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Effect of garlic extract on growth performances and hematological parameters of broilers

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Abstract: This experiment was conducted to evaluate the efficacy of garlic (*Allium sativum*) extracts supplementation in drinking water as a growth promoter of broiler chicken. A total of 60 one-day-old male Lohman meat broiler chicks were distributed over two groups of 30 chicks with three replicates of 10 birds. Group B was supplemented with garlic extract from water and Group A kept as a control. Weekly observations were recorded for live body weight gain up to 4th weeks and hematological tests were performed at 30th days. Live weight and weight gain of the treatment group were significantly ($p < 0.05$) higher than that of the control group. Significant ($p < 0.05$) higher values also observed in terms of weight of heart, liver, spleen, and pancreas for the treatment group. The value of TEC and PVC of treatment group showed significant ($p < 0.05$) differences. The results suggest that better growth performance could be achieved in broilers with feed supplemented with garlic extract.

Keywords: garlic extracts; growth; hematological parameters; broiler

1. Introduction

Poultry meat contains 60 % protein and is essential for human health as dietary minerals, vitamins and amino acids deficiency can be reduced by the contribution of poultry products rich in all essential nutrients (Cherian *et al.*, 2005). It also minimizes the risk of developing cardiovascular diseases and their risk factors, overweight, insulin resistance and tumors (Marangoni *et al.*, 2015). The poultry production systems have led to marked increase in the production of poultry meat and eggs throughout the world (Armstrong, 1986). Garlic (*Allium sativum*) extracts as food additives have attracted worldwide due to its vast range of medicinal properties like antibacterial, antiviral, antifungal, anti protozoal, hepato protective and various other properties without showing any adverse effects (Carrijo *et al.*, 2005; Rehman and Munir, 2015). Also, garlic promotes growth (Demir *et al.*, 2008; Dibner and Richards, 2005; Vohra and Khan, 1981; Freitas *et al.*, 2001; Lewis *et al.*, 2003) and feed efficiency of birds because of their antibacterial properties (Vohra and Khan, 1981). So, garlic supplemented broiler chicken diets have been recognized for their strong stimulating effect on the body weight

gain (Rehman and Munir, 2015), the immune and digestive systems in birds (Horton *et al.*, 1991; Gardzielewska *et al.*, 2003; Al-Yahya, 1986) and low dose of garlic leave extract have an inhibitory action on wide spectrum of microorganisms (Qureshi, 1998) and immunomodulation actions that induce cellular immune reaction (Mishra and Singh, 2000; Agarwal, 1996; Chesson *et al.*, 1982). It has a great impact on haematological parameters, which affect the physiological, pathological and nutritional status of poultry (Oleforuh-okoleh *et al.*, 2015). Growing population and rising household income has led to rapid increasing demand for poultry in Bangladesh. At the same time, poultry meat products became a serious issue as some hazardous material like antibiotic residues come from the meat. The herbal extract can be the alternative to antibiotic and growth promoters and ensure increased and healthy production of poultry meat. Moreover, garlic is a widely available cheap cooking spice in this region. Considering the facts, this study was designed to evaluate garlic extracts as a safe growth promoting agent in broiler chickens.

2. Materials and Methods

2.1. Experimental design

The experiment was conducted at Sonarbangla Poultry Farm, Kashipur, Barisal during the period from 01 April to 30 April 2016. A total of 60 one-day-old male Lohman meat broiler chicks were distributed among two groups of 30 chicks with three replications of 10 birds. Birds were kept on the floor in isolated pens and fed commercial ration and ad libitum water. Chicks of group A were fed basal diet, while group B was fed basal diet supplemented with garlic extract during five weeks experimental periods. Weekly feed consumption of each group was determined. Mean initial and weekly body weight of birds for each group was determined and then body weight gain was calculated. By the end of experimental periods, 3 birds from each replicate were weighed, numbered and then slaughtered. The weight of breast and thigh were recorded along with heart, liver and gizzard and other organs.

2.2. Management of broiler

Floor of shed and other surroundings of the shed were properly cleaned with disinfectant. Day old broiler chickens were brought in the experimental shed. Immediately after unloading from the chick boxes the chicks were given vitamin-C and glucose to prevent the stress of transport. Temperature and litter management maintained very carefully. The starter, grower, and finisher broiler rations were supplied to the broiler chicken appropriately. Chicks of group 'B' were treated with garlic extracts from drinking water for next four weeks.

2.3. Preparation of garlic extract

The Superficial bulk of garlic was removed and then washed with distilled water properly. After washing 10 gm garlic was ground with mortar and pestle. After grinding 1000 ml distilled water was added to make 1 liter stock solution and properly filtered. Finally, it was stored in a refrigerator at 4°C to maintain the active ingredients.

2.4. Hematological parameters

Hematological experiment was conducted at "Quality poultry disease and diagnostic laboratory (QPDDL)" Miarhat, Nesarabad, Pirojpur. Blood samples were collected from wing vein of chicken of both control and treated groups at the 30th day to observe the effect of the garlic extract. Total Erythrocyte Count (TEC), Hemoglobin Estimation (Hb), Packed Cell Volume (PCV) and Erythrocyte Sedimentation Rate (ESR) tests were performed as described by Lamberg and Rothstein (1977).

2.5. Statistical analysis

The data were analyzed statistically between control and treated groups of chicken by paired student's "t" test. Least significant difference (LSD) was used to determine the significance between means and the differences were considered statistically significant at $P < 0.05$. SPSS program 16 was used for statistical analysis.

