



Effects of feeding garlic powder on growth performance and meat quality of broiler

Ali MS, M Kamruzzaman*, ZH Khandaker

Department of Animal Nutrition, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract

An experiment was conducted with 60 day old Cobb-500 broiler chicks for a period of 28 days with the aims of investigating the effects of different level of garlic powder on growth performance, carcass characteristics and meat quality of broilers to produce safe broiler meat. The experimental broiler chicks were divided randomly into four different groups with three replications having 5 chicks in each. Maize-soybean based diet was used as basal diet for group 1. Basal diet was supplemented with 1%, 2% and 3% garlic powder on fresh basis for group 2, 3, and 4 respectively. The broiler of groups 2, 3, and 4 were showed significantly ($p>0.05$) higher body weight than control group at 4 weeks of age. Feed conversion ratio of group 2, 3, and 4 were significantly ($p>0.05$) lower than group 1. Group 2 was given significantly lower fat percentage than other groups. Group 3 and 4 showed more or less similar fat content but lower than control groups. Thus, it may be concluded that garlic powder may be used in chicken diet.

Key words: broiler, garlic powder, growth, meat quality

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Bang. J. Anim. Sci. 2016. 45 (2): 79-83

Introduction

Garlic has been one of the medicinal plants of interest throughout human history as a medicinal panacea in almost every known culture (Rivlin *et al.*, 2001). Since its discovery, the health beneficial activity of garlic has been partly attributed to its organosulfur compounds (Amagase *et al.*, 2001). The major sulphur-containing compounds in intact garlic are alliin, diallylsulfides and allicin (Amagase *et al.*, 2001). Furthermore, a variety of components, including nonsulfur compounds such as saponins, work synergistically to exhibit various health benefits of garlic. Garlic is as a spice and herbal medicine for prevention and treatment of a variety of diseases (Adibmoradi *et al.*, 2006). Garlic has been found to lower serum and tissue cholesterol levels (Stanacev *et al.*, 2012), inhibit bacterial growth (Cavallito *et al.*, 1994), inhibit platelet growth and reduce oxidative stress. In broilers, it was reported that garlic, as a natural feed additive, improved broiler growth and feed conversion ratio, and decreased mortality rate (Puvaca *et al.*, 2014). Improvement of broilers performance, blood lipid profile and tissues can be achieved by supplementation of diets with garlic powder (Stanacev *et al.*, 2011).

It was reported that feeding garlic powder at levels of 1.5, 3 and 4.5% had no effect on poultry performance (Konjufca *et al.*, 1997), but caused a significant reduction in poultry serum and liver cholesterol. Tissues cholesterol levels were decreased with feeding garlic powder to broiler chickens (Stanacev *et al.*, 2012) which showed that addition of garlic to broilers diet has effects on chicken performance and lipid profile. In research of Puvaca *et al.*, (2014), addition of various spice herbs and their mixture such as garlic, black pepper and hot red pepper led to an improved performance results and reduced mortality rate of chicken fed with addition of these spice herbs. Using garlic powder in broilers diet in research of Horton *et al.* (1991) had no significant effect on performance but had positive influence on meat quality and carcass yield. In Bangladesh, very few researches have been conducted and very little information is available about feeding garlic components on growth performance, and carcass characteristics in chicken. Thus, the present study was performed to investigate the feeding effects of garlic on growth performances and meat quality of broiler.

*Corresponding author: sajal_anbau@yahoo.com

Materials and Methods

Experimental design and layout

An experiment was conducted with day old broiler chicks for a period of 28 days from 9th August to 6th September, 2015. A total number of 60 Cobb 500 commercial broiler chicks were equally and randomly divided into four dietary treatment groups and each group was replicated to three sub groups and each replicate having 5 birds. There were four dietary treatments containing 0%, 1%, 2% and 3% garlic powder respectively.

Collection of feed ingredients and preparation of ration

Feed ingredients used in the experiment were purchased from Janani and Shah Paran feed shop of Mymensingh town. At first, maize, wheat and oyster shell were grinded individually with the help of a grinding machine. After weighing, a required amount of ground maize, wheat, soybean meal, rice polish and fish meal were mixed thoroughly. Soybean oil was mixed with this mixture. Then the required amount of dicalcium phosphate, vitamin mineral premix, DL-methionine, choline chloride, oyster shell, common salt were mixed thoroughly.

Feeding management

Mash feed was supplied to the birds two times (7.30am and 4.30pm) per day on *ad libitum* basis. For first 3 days, feeds were given on newspaper and then, round plastic feeders were used up to the end. Fresh clean

drinking water was also supplied two times every day. Feeders were cleaned in each week and waterers were washed each time during supplying of water.

