

Corresponding author: saka.azeez@gmail.com **Phone number:** 08055624725

ABSTRACT

A 56 days study was conducted to determine the effect of garlic powder (GP) supplementation on growth performance and serum biochemical indices of broiler chicken. A total of 150 day old broiler chicks, were randomly allotted into four (4) treatment groups with three replicates, each replicate consisted of 12 birds in a completely randomized design. Four (4) diets were formulated to contain 0, 1, 5, 10g/kg GP and these were designated as D₁, D₂, D₃ and D₄ respectively. Data were collected based on feed intake, weight gain, feed conversion ratio and serum biochemical indices of broiler chicken. Results showed that, GP based diet significantly ($P<0.05$) influenced the feed conversion ratio across the dietary treatments as birds in D₂ (1g/kg GP) recorded the best FCR (1.64) values. Serum biochemical indices of broiler chicken observed in this study increased across the dietary treatments as the GP inclusion levels increased. Birds fed 5g/kg and 10g/kg GPM based diet recorded the highest total protein (13.66 and 14.13mg/dL) and globulin (4.10 and 4.23mg/dL) values. GP supplementation groups had significantly ($P<0.05$) higher albumin values compared with those on D₁. It can be concluded that the garlic powder supplemented at 1g/kg in the diet of broiler chicken gave optimal performance and improved serum biochemical indices of broiler chicken.

Keywords: Broiler, Herbs, Additives, Garlic powdered meal, Antibiotics, Supplement

INTRODUCTION

In pursuit of improved and healthy chicken, coupled with the ban of use of antibiotic in poultry industry and the food quality must not be compromised. This then triggered the need for natural and safe feed additives purposely to fulfil consumer expectations. Growth promoters from herbal sources (phytogenic extracts) are used to achieve better production results (Ortserga *et al.*, 2008), thus ensuring food quality. Poultry farmers produce more of their birds applying natural feed supplemented with herbs (Iji *et al.*, 2001). Garlic is considered as a plant with antibiotic (Reuter *et al.*, 1996) and as natural feed additive in poultry nutrition enhancing broiler production. Feed additives play a significant role in improving the nutritive values of feed ingredients which will invariably enhance the performance of poultry birds. Thus, it has also been described as an alternative antibiotic growth promoter (Demir *et al.*, 2003) in broiler production enhancing feed conversion ratio and decreasing the mortality rate (Horton *et al.*, 1991). A diet comprising garlic powder has been described having beneficial effects on body metabolites (Mottaghitalab and Taraz, 2002). Garlic has benefits in lowering total plasma cholesterol and decreasing platelet aggregation (Sterling and Eagling, 2001). Thus this study is designed to determine the effect of dietary garlic supplementation on growth performance and serum biochemical indices of broiler chicken.

MATERIALS AND METHODS

Experimental site: This study was conducted at the Teaching and Research Farm of Federal College of Animal Health and Production Technology, Bora, Ibadan, Oyo State.

The garlic used for this study was purchased from a local market in Ibadan, Oyo State. The garlic bulb was de-segmented, de-skinned, cut into pieces, sun dried and ground into powdery form. The garlic powder (GP) was incorporated at varying levels of 0, 1, 5, 10g/kg GP to formulate four (4) dietary treatments as indicated in Table 1.

Experimental Animals

A total of one hundred and fifty (150) day old broiler chicks were used for this study. Initial weight were taken and they were randomly allotted into four (4) treatment groups with three replicates, each replicate consisted 12 birds in a completely randomized design.

Data Collection

The birds were subsequently weighed weekly to obtain weight gain per week. Birds were housed in pens under the deep litter system, Weekly weight gain, feed intake and feed to gain ratio were recorded. Feed and water were supplied *ad libitum*.

3mL of blood samples was collected at the end of the experiment from nine (9) randomly selected experimental birds per treatment via the jugular vein using hypodermic needle and syringe. The blood sample was poured into plain sample bottles, decanted and centrifuged to determine serum biochemical parameters.

