ISSN: 1314-6246 Fakhim *et al.* *J. BioSci. Biotech.* **2013**, 2(2): 95-99.

RESEARCH ARTICLE

Rajab Fakhim
Yahya Ebrahimnezhad
Hamid Reza Seyedabadi
Tohid Vahdatpour

Effect of different concentrations of aqueous extract of ginger (*Zingiber officinale*) on performance and carcass characteristics of male broiler chickens in wheat-soybean meal based diets

Authors' address:
Department of Animal Science,
Faculty of Agriculture,
Shabestar Branch,
Islamic Azad University,
Shabestar, East Azerbaijan,
5381637181, Iran.

Correspondence:
Yahya Ebrahimnezhad
Department of Animal Science,
Faculty of Agriculture,
Shabestar Branch,
Islamic Azad University,
Shabestar, East Azerbaijan,
5381637181, Iran.
Tel.: +98-4712225311
e-mail: ebrahimnezhad@gmail.com

Article info:
Received: 5 January 2013
Accepted: 18 April 2013

ABSTRACT

This study was conducted to investigate the effects of using different concentrations of ginger extract (*Zingiber officinale*) on performance and carcass characteristics of male broiler chickens. Three hundred one-day-old commercial male broilers (Cobb-500) were randomly allocated in 20 floor pens (15 chicks each). Animals of each pen were supplemented with five different concentrations of ginger and the experiment was performed in quadruplicate. The broilers were fed a wheat-soybean meal based diet containing different concentrations of ginger extract (0, 0.25, 0.5, 0.75 and 1%) supplemented to drinking water. Feed intake, body weight gain and feed conversion ratio were measured during 1 to 10, 11 to 21, 22 to 42 and 1 to 42 days of age. At 42 days of age, two birds from each pen were selected and after weighing and slaughtered were dissected manually. Carcass yield, liver, abdominal fat and gut weight is expressed as percentage of live body weight. The results showed that there is no significant difference in the feed intake, body weight gain and feed conversion ratio between the different treatments except the feed conversion ratio of the period 1 to 10 days of age ($p<0.05$). Also, different supplemented concentrations of ginger extract to drinking water of broilers influenced the carcass yield ($p<0.05$).

Key words: *Zingiber officinale*, ginger extract, broiler, performance, carcass characteristics

Introduction

Ginger (*Zingiber officinale*) belongs to Zingiberaceae family. The used part of the plant is rhizome. This plant produces an orchid like flower with greenish yellow petals streaked with purple color. Ginger is cultivated in areas characterized by abundant rainfall. Even though it is native to southern Asia, ginger is also cultivated in tropical areas such as Jamaica, China, Nigeria and Haiti and it is an important spice crop in India (Bajaj, 1989).

Feed is a major component, affecting net return from the poultry business, because 80% of the total expenditure in term of cash is spent on feed purchase (Asghar et al., 2000; Farooq et al., 2001). Ensure more net return and minimize high expenditure for feed are the main challenges, for which many research strategies have been practiced such as introducing feed supplements and feed additives. In the past, the major growth promoters were antibiotics. However, the current research is looking for natural alternative because their residues represent risk for consumers and can allow the onset of bacteria resistance (Lee et al., 2004). At present, the scientists are working to improve feed efficiency and growth rate of livestock using useful herbs.

Among medicinal herbs, ginger possesses a mixed composition of zingerone, shogaols and gingerols. Stated that feed added ginger with garlic have no role on the growth performance of broilers, although both significantly affected hematological activity (Ademola et al., 2004). A negative correlation between productive traits and immune responses and also resistance against diseases has been observed

RESEARCH ARTICLE

(Demir et al., 2003). Removing these kinds of growth promoters from broiler diets result in low growth performance, and also less resistance against diseases. Therefore, using other alternatives is being concerned.

Several compounds like, enzymes, organic acids, probiotics, prebiotics and phytogenics are used to improve the performance (Patterson & Barkholder, 2003). Nutritional strategies aimed reduce cost of animal production have led to high accumulation of fat in broiler carcass (Abdulrahim et al., 1999). Feeding low-protein diets to broilers resulted in consistent decreased nitrogen excretion with increase in abdominal and whole-body fat deposition (Aletor et al., 2000). Thus, our aim was to study the effect of periodically use of aqueous extract of ginger on performance and carcass characteristics in male broiler chickens.

Materials and Methods

Animals

Three hundred one-day-old commercial male broilers (Cobb-500) were randomly allocated to one of 20 floor pens in a completely randomized design with five treatment and four replicate groups and fifteen chicks per each pen. The broilers were fed a wheat-soybean meal based diet (Table 1) containing different concentrations of ginger extract (0, 0.25, 0.5, 0.75 and 1%) supplemented to drinking water. Feed intake, body weight gain and feed conversion ratio were measured during 1 to 10, 11 to 21, 22 to 42 and 1 to 42 days of age. At 42 days of age, two birds from each pen were selected and after weighing and slaughtered were dissected manually. Carcass yield, liver, abdominal fat and gut weight are presented as percentage of the live body weight.