Data collection and record keeping

The amount of feed consumed by the experimental broilers of different treatment groups were calculated for every week by deducting the amount retained from the amount supplied in that week. The chicks were weighed at the time after arrival and then every 7 days intervals until the termination of the experiment at 28 days of age group wise. The weight was taken at the morning before feeding time. The average live weight and the weight gains of the broilers on different dietary treatments were calculated on weekly and at the end of the experiment. Feed conversion ratio was calculated as the unit of feed consumed per unit of body weight gain.

Carcass characteristics

At the end of the experiment, representative birds from each treatment were selected, weighed and sacrificed to determine carcass traits. Data such as live weight, blood weight, dressed weight, kidney weight, liver weight, heart weight, intestine weight, head weight, gizzard weight, shank weight, wing weight, spleen weight etc. were recorded treatment wise and converted into percentages of respective live weights prior to statistical analysis.

Table 1. Effects of garlic powder on growth performance and feed intake of broiler

Parameters	Dietary treatments				Level of significance
	T ₀	T ₁	T ₂	T ₃	
Initial body weight (g)	50.53	55.67	55.73	53.53	Non significant
Final body weight (g)	1230 ^d	1447 ^b	1403 ^c	1472 ^a	*
Total body weight gain (g)	1179 ^d	1391 ^b	1347 ^c	1418 ^a	*
Daily live weight gain (g/d)	42.12 ^c	49.69 ^{ab}	48.12 ^b	50.66 ^a	*
DM intake					
Total dry matter intake(g)	2020.49	2146.14	2202.65	2134.68	Non significant
Average dry matter intake(g/day)	72.16	76.66	78.67	76.24	Non significant
Total CP intake (g)	584.93	536.54	550.66	533.67	Non significant
CP intake (g/day)	20.89	19.16	19.67	19.06	Non significant
FCR	1.71 ^a	1.54 ^c	1.63 ^b	1.5 ^d	*

Group 1, concentrate mixture with 0% garlic powder; Group 2, concentrate mixture with 1% garlic powder; Group 3, concentrate mixture with 2% garlic powder; Group 4, concentrate mixture with 3% garlic powder. Different symbols mean *, significant at 5% level of significance, Superscripts a, b, c, and d mean values with dissimilar superscripts within same rows are significantly different.

Chemical analysis of feed

Feed sample were analyzed following the method of AOAC (2004).

Statistical analysis

All recorded and calculated variable were subjected to analysis of variance (ANOVA) in a Completely Randomized Design (CRD) by following a statistical package using SPSS statistical computer package program. Duncan's Multiple Range Test (DMRT) was used to compare treatment means (Steel and Torrie, 1980).

Results and Discussion

Effect of garlic powder on growth performance

The effect of different levels of garlic powder with concentrated mixture on growth performance of broiler is shown in Table 1. The daily body weight gain was 42.12, 49.69, 48.12 and 50.66g respectively among the treatment groups. The highest live weight gain per day was obtained at treatment containing 3% garlic powder. The daily live weight gain of broilers was significantly different among the groups. The results of this study indicated that, an addition of garlic powder at 3% level with concentrated mixture had beneficial effect on growth performance of broiler. This might be due to increased amounts of protein available at the cellular level for deposition in the body tissues. This result agrees with reports of Ortsergu *et al.*, (2008) and Ademola *et al.*, (2005), who reported an increased weight gain of rabbits and broilers, fed 1.5 and 2% garlic supplemented diets respectively. Pourali *et al.* (2010), showed that allicin in garlic promotes the performance of the intestinal flora thereby improving digestion and enhancing the utilization of energy, leading to improved growth.

The average total dry matter (DM) intake was 2020.49, 2146.14, 2202.65 and 2134.68g for treatment 1, 2, 3 and 4 respectively (Table 1). The dietary treatments did not differ significantly ($P>0.05$) among the dietary groups. The average total crude protein (CP) intake of different dietary treatment was 584.93g, 536.54g, 550.66g and 533.67g for diet 1, 2, 3 and 4 respectively (Table 1). There was no significant difference among the treatment groups. The average FCR on diet 1, 2,

3 and 4 were 1.71, 1.54, 1.63, and 1.50 respectively (Table 1) and it was expressed that adding of garlic powder increased feed efficiency in diet. This result agrees with the result of El-Sayiad *et al.*, (2003) on broiler who reported that the best results of feed conversion were recorded with 1% garlic. They observed that the improvement in feed conversion by garlic may be due to better efficiency of feed utilization, reducing animal pain and improve organs function. Javendel *et al.*, (2008) who also fed herbal plants (ginger and garlic) as growth promoters in broiler diets and observed a pronounced improvement in their body weight gain and feed conversion ratio.