Statistical Analysis: Data collected were subjected to analysis of variance (SAS, 2005). While significant means among variables were separated using Duncan Multiple Range test of the same package

Table 1: Gross Composition of Experimental Diets at Starter and Finisher Phase

Ingredients	Starter Phase (g/kg)				Finisher Phase (g/kg)			
	D ₁ (0)	D ₂ (1)	D ₃ (5)	D ₄ (10)	D ₁ (0)	D ₂ (1)	D ₃ (5)	D ₄ (10)
Maize	50.50	50.50	50.50	50.50	50.00	50.00	50.00	50.00
Soya bean meal	30.00	30.00	30.00	30.00	20.00	20.00	20.00	20.00
Groundnut cake	5.00	5.00	5.00	5.00	10.00	10.00	10.00	10.00
Fishmeal (72%)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Wheat offal	7.30	7.30	7.30	7.30	15.00	15.00	15.00	15.00
Bonemeal	2.50	2.50	2.50	2.50	2.30	2.30	2.30	2.30
Limestone	2.00	2.00	2.00	2.00	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Premix(starter)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Garlic Powder	-	++	+++	++++	-	++	+++	++++
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis								
Metabolizable								
Energy(Kcal/Kg)	2830.4	2830.4	2830.4	2830.4	2832	2832	2832	2832
Crude Protein(%)	22.50	22.50	22.50	22.50	21.64	21.64	21.64	21.64

RESULTS AND DISCUSSION

Presented in Table 2 is the growth performance of Broiler chicken fed diet containing varying levels of garlic powder. Garlic powder (GP) based diet did not affect ($P>0.05$) growth parameters observed in this study except the feed conversion ratio (FCR). However, feed conversion ratio varied significantly across the dietary treatments in which birds fed 1g/kg GP based diet recorded the best FCR values (1.64). This actually pointed to the fact that birds fed at 1g/kg GP inclusion levels met their optimal level on which they can cope and this invariably improved the FCR values. This can be attributed to the fact that garlic contains an antibiotic properties (Reuter *et al.*, 1996) and natural feed additives in poultry nutrition thus enhances the nutritive values of feed ingredients which invariably influenced the performance of poultry birds. This was similar to the result of Tollba and Hassan (2003) who reported that garlic supplementation improved broiler's growth and feed conversion ratio (FCR). Feed additives have been widely used to increase animals' performance but recently it is used in poultry industry as it brought about increase in growth and feed efficiency (Khan *et al.*, 2007). The insignificant feed intake values obtained across the dietary treatments contradicted the observation of Abouelfetouh *et al.* (2012) who reported garlic supplementation in broiler's diet influenced feed intake. The disparity observed could be attributed to different methods employed in the usage of garlic powder and different breeds used.

Table 2: Growth Performance of Broiler Birds Fed Diet containing varying levels of Garlic Powder meal

Parameters	Inclusion levels of GPM (g/kg)				SEM
	D ₁ (0)	D ₂ (1)	D ₃ (5)	D ₄ (10)	
Initial weight(g/b)	38.36	41.08	40.67	37.74	0.74
Final weight (g/b)	1995.00	2200.00	2065.00	1937.00	39.00
Total weight gain (g/b)	1956.64	2158.92	2024.33	1899.26	38.66
Average daily weight gain(g/b/d)	34.94	38.55	36.15	33.92	0.69
Feed intake (g/b)	3695.42	3537.57	3532.68	3787.50	74.88
Average daily feed intake(g/b/d)	65.99	63.17	63.08	67.3	1.34
FCR	1.88 ^b	1.64 ^c	1.75 ^{bc}	1.99 ^a	0.10

^{a,b,c}Means along the same row with different superscripts are significantly (P<0.05) different.FCR: Feed Conversion ratio

Indicated in Table 3 are the serum biochemical indices of Broiler chicken fed diet containing varying levels of garlic powder. Garlic powder (GP) based diet significantly influenced the serum biochemical indices observed in this study except the glucose and cholesterol. The total protein, globulin, albumin and blood urea nitrogen values of the experimental birds increased across the dietary treatments as the GP inclusion levels increased. This is a similar to the study reported by Oleforuh-Okoleh *et al.* (2015), where increase in total protein, albumin and globulin of broiler birds fed on aqueous garlic extract as compared to control group. However, the results of the study on biochemical parameters of birds supplemented with dietary garlic contradicted with the previous study conducted by Onyimonyi *et al.* (2012), who reported that garlic supplementation decreased serum cholesterol levels