Table 1. *Composition and nutrient content of the broiler diets.*

Ingredients (%)	Starter (1 to 10 d)	Grower (11 to 21 d)	Finisher (22 to 42 d)
Wheat	62.37	68.92	70.96
Soybean meal (42%)	29.06	22.59	19.91
Poultry fat	3	3	4
Dicalcium Phosphate	2.08	1.54	1.34
Oyster shell	1.18	1.44	1.38
Salt	0.35	0.35	0.35
Vitamin permix[a]	0.25	0.25	0.25
Mineral permix[b]	0.25	0.25	0.25
DL-Methionine	0.24	0.27	0.27
L-Lysine HCL	0.21	0.23	0.29
Salinomycin	0.5	0.5	0.5
Arbinoxylanse enzyme	0.5	0.5	0.5
Inert	0.01	0.16	0.0
Nutrients (Calculated)			
ME, kcal/kg	2834	2894	2978.07
CP, %	19.95	17.86	16.92
Ca, %	0.95	0.9	0.83
Available phosphorous, %	0.47	0.45	0.41
Na, %	0.17	0.17	0.17
K, %	0.84	0.74	0.69
CL, %	0.24	0.24	0.24
Met, %	0.27	0.24	0.22
Met + Cys, %	0.83	0.8	0.77
Lys, %	1.14	1	0.98
Trp, %	0.28	0.24	0.23

a - Vitamins mixture provide per 2.5 kilogram of diet: vitamin A,12000000 IU; vitamin B1, 4000 mg; vitamin B2, 6000 mg; vitamin B3, 18000 mg; vitamin B6, 3000 mg; vitamin B12, 15 mg; vitamin D3, 5000000 IU; vitamin E, 50000 IU; vitamin K3, 3000 mg; vitamin B9, 1500 mg; vitamin B5, 70000 mg; vitamin H2, 100 mg; choline chloride, 400000 mg.

b - Mineral mixture provide per 2.5 kilogram of diet: Mn, 120000 mg; Zn, 100000 mg; Fe, 40000 mg; Cu, 20000 mg; I, 1000 mg; Se, 300 mg.

RESEARCH ARTICLE

Table 2. *Effect of different concentrations of aqueous extract of ginger on performance of male broiler chickens.*

Parameters	Different concentrations of aqueous extract of ginger (%)						
	Control	0.25%	0.5%	0.75%	1%	P-value	SEM
Feed intake (g)							
1-10 day	249.7	250.0	248.0	245.7	247.5	0.6131	2.11
11-21 day	844.7	869.5	858.7	849.0	848.2	0.7645	14.82
22-42 day	3238	3225	3244.2	3236.7	3245.2	0.9975	43.82
1-42 day	4332.5	4344.5	4351	4331.5	4341	0.9990	55.64
Body weight gain (g)							
1-10 day	224.7	225.5	228.2	231.0	228.5	0.4900	2.65
11-21 day	426.7	427.0	391.7	412.7	421.5	0.3089	12.82
22-42 day	1522.5	1446.7	1566.2	1536.2	1543	0.7476	65.34
1-42 day	2174	2099.2	2186.2	2180	2193	0.8661	68.58
Feed conversion ratio							
1-10 day	1.11^{a}	1.10^{a}	1.08^{ab}	1.06^{b}	1.08^{ab}	0.0178	0.0095
11-21 day	1.98	2.04	2.19	2.05	2.01	0.2028	0.0617
22-42 day	2.12	2.24	2.08	2.11	2.11	0.7748	0.0938
1-42 day	1.99	2.07	1.99	1.98	1.985	0.8291	0.0640

$^{a-b}$ With in the same column, means with different superscripts are significantly different ($p<0.05$).

Preparation of aqueous extract mixture

Ginger rhizomes were purchased from the local vegetable market. For preparation of mentioned levels, the plant material was trodden into small pieces with the help of metallic grinder and taken in a separate non-metallic jar. The pieces were added to one liter of hot boiling water, and kept at room temperature overnight (Liela, 1977). The collected aqueous extract was mixed with drinking water.

Experimental design and statistical evaluation

All data were analyzed using the CRD (Completely Randomized Design) of SAS (1998). Duncan's multiple range tests were used to compare differences among the treatments (Duncan, 1995).

