

EFFECT OF DIETARY SUPPLEMENTATION OF GARLIC ON FEED CONVERSION RATIO, CARCASS PHYSIOGNOMIES AND HAEMATOLOGICAL PARAMETERS IN BROILERS

M. F. Islam¹, M. N. Haque², A. Parvin³, M. N. Islam², M. N. Alam¹ and M. H. Sikder^{1*}

¹Department of Pharmacology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202; ²Department of Livestock Services, Krishi Khamar Sarak, Farm gate, Dhaka-1215, Bangladesh; ³Agribusiness (Animal Health)- ACI Ltd. Dhaka, Bangladesh.

ABSTRACT

One of the widespread spices is garlic which consumed by people of different parts of the world but its valuable growth promoting effect is not sufficiently studied in poultry. Growth promoting effect of garlic in broiler chickens was studied together with its carcass characteristics and blood parameters. Broilers were grouped into four: A (1%), B (2%), C (positive control) and D (negative control). Aqueous extract of garlic (1% and 2%) was prepared by extraction and were administered with drinking water. A group (1%) shows best performance with regards to body weight gain rather than B (2%), positive and negative control. At the end of experiment (35th day), in A group, the live body weight, dressed weight, feed conversion ratio, liver, gizzard, heart, spleen, and pancreas were 1833.2±2.1g (P<0.05), 1229.7±1.9g (P<0.05), 1.63(P<0.05), 47.13±0.4g, 26.15±0.7g, 9.71±1.8g, 2.21±0.2g, 2.27±0.1g respectively. The mean Total Erythrocyte Count (TEC), Haemoglobin concentration (Hb) and Packed Cell volume (PCV) were 2.9±0.1million/cm³, 7.5g ± 0.2g, and 25.8 ± 0.6%, respectively. It is recommended that 1% aqueous extraction of garlic shows better growth and improved carcass qualities in Broilers.

Keywords: Garlic, FCR, growth promoter, broiler.

INTRODUCTION

In poultry production feed additives are used in poultry feed to improve nutritive value and enhances their performance. Feed is the major component of total costs of poultry venture as 80% of the total expenditure is on procurement of feed. Antibiotic is intensively used in broiler's ration to improve productivity but it has got negative effects on animal and human health (Noman *et al.*, 2015). However, nowadays use of antibiotics is not only limited but their use in livestock and poultry industry also have been banned in many countries due to the reasons like alteration of natural gut microbiota and drug resistance in bacteria and humans. As a result, to replace them without adversely affecting the performance of birds, natural growth promoters such as prebiotics, probiotics, synbiotics, enzymes, plant extracts, etc., can be used to feed the broilers. Therefore, the use of antibiotic as growth promoters has not been encouraged (Castanon, 2007). Phytogetic feed additives have shown promising effects with regard to weight gain, feed efficiency, lowered mortality and increased livability in poultry (Ahmad and Khan, 2008). Garlic as natural growth promoters can be possible alternatives for common artificial growth promoters like antibiotics. Garlic (*Allium sativum*) has been used as a spice and a natural medicine for many years. It has influenced antibacterial, antiviral, antiparasitic, antifungal, anticholesteremic, antioxidant, anti-cancerous, and vasodilator characteristics (Hanieh *et al.*, 2010). The garlic has a great influence on haematological parameters, which leads physiological, pathological and nutritional status of poultry (Oleforuh-Okoleh *et al.*, 2015). This is an important spice in traditional cooking of curry in Indian sub-continent and is cheap and available (Huda *et al.*, 2008). Therefore, this study was undertaken to evaluate garlic as a safe growth promoting agent in broiler chicken (Cobb 500).

MATERIALS AND METHODS

Test elements

The fresh garlic was bought from local market. The garlic was peeled, cut into small pieces and dried. The dried garlic was crumpled by grinder and aqueous extract was prepared by extraction as described by (Dieumou *et al.*, 2012). After receiving the extraction 1% and 2% solution of garlic was freshly prepared for daily need.