Table 3: Serum Biochemical Indices of Broiler Chickens Fed Diets containing varying levels of Garlic Powdered Meal

Parameters	Inclusion levels of GPM (g/kg)				SEM±	Range of Values
	D ₁ (0)	D ₂ (1)	D ₃ (5)	D ₄ (10)		
Total Protein (mg/dL)	8.33 ^b	11.33 ^{ab}	13.66 ^a	14.13 ^a	0.79	24.50-45.20
Globulin (mg/dL)	2.50 ^b	3.40 ^{ab}	4.10 ^a	4.23 ^a	0.24	7.40-13.10
Albumin (mg/dL)	5.83 ^b	7.93 ^a	9.56 ^a	9.90 ^a	0.55	1.45-4.10
Glucose (mmol/L)	61.67	88.00	59.67	75.33	6.08	9.20-31
Cholesterol (mg/dL)	30.00	83.00	30.66	37.53	2.22	100-129
BUN (mol/dL)	20.10 ^b	20.46 ^{ab}	30.73 ^{ab}	40.03 ^a	0.33	25.40-40.70

Month

CONCLUSION: It can be concluded that the garlic powder supplemented at 1g/kg in the diet of broiler chicken gave optimal performance and improved serum biochemical indices of broiler chicken.

REFERENCES

- Abouelfetouh, A. Y. and Moussa, N. K. (2012). Enhancement of antimicrobial activity of four classes of antibiotics combined with garlic. *Asian Journal of Plant Sciences*. 11: 148- 152.
- Demir, E., Sarica, S., Ozcan, M. A. and Suicmez, M. (2003): The use of natural feed additives as alternatives for an Antibiotic growth promoter in broiler diets. *British. Poultry Science*. 44: S44–S45.
- Iji, P. A., Saki, A. and Tivey, D. R. (2001). Body and intestinal growth of broiler chicks on a commercial starter diet. Intestinal weight and Mucosal development. *British Poultry Science*. 42: 505 - 513.
- Khan, H. S., Sardar, R., and Anjum, M. A. (2007). Effects of dietary garlic on performance and serum and egg yolk cholesterol concentration in laying hens. *Asian Journal of Poultry Science*. 1: 22 - 27.

- Mottaghitalab, M. and Taraz, Z. (2002). Effects of garlic (*Allium sativum*) on egg yolk and blood serum cholesterol in Aryan breed laying hens. *British Poultry Science*. 43: 42-43
- Reuter, H. D., Koch, H. P. and Lawson, L. D. (1996). Therapeutic effects and applications of garlic and its preparations. In: Garlic: The science and therapeutic application of *Allium sativum* L. and Related Species, Koch, H. P. and L. D. Lawson (Eds.). Williams and Wilkins, Baltimore, MD, 135 - 213.
- Tollba, A. A. H. and Hassan, M. S. H. (2003). Using some natural additives to improve physiological and productive performance of broiler chicks under high temperature conditions. Black cumin (*Nigella sativa*) or Garlic (*Allium sativum*). *Poultry Science*. 23: 327 - 340.
- Horton, G. M. J., Fennell, M. J. and Prasad, B. M (1991). Effects of dietary garlic (*Allium sativum*) on performance, carcass composition and blood chemistry changes in broiler chickens. *Canadian Journal of Animal Science*. 71: 939-942.
- Oleforuh-Okoleh, V. U., Ndofo-Foleng, H. M., Olorunleke, S. O. and Uguru, J. O. (2015). Evaluation of growth performance, haematological and serum biochemical response of broiler chickens to aqueous extract of ginger and garlic. *Journal of Agricultural Sciences*. 7(4): 167-173.
- .Onyimonyi. A. E., Chukwuma, P. C. and Igbokwe, C. (2012). Growth and hypocholesterolemic properties of dry garlic powder (*Allium sativum*) on broilers. *African Journal of Biotechnology*. 11(11): 2666-2671.