Results and Discussion

Feed consumption

The mean cumulative feed consumption (g/bird) of broilers as influenced by dietary inclusion levels of aqueous extract of ginger supplemented to drinking water is presented in Table 2. Analysis of data on mean cumulative feed consumption revealed no significant differences between treatment groups from 1 to 10, 11 to 21, 22 to 42 and 1 to 42 days of age. This was similar to the findings of Ademola et al. (2009) and Doley et al. (2009) who observed no difference in feed intake in broilers fed with ginger and pepper extract for a period of six weeks. This was contrary to the findings of El-Deek et al. (2002), Alçiçek et al. (2004). Moorthy et al. (2009) and Tekeli et al. (2011) who observed difference in feed intake in broilers fed with ginger extract for a period of six weeks.

Body weight gain

The body weight gain of the chickens in the starter groups (1 to 10 day), grower groups (11 to 21 day), finisher groups (22 to 42 day) and during (1 to 42 day) of treatment was not significantly different among the groups (Table 2). This was similar to the findings of Garcia et al. (2007), Ghazaiah et al. (2007) and Tollba et al. (2007) who observed no difference in body weight gain in broilers fed with ginger and pepper extract for a period of six weeks. This was contrary to the findings of Onimisi et al. (2005) and Ademola et al. (2009) who observed that ginger increased body weight when included in the diet up to 2% level in the diet.

Feed Conversion Ratio (FCR)

The mean cumulative feed conversion ratio (Table 2) of broilers fed with different levels of aqueous extract of ginger supplemented to drinking water show no significant differences at 11 to 21, 22 to 42 and 1 to 42 day of age, but the feed conversion ratio was significantly different between treatments at 1 to 10 days of age ($p<0.05$). Present data support the findings of Chowdhury et al. (2002) where they fed sun-dried garlic and reported non-significant differences in the feed consumption and feed efficiency of the laying hens. Similarly, Ademola et al. (2004) observed such finding

RESEARCH ARTICLE

by supplementing feed added garlic and ginger in broilers ration, but this was contrary to the findings of our experiment at 1 to 10 days of age ($p<0.05$). Due to the active ingredients in these additives, the formation of more stable intestinal flora and improved feed conversion efficiency in consequence of a better digestion (Tekeli, 2007).

Carcass characteristics

Abdominal fat percentage, cut percentage and liver percentage of live weight (Table 3) did not show significantly differences between the treatment groups from 1-42 days of age, but the carcass yield was differ significantly between treatments at 1-42 days of age ($p<0.05$). This was similar to the findings of El-Deck et al. (2002) and Moorthy et al. (2009) who observed that there was no significant effect on carcass characteristics of broilers fed with different levels ginger powder and extract of ginger of respectively up to six weeks of age, but the authors stated that carcass yield was not significantly different between the treatments. On the other hand, Alçiçek et al. (2004), Tollba et al. (2007), Ademola et al. (2009) and Javed et al. (2009) stated that carcass characteristics improved in broilers fed different levels of powder/aqueous extract of ginger from 1-42 days of age. It is supposed that the improvement in feed conversion efficiency is resulted from the increase in appetite due to the stimulation of salivary and gastric glands by *Z. officinale*, decreased levels in pathogenic bacteria, formation of more stable intestinal flora and hence, a better digestibility.

Two main remarks can be made on the basis of the findings obtained in this study and their assessment in accordance with the findings of the previous studies. The remarks are as follows:

1. The values for feed efficiency of the chickens in the starter groups were better in all the experimental groups than in the control.

2. The carcass yield was higher in 0.75% supplemented groups than 0.25%, 0.5%, 1% and control groups ($p<0.05$).

Table 3. *Effect of different concentrations of aqueous extract of ginger on carcass characteristics of male broiler chickens (% of live body weight).*

	Different concentrations of aqueous extract of ginger (%)						
Parameters	**Control**	**0.25%**	**0.5%**	**0.75%**	**1%**	**P-Value**	**SEM**
Carcass yield	62.84[b]	64.82[b]	65.27[b]	69.66[a]	65.36[b]	0.015	1.3177
Liver	2.44	2.56	2.56	2.61	2.53	0.678	0.0854
Abdominal fat	0.77	0.75	0.88	0.82	0.81	0.759	0.0784
Gut	8.05	7.81	8.07	7.88	9.71	0.084	0.5307

[a-b] With in the same column, means with different superscripts are significantly different ($p<0.05$).

Acknowledgement

This article is adopted from M.Sc. thesis in Poultry Science, Islamic Azad University, Shabestar Branch (thesis supervisor: Dr. Y. Ebrahimnezhad). We would like to acknowledge Dr. Aboulfazl Gorbani, Dr. Habib Agdam Shahriar for their valuable assistance.

References

Abdulrahim SM, Haddadin MS, Odetallah NH, Robinson RK. 1999. Effect of *Lactobacillus acidophilus* and zinc bacitracin as dietary additives for broiler chickens. Br. Poult. Sci., 40(1): 91-94.