*Corresponding e-mail address: drmsikder@bau.edu.bd
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Management of experimental bird's

A total of 60 day-old Cobb 500 broiler chicks were purchased from Nourish Poultry & Hatchery Limited, Gazipur, Bangladesh. The chicks were kept for seven days for adaptation and were fed commercial broiler starter feed (Narish poultry Feed, Narish poultry feed limited, Gazipur, Bangladesh) only and given normal drinking water. The brooding temperature was maintained at 35°C during 1st week. It was then gradually lowered by 3°C every week until it reached to room temperature (i.e. 25±1°C). Mean initial weight of the chicks was 36.45 gm. at the start of experiment. Newcastle disease vaccination (Baby Chick Ranikhet Disease Vaccine-BCRDV, Livestock Research Institute, Mohakhali, Dhaka, Bangladesh): intraocular at 4th day and 21th day. On day 7th the 60 chicks weighing average body weight of 93g were randomly selected to four treatments and a positive and negative control group in a completely randomly design (CRD). The birds were reared in litter system. Four experimental groups were identified as A (1% garlic), B(2% garlic), C (negative control: only feed and water) and D (positive control: antibiotic Renamycin® 20 w/w Oxytetracycline Hydrochloride USP- Renata Animal Health, Dhaka, Bangladesh supplied as pharmaceuticals recommended dose).

Collection of data

Daily body weights of all birds were recorded. At the end of treatment blood sample was collected from the wing vein of each bird using disposable plastic syringe and needle with an EDTA. After sacrificed dressing percentage were taken and offal's weight such as the liver, heart, pancreas, gizzard and spleen were recorded.

Haematological assay

The Packed Cell Volume (PCV), Total Erythrocyte Count (TEC) and Haemoglobin concentrations were done as described by Lamberg and Rothstein (1977).

Statistics and data analysis

The data were analyzed using general linear model procedure of Statistical Package For Social Science (SPSS) IBM 20 and comparison of means tested using Duncan's multiple range test and significance was considered at $p < 0.05$ (Dieumou *et al.*, 2012).

RESULTS AND DISCUSSION

The effects of feeding different concentration of dietary garlic on daily body weight gain are shown in table 1. All groups had initial body weight 93.35 ± 1.4 g. No mortality was detected in all treatment groups throughout the study period. Feed Conversion Ratio (FCR) is shown in the table 2, where significant variation was evident in A. Dressed weights of birds are shown in Table 3; better dressed weight was in A group (1223.7 ± 2.1 g). No significance variation was found in offal's weight (Table 4). Significant increases of PCV, Hb and TEC are shown in table 5.

Growth performance

Daily body weight gain was collected in record log book. In table 1, average weight gain from day 7 to day 35 were described with 7 days interval. Best weight gained by A group at day 35 followed by B, C and lowest in D.

Table 1. Live body weight of birds

Groups	Body weight gain (gm)				
	Day 7	Day 14	Day 21	Day 28	Day 35
A	88.8±0.4 ^{b*}	311.4±1.1 ^d	741.5±1.7 ^a	1332.6±1.8 ^b	1833.2±2.1 ^a
B	90.6±0.5 ^b	337.5±1.1 ^a	731.1 ±1.7 ^b	1123.8±1.9 ^d	1761.5±1.9 ^b
C	93.2±0.3 ^a	3134.5±1.2 ^c	711.8 ±1.8 ^c	1357.4±1.7 ^a	1761.3 ±2.1 ^b
D	91.9±0.6 ^a	318.5 ±1.1 ^b	629.5±2.1 ^d	1139.3± 2.9 ^c	1537.5±2.4 ^c

*Different letters denote significant variation among the groups

Supplementation of garlic extraction in broiler diet have significant ($P<0.05$) influence on body weight gain from 7 days to 35 days of age. The highest mean body weight is gained by 1% garlic treatment group.

A number of researches reported the growth promoting effect of garlic extract in broiler (Elagib *et al.*, 2013; Noman *et al.*, 2015; Mahmood *et al.*, 2009; Javed *et al.*, 2009; Meraj, 1998). However, how garlic extracts shows growth promoting effect is not decisive. It is suggested, antibacterial compound present in garlic extract (Meraj, 1998), bioactive compound “dialkylpolysulphide”. Previous researches on garlic on poultry statistics the gaining of better live weight performances(Elagib *et al.*, 2013).

Mahmood *et al.* (2009) stated that garlic had positive effect on the growth rate of broiler chicks. Meraj (1998) reported that the existence of antibiotic ingredients in garlic is accountable for the enhancement of weight gain. In consonance, Rehman *et al.* (2012) reported that mean feed conversion ratio was significantly influenced by water based infusion of garlic. The study findings also support the findings of Javed *et al.* (2009) which showed a positive effect of aqueous extract of garlic on the performance of broiler chicks in term of FCR and weight gain.