Table 2. Effects of garlic powder on meat quality of broiler

Parameters	Dietary treatments				Significance
	T ₀	T ₁	T ₂	T ₃	
Carcass weight (g)	780 ^d	1020 ^a	897 ^b	834 ^c	*
Dressing yield (%)	60.00	60.72	60.61	60.57	NS
CP (%)	17.65 ^b	17.90 ^b	20.21 ^a	20.19 ^a	*
EE (%)	0.78 ^a	0.51 ^b	0.72 ^a	0.75 ^a	*

Group 1, concentrate mixture with 0% garlic powder; Group 2, concentrate mixture with 1% garlic powder; Group 3, concentrate mixture with 2% garlic powder; Group 4, concentrate mixture with 3% garlic powder. Different symbols mean *, significant at 5% level of significance, Superscripts a, b, c, and d mean values with dissimilar superscripts are significantly different.

Effect of garlic powder on meat quality of broiler

The carcass weight was 780g, 1020g, 897g and 834g for dietary treatment 1, 2, 3 and 4 respectively, which corresponded to 60.00%, 60.72%, 60.61 and 60.57% dressing yield (%) respectively (Table 2). There was no significant difference among the groups in terms of dressing percentage, but carcass weight was significantly higher in garlic supplemented groups than control groups.

The crude protein (CP) content of meat was 17.65%, 17.90%, 20.21% and 20.19% for dietary treatment 1, 2, 3 and 4 respectively and there was significant difference among the treatment groups. The results state that if garlic powder is supplemented with concentrated diets, crude protein (CP) percentage of meat will be increased. This result agrees the result of Shehata *et al.*, (2003) who reported that addition of garlic with different levels improved DCP and

TDN significantly. These results might be due to restore of important protein which increase glutathione enzymes in the liver which protects the cells from oxidative damage and play vital role in detoxification, inhibit lipid per oxidation, improve organs function and immunity. The ether extract (EE) was 0.78, 0.51, 0.72 and 0.75% for dietary treatments 1, 2, 3 and 4 respectively and it was found that garlic powder significantly decreased the fat content of meat. The result agrees with the reports of Fuhrman *et al.* (2000), reported that plant component had cholesterol-suppressive capacity.

The hypocholesterolemic effects of ginger and garlic reduced fat content in broiler meat for safe human consumption. Vidica *et al.* (2011), also reported that incorporation of 0.75% garlic in the diet of broilers reduced drastically the level of cholesterol in the meat. Chowdhury *et al.*, (2002), showed that garlic has cholesterol lowering effect in layer chicken only due to the presence of sulphur containing bioactive compounds in its homogenates. Lydia (2001), also suggested that garlic supplementation could reduce fat deposition than control diet. The findings of Dieumou *et al.* (2009) and Fadlalla *et al.* (2010), in the diet of broilers reported a non-

significant effect on broiler dressing percentage values (but numerically higher) due to the inclusion of garlic powder. The present result agrees with Lydia *et al.*, (2001) who reported that there were no significant differences on carcass percentage of birds fed varying levels of garlic powder.

Cost analysis of different treatments

The costs of these four dietary treatments were 40.13, 41.47, 42.72 and 44.03 Tk/kg for diet 1, 2, 3 and 4 respectively (Table 3). The results showed that there was no significantly difference for the price of diets among the treatments. The cost of production of the present research work is shown in the Table 3. The highest total production cost per kg broiler was obtained in group 1 and lowest in group 2.

Conclusion

It may be concluded that, supplementation of garlic improve growth performance, feed conversion efficiency and dressing yield of broilers. It also helps to reduce ether extract (EE) or fat content of broiler meat. So, it is recommended that garlic powder is used as supplement in modern poultry production and further research is necessary in this context.

Table 3. Cost analysis of broiler production under different dietary treatments

Parameters	Dietary treatments				Level of significance
	T ₀	T ₁	T ₂	T ₃	
Cost /kg feed (Tk)	40.13	41.47	42.72	44.03	Non significant
Chick Price /bird (Tk)	35.00	35.00	35.00	35.00	Non significant
Feed intake kg/bird	2.34	2.49	2.55	2.50	Non significant
Total feed cost/broiler (Tk)	93.93	103.34	109.08	110.27	Non significant
Total cost (feed+chick) (Tk)	128.93	138.34	144.08	145.27	Non significant
Other cost/ broiler (Tk)	20.00	20.00	20.00	20.00	Non significant
Total production cost/broiler (Tk)	148.93	158.34	164.08	165.27	Non significant
Total production cost/ kg broiler (Tk)	121.06 ^a	109.37 ^c	116.85 ^b	111.25 ^c	Significant
Price (@ 125 Tk) /broiler	153.75	180.88	175.38	184.00	Non significant
Profit (Tk) /broiler	4.82	22.53	11.29	18.73	Non significant

Group 1, concentrate mixture with 0% garlic powder; Group 2, concentrate mixture with 1% garlic powder; Group 3, concentrate mixture with 2% garlic powder; Group 4, concentrate mixture with 3% garlic powder. Different symbols mean *, significant at 5% level of significance, Superscripts a, b, c, and d mean values with dissimilar superscripts within same rows are significantly different.

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