Ademola SG, Farinu GO, Ajayi Obe AO, Babutunde GM. 2004. Growth, hematological and biochemical studies on garlic- and ginger-fed broiler chickeя. Moor J. Agric. Res., 5(2): 122-128.

Ademola SG, Farinu GO, Babatunde GM. 2009. Serum lipid, growth and hematological parameters of broilers fed garlic, ginger and their mixtures. World J. Agric. Sci., 5(1): 99-104.

Alçiçek A, Bozkurt M. Çabuk M. 2004. The effect of mixture of herbal essential oils, an organic acid or a probiotic on broiler performance. South Afr. J. Anim. Sci., 34(4): 217-222.

Aletor VA, Hamid II, Niess E. Pfeitter E. 2000. Low-protein amino acids-supplemented diets in broiler chickens: effects on performance, carcass characteristics, whole-body composition and efficiencies of nutrient utilization. J. Sci. Food Agric., 80(5): 547-554.

Asghar A, Farooq M, Mian MA, Khurshid A. 2000. Economics of broiler production of Mardan Divison. Journal of Rural Development Administration, 32(3): 56-64.

Bajaj YPS. 1989. Biotechnology in agriculture and forestry: medicinal and aromatic plants. Vol. Vl, Springer-Verlag, Berlin.

Chowdhury SR, Chowdhury SD. Smith TK. 2002. Effects of dietary garlic on cholesterol metabolism in laying hens. Poult. Sci., 81(12): 11856-1862.

Demir E, Sarica Ş, Özcan MA. Suiçmez M. 2003. The use of natural

RESEARCH ARTICLE

feed additives as alternative for an antibiotic growth promoter in broiler diets. Br. Poult. Sci., 44(1): 44-45.

Doley S, Gupta JJ. Reddy PB. 2009. Effect of supplementation of ginger, garlic and turmeric in broiler chicken. Indian Vet. J., 86(6): 644-645.

Duncan DB. 1995. Multiple Range and Multiple *F* Test. Biometrics, 11(1): 1-42.

El-Deek AA, Attia YA. Hannfy MM. 2002. Effect of anise (*Pimpinella anisum*), ginger (*Zingiber officinale roscoe*) and fennel (*Foeniculum vulgare*) and their mixture on performance of broilers. Arch. Geflügelk., 67(2): 92-96.

Farooq M, Main MA, Faisal S, Durrani FR, Arshad M, Khurshid A. 2001. Status of broiler breeders in Abbottabad and Mansehra. Sarhad J. Agric., 17(4): 489-495.

Garcia V, Catalá-Gregori P, Hernández F, Megias MD. Madrid J. 2007. Effect of formic acid and plant extracts on growth, nutrient digestibility, intestine mucosa morphology, and meat yield of broilers. J. Appl. Poult. Res., 16(4): 555-562.

Ghazaiah AA, El-Hakim ASA. Refaie AM. 2007. Response of broiler chicks to some dietary growth promoters throughout different growth periods. Egyptian Poult. Sci. J., 27: 53-57.

Javed M, Durrani FR, Hafeez A, Khan RU, Ahmad I. 2009. Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. ARPN Journal of Agricultural and Biological Science, 4(1): 37-40.

Lee KW, Evarts H. Beynen V. 2004. Essential oils in broiler nutrion. Int. J. Poult. Sci., 3(12): 738-752.

Leila SFM. 1977. A manual on some Philippine medicinal plants (preparation of drug materials). Bot. Soc. U. P., 20: 78-82.

Moorthy M, Ravi S, Ravikumar M, Viswanathan K. Edwin SC. 2009. Ginger, pepper and curry leaf powder as feed additives in broiler diet. Int. J. Poult. Sci., 8(8): 779-782.

Onimisi PA, Dafwang II. Omage JJ. 2005. Growth performance and water consumption pattern of broiler chicks fed graded levels of ginger waste meal. J. Agric. Forest. Soc. Sci., 3(2): 113-119.

Patterson TA. Barkholder KM. 2003. Application of prebiotics and probiotics in poultry production. Poult. Sci., 82(4): 627-631.

SAS Institute. 1998. SAS User's Guide: Statistics. SAS Institute, Inc. Cary, NC.

Tekeli A. 2007. Potential use of plant extracts and propolis to be natural growth promoter in broiler chick's diets. Ph.D. Thesis, University of Cukurova Institute of Natural and Applied, Department of Animal Science Adana.

Tekeli A, Kutlu HR. Celik L. 2011. Effect of *Z. officinale* and propolis extracts on the performance, carcass and some blood parameters of broiler chicks. Current Research in Poultry Science, 1(1): 12-23.

Tollba AAH, Azouz HMM. Abd-Samad MH. 2007. Antioxidants supplementation to diet of Egyptian chicken under different environmental conditions: 2 - The growth during cold winter stress. Egyptian Poult. Sci. J., 27: 727-748.