Feed Conversion Ratio (FCR) of birds

In every 7 days interval FCR was calculated where best FCR was found in A group at 35th day, followed by C, B and less feed conversion was observed in D group.

Table 2. Feed Conversion Ratio (FCR) of birds

Groups	Feed Conversion Ratio (FCR)				
	Day 7	Day 14	Day 21	Day 28	Day 35
A	1.13	1.81	1.6	1.57	1.63
B	1.12	1.75	1.7	1.63	1.77
C	1.12	1.74	1.8	1.66	1.73
D	1.11	1.82	1.97	1.92	1.94

Significant ($P<0.05$) difference were revealed for FCR in all the treatments from 7 days to 35 days of age. Poor FCR was observed in negative control group and better FCR was observed in 1% garlic group. According to Senthil Kumar *et al.*,(2015) the FCR of broiler shows garlic extraction has better affect on FCR.

Dressed weight

At day 35, after dressing of each bird they were individually weighted. Among the groups A obtained highest dressed weight followed by C, B and lowest dressed weight was in D group.

Table 3. Dressed weight of birds

Group	Weight of dressed birds (gm)
A	1233.56±1.9 ^a
B	1061.23±1.8 ^c
C	1103.0 ±2.1 ^b
D	994.3±2.2 ^d

*Different letters denotes significant variation among the groups

The dressed weight of birds was gained more in 1%garlic treatment group than others ($P<0.05$).

Offal's weight of birds

Individual bird's liver, gizzard, hear, spleen and pancreas weight was taken and no statistical significance was observed ($P<0.05$).

Table 4. Offal's weight of birds after dressing at day 35

Groups	Offal's weight of birds (gm)				
	Liver	Gizzard	Heart	Spleen	Pancreas
A	47.13±0.4 ^b	26.15±0.7 ^a	9.71±1.8 ^a	2.21±0.2 ^a	2.27±0.1 ^a
B	53.25±0.5 ^a	22.19±0.3 ^b	10.01±1.9 ^b	2.87±0.1 ^a	2.35 ±0.1 ^a
C	53.15±0.4 ^b	22.61±0.4 ^b	11.01±1.7 ^b	2.57±0.1 ^a	2.74±0.2 ^a
D	52.61±0.4 ^a	18.81±0.5 ^c	10.136±1.8 ^b	2.49±0.1 ^a	2.46±0.1 ^a

*Different letters denotes significant variation among the groups

The results shown no significant differences ($P < 0.05$) between all treatment groups in offal's (liver, gizzard, heart, spleen and pancreas) weight of bird. The decrease in weight of liver of birds on supplemented diets contrast with the earlier report of Tchakounte *et al.* (2006) where liver and the gizzard of birds on supplemented diets were more developed thus indicating an intense activity of these organs. The higher body weight and lower offal's weight indicates the best performance (Plumber and Kiepper, 2011).

Haematological assay

After collection of blood with anticoagulant (EDTA), TEC, Hb and PCV were performed at department of physiology, Bangladesh Agricultural University, Mymensingh. No significance variation was found but significance increase was found among the groups.

Table 5. Hematological data

Group	Mean			Standard Deviation		
	TEC (million/cm ³)	Hb (g)	PCV (%)	TEC (million/cm ³)	Hb (g)	PCV (%)
A	2.9	7.5	25.8	0.1	0.2	0.6
B	2.9	7.4	29.7	0.1	0.2	1.0
C	2.2	7.4	23.3	0.2	0.3	3.7
D	2.3	6.9	21.1	0.2	0.3	3.6

There was significant increase ($P < 0.05$) in the PCV, Hb and TEC of birds on the garlic extraction than other treatments. The increasing of PCV, Hb, and RBC contents of the blood is an indication of improved oxygen carrying capacity of the cells which translated to a better availability of nutrients to the birds consequently affecting their well-being (Oleforuh-Okoleh *et al.*, 2015). Administration of garlic statistically reduced the platelets in the blood. Lawson *et al.* (1992) reported that preventing the transformation of arachidonic acid to thromboxane and decreasing the sensitivity of platelets to aggregating agents may be possible with the administration of garlic in fatty diets. This implies that garlic could be potentially useful in improving blood circulation on account of its inhibitory effects on platelet aggregation

CONCLUSION

Aqueous extract of garlic displays better performance than positive and negative control groups. Among garlic extractions, 1% garlic extracts exhibits best performance in relation to carcass weight and others. As it is organic in nature, positive effects on consumer's health are observable. Consequently, it is recommended that garlic extract can be used as the substitute organic growth promoter in poultry.