3. Results

3.1. Live weight gain of broiler

The Inclusion of garlic had a strong effect on the growth performance and carcass characteristics of broiler. No mortality found in both treatment and control groups. Table 1 revealed that live weight and weight gain of treatment were found to be significantly higher than that of the control group. But, garlic extract had no significant effect on the amount of total feed consumption. Feed conversion ratio (FCR) of two groups was 1.47

and 1.41 respectively. A significant increased (16.46%) live body weight was recorded for group B than that of the control group.

Table 1. Live weight gain of broiler.

Variables	Treatments	Average weight	P value
Initial live weight (g) on 1 th day	Control	42.70±10.21	0.59
	Garlic extract	42.83±6.88	
Final live weight (g) on 30 th day	Control	1750.89±43.71	0.040*
	Garlic extract	1800.94±45.73	
Weight gain from 7 th day (g)	Control	1671.32± 52.26	0.0310*
	Garlic extract	1762.51± 41.25	
Feed consumption (g)	Control	2572.50 ± 35.49	0.070
	Garlic extract	52.29	

3.2. Dressing percentages and relative giblet weight

Table 2 shows differences between two groups regarding the dressing percentages and relative giblet weight where the weight of heart, liver, spleen and pancreas significantly higher for garlic extract treated group but no significant difference observed in dressing percentage and gizzard weight.

Table 2. Dressing percentages and relative giblet weight.

Variables	Treatments	Average value	P value
Dressing percentage	Control	64.416 ±0.414	0.931
	Garlic extract	64.470 ±0.961	
Relative heart weight (g)	Control	0.427 ± 0.032	0.011*
	Garlic extract	0.501 ± 0.032	
Relative gizzard weight (g)	Control	1.460 ± 0.034	0.605
	Garlic extract	1.440± 0.014	
Relative liver weight (g)	Control	2.530±0.034	0.042*
	Garlic extract	2.618±0.032	
Relative spleen weight (g)	Control	0.120±0.011	0.023*
	Garlic extract	0.130± 0.015	
Relative pancreas weight (g)	Control	0.230± 0.011	0.047*
	Garlic extract	0.250± 0.017	

3.3. Hematological parameters of broiler

Table 3 shows the changes of the hematological parameter (TEC, Hb, PCV and ESR) on 30th day where there was significantly higher TEC and PCV, in garlic extract treated groups than the control. The level of Hb also higher but no significant.

Table 3. Hematological parameters of broiler on 30th day.

Blood parameters	Treatments	Average blood parameters value	P value
TEC (mm ³)	Control	247.67 ± 1.028	0.021*
	Garlic extract	298.39 ± 0.751	
Hb (gm/dl)	Control	6.92 ± 0.491	0.063
	Garlic extract	7.79 ± 0.111	
PCV (%)	Control	18.00 ± 0.134	0.031*
	Garlic extract	19.95 ± 0.022	
ESR mm in 1 st hour	Control	7.40 ± 0.268	0.064
	Garlic extract	5.24 0.554	

4. Discussion

In this study, inclusion of garlic had a strong effect on the growth performance and carcass characteristics of broiler. This result was in agreements with Raeesi *et al.* (2010), Mansoub and Nezhad (2011). Kumar *et al.* (2005), Afsharmanesh *et al.* (2008) and (Meraj, 1998; Javed *et al.*, 2009; Mahmood *et al.*, 2009; Elagib *et al.*,

2013) where positive effects of garlic supplementation on broiler performance was observed. But, Onibi *et al.* (2009) found no significant differences between treatments of different levels of garlic and control. In our research, live weight and weight gain of treatment were significantly higher than that of control group. Similarly, weight gain (g/bird) was found to be significantly higher in garlic (Varmaghany *et al.*, 2015; Noman *et al.*, 2015). More so, garlic extract improve productive performance of broiler chicks (Cardozo *et al.*, 2004; Akilandeswari *et al.*, 2003). It is suggested that the antibacterial compound dialkylpolysulphide present in garlic extract is playing a pivotal role in weight gain of broilers (Meraj, 1998; Ross *et al.*, 2001). In our investigation, FCR of treatment group was higher but not significant. Few studies also showed better FCR with garlic extract treatment (Rehman *et al.*, 2012; Senthikumar *et al.*, 2015; Sharma *et al.*, 1979; Horton *et al.*, 1991; Canogullar *et al.*, 2009). Some authors reported that feed intake was not affected by the supplementation of garlic in broiler chicks (Varmaghany *et al.*, 2015; Noman *et al.*, 2015; Yalcin *et al.*, 2006). Lower FCR means better the performance. Lower FCR which indicates that taking lower feed intake and their body weight gain is higher (Hossain *et al.*, 2014). A significant difference between two groups in terms of weight of heart, liver, spleen and pancreas in this study but not in dressing percentages. Gralic extract has no significant effect on offal's weight (Noman et al 2015; Samresh *et al.*, 2003). There was a significant difference between the average dressing percentages (Samresh *et al.*, 2003). Significantly higher TEC and PCV in garlic extract treated groups than the control which is in agreement with the results of Dar *et al.* (2014) but PCV decreased significantly with increasing level of garlic extract (Varmaghany *et al.*, 2015). Garlic extract has not significant effect on blood parameters (Noman *et al.*, 2015).

5. Conclusions

In the study, better growth performances, carcass characteristics, and blood parameters showed in the treatment group of broiler supplemented with garlic extract. It enhancing the production potential, improve feed conversion ratio, increases weight gain, maximizes economic returns and protects the birds from different diseases. It also has beneficial effects on consumer's immunity. So, it can be effectively used to replace the antibiotic growth promoter in the poultry industry.

Conflict of interest

None to declare.

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