REFERENCES

1. Ahmad T and Khan S (2008). Evaluation of different medicinal plants as growth promoters for broiler chicks. *Sarhad Journal of Agriculture* 24: 323-330.
2. Al-Kassie GAM (2009). Influence of two plant extracts derived from thyme and cinnamon on broiler performance. *Pakistan Veterinary Journal* 29: 169-173.
3. Castanon JIR (2007). History of the use of antibiotic as growth promoters. *Journal of Poultry Science* 86: 2466-2471.

4. Dieumou FE, Tegua A, Kuate JR, Tamokou JD and Doma UD (2012). Effect of diets fortified with garlic organic extract and streptomycin sulphate on growth performance and carcass characteristics of broilers. *International Journal of Livestock Production* 3: 36-42.
5. Elagib HAA, El-Amin WIA, Elamin KM and Malik HEE (2013). Effect of dietary garlic (*Allium sativum*) supplementation as feed additive on broiler performance and blood profile. *Journal of Animal Science Advances* 3: 58-64.
6. Huda FA, Islam MS, HB and MS (2008). Impact assessment study on selected spice crops under action plan in Bangladesh. *Progressive Agriculture* 19: 229-241.
7. Hanieh H, Narabara K, Piao M, Gerile C, Abe A and Kondo Y (2010). Modulatory effects of two levels of dietary Alliums on immune responses. *Animal Science Journal* 81: 673-680.
8. Javed M, Durrani F, Hafeez A, Khan RU and Ahmad I (2009). Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. *ARP Journal of Agricultural and Biological Science* 4: 37-40.
9. Lamberg SL and Rothstein R, 1977. Laboratory Manual of Hematology and Urinalysis, West Port Connecticut, USA: Avi. Publishing Company, Inc.
10. Lawson LD, Ransom DK and Hughes B G (1992). Inhibition of whole blood platelet-aggregation by compounds in garlic clove extracts and commercial garlic products. *Thrombosis Research* 65: 141-156.
11. Mahmood S, Hassan MM, Alam M and Ahmad F (2009) Comparative efficacy of *Nigella sativa* and *Allium sativum* as growth promoters in broilers. *International Journal of Agriculture and Biology* 11: 775-778.
12. Meraj ICA (1998). Effect of garlic and neem leaves supplementation on the performance of broiler chickens. M. Sc. Thesis, Department of Poultry Science, University of Agriculture, Faisalabad, Pakistan.
13. Noman ZA, Hasan MM, Talukder S, Sarker YA, Paul TK and Sikder MH (2015). Effects of garlic extract on growth, carcass characteristics and haematological parameters in broilers. *The Bangladesh Veterinarian* 32: 1-6.
14. Rehman ZU, Khan S, Chand N, Tanweer AJ, Sultan A, Akhtar A and Tauqeer AM (2012). Effect of water based mixture infusion of *Allium sativum* and *Withania somnifera* on performance of broiler chicks. *Pakistan Journal of Science* 64: 180-183.
15. Oleforuh-Okoleh VU, Ndofor-Foleng HM, Olorunleke SO and Uguru JO (2015). Evaluation of growth performance, haematological and serum biochemical response of broiler chickens to aqueous extract of ginger and garlic. *Journal of Agricultural Science* 7: 167-174.
16. Plumber HS and Kiepper BH (2011). Impact of poultry processing by-products on wastewater generation, treatment and discharges. In Proceedings of the 2011 Georgia Water Resources Conference.
17. Senthilkumar S, Madesh N, Purushothaman MR, Vasanthakumar P, Thirumalaisamy G and Sasikumar P (2015). Effect of garlic supplementation on performance in broilers - a review. *International Journal of Science, Environment and Technology* 4: 980-983.
18. Tchakounte J, Bopelet M, Ngoungoupayou JD, Dongmo T, Meffeja F and Fotso J (2006). Influence de la consommation de la boue d'huile de palme sur les performances zootechniques et économiques des poulets de chair en phase definition. *Livestock Research for Rural Development* 18: 173.