

**MON -45**

**Effect of Dietary Garlic, Ginger and Their Mixture on the Performance of Broiler Chickens**

U. E. John<sup>1</sup> and O.O. Emenalom<sup>2</sup>

<sup>1</sup>Department of Animal Nutrition and Forage Science, Michael Okpara University of Agriculture, Umudike, Abia State; <sup>2</sup>Department of Animal Science and Technology, Federal University of Technology, Owerri, Imo State

**Corresponding author:** U. E. John; E-mail: [uduakobongjohn@gmail.com](mailto:uduakobongjohn@gmail.com)

**Abstract**

Ginger and garlic are spices used in various human foods and medicine. The effect of garlic, ginger and their mixture on broiler performance was investigated in a 56-day feeding trial using broiler chicks. Four experimental broiler starter and finisher diets were formulated such that the diets contained 1.0% each of ginger (T<sub>2</sub>), garlic (T<sub>3</sub>) and garlic-ginger mixture (0.5 gingers + 0.5garlic) (T<sub>4</sub>), respectively. The control (T<sub>1</sub>) diet contained none of the test materials. The diets were randomly assigned to four treatment groups of 30 day-old broiler chicks, each replicated 3 times with 10 birds per replicate. The design was a complete randomized design (CRD). Broiler starter and finisher diets were fed for 0-28 and 29-56 day of age, respectively. There were no significant ( $p>0.05$ ) differences in growth, feed intake and feed conversion ratio of the birds fed the different diets and control. Cost of feed consumed was significantly ( $p<0.05$ ) higher in garlic and ginger treatment groups than in the control. Birds fed the garlic diet consumed less feed, gained more weight and had better feed conversion ratio than the control. It is concluded that 1.0% dietary inclusion of garlic, ginger or their mixture in broiler diets had no negative effect on performance. Further research on environmental and health benefits of the products on broilers is worthwhile.

**Keywords:** Garlic, ginger, broiler chicken, poultry feed

**Introduction**

Over the years different feed materials and growth promoters have been used in poultry feed formulations to enhance growth rate, improve feed efficiency and utilization (Abbas and Ahmed 2010; Raeesi *et al.*, 2010; Oleforuh-Okoleh *et al.*, 2014). Some of these feed materials and growth promoters are costly and are not readily available to local farmers. Growth promoters have also been banned by the European Union. There is need therefore, for the identification and use of plant products that have the potentials of improving feed efficiency as well as enhancing the growth of animals.

Phytogenic feed additives are currently used in livestock and poultry production because of their positive properties including; anti-inflammatory, antiseptic, sedative, bactericidal, gut functions, fungicidal, antiviral, antioxidant, growth-promoting efficacy, dietary palatability, immune stimulating, stimulation of digestive enzyme and absorption of nutrients (Steiner, 2009; Puvaca *et al.*, 2013). A variety of these phytogenic feed additives including ginger and garlic have been widely used as alternatives to synthetic antimicrobial growth promoters in livestock and poultry industry.

Garlic (*Allium sativum*) and ginger (*Zingiber officinale*) are commonly used as condiments for various foods and beverages and also used in medicinal (Chrubasik *et al.*, 2005). Meanwhile, reports on their use in poultry nutrition varied among authors. Zomrawi *et al.* (2013) and Omage *et al.* (2007) reported non-significant differences on weight gain of broiler chicks fed garlic and/or ginger powder supplemented diets. Similarly, Oleforuh-Okoleh *et al.* (2014), Mohamed *et al.*, (2012), Ademola *et al.* (2009) and Fayed *et al.* (2012) reported significantly improved final live weight and total weight gain of broiler chicks fed diets containing garlic or ginger and their mixtures. Ademola *et al.* (2004) reported no significant effect ( $p>0.05$ ) in the average live weight and weight gain of broiler chicken fed garlic at 5000mg/kg diet. However, not much is known about lower dietary inclusion levels in broiler diets.

The aim of this work therefore, is to determine the performance of broilers fed diets containing 1% ginger, garlic and ginger-garlic mixture, respectively.

**Materials and Methods**

This experiment was conducted at the Poultry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Nigeria. Owerri is located in the South-East agro-ecological zone of Nigeria. It lies between latitude 4<sup>o</sup>41' and 6<sup>o</sup>31'N and longitude 6<sup>o</sup>15' and 8<sup>o</sup>15'E with mean annual rainfall, temperature and relative humidity of 2250mm, 26.5-27<sup>o</sup>C and 70-80%, respectively (Adeyemi, 2011). Ginger and garlic were procured fresh from a market in Owerri.

The light scaly leaves on garlic were removed and the bulb separated into cloves. Both ginger and garlic were then sliced into 3-4 slices, sun-dried for 5 - 7 days depending on the intensity of the sun, ground into meals using attrition mill and stored for use in broiler diets. Four experimental broiler starter and finisher diets were formulated such that diet 1(control) contained no ginger, garlic or their mixture. Diets 2, 3 and 4 contained 1% ginger, garlic and mixture (0.5 ginger + 0.5 garlic), respectively. The ingredient compositions of the diets are shown in table 1. The diets were analyzed for their proximate compositions using the method outlined by A.O.A.C (2010). One hundred and twenty (120) day-old broiler chicks of Cobb strains were used for the trial. The birds were divided into 4 groups of 30 birds each. Each group was sub-divided into 3 replicates of 10 birds, housed in a 1.4 x 1.4 m compartment. Wood shavings were used as the litter material. Feed and water were provided *ad libitum*. Routine medications and other routine poultry management practices were maintained. The design was a complete randomized design.

Data collected were subjected to statistical analysis using the General Linear Models (GLM) procedure of SAS<sup>®</sup> and the Student Newman-Keul's test  $p < 0.05$ .

Table 1: Ingredient and nutrient composition of the experimental starter and finisher broiler diets

Ingredient	Starter				Finisher			
	T <sub>1</sub> (0%) Control	T <sub>2</sub> (1%) Ginger	T <sub>3</sub> (1%) Garlic	T <sub>4</sub> (0.5+0.5%) Ginger+Garlic	T <sub>1</sub> (0%) Control	T <sub>2</sub> (1%) Ginger	T <sub>3</sub> (1%) Garlic	T <sub>4</sub> (0.5+0.5%) Ginger+Garlic
Maize	48.00	48.00	48.00	48.00	58.00	58.00	58.00	58.00
Soybean Meal	26.00	26.00	26.00	26.00	19.00	19.00	19.00	19.00
PKC	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00
Wheat Offal	4.00	3.00	3.00	3.00	3.00	2.00	2.00	2.00
Spent Grains	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00
Fish Meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Bone Meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L-Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
L-Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vit/im	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix <sup>+</sup>								
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ginger	-	1.00	-	0.50	-	1.00	-	0.50
Garlic	-	-	1.00	0.50	-	-	1.00	0.50
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
Chemical Analysis(%DM)								
Crude Protein	23.13	22.64	22.71	22.50	18.65	18.46	18.58	18.84
Crude Fibre	6.05	7.85	5.80	6.33	4.57	5.16	4.81	5.09
Esther Extract	6.88	5.26	3.19	1.93	5.57	5.61	5.25	5.99
Ash	10.39	10.78	9.99	10.00	13.42	12.33	12.58	13.12
NFE	53.54	55.47	58.31	59.54	57.79	59.54	59.18	56.96
Nitrogen	3.34	2.96	3.28	3.24	2.67	2.49	2.61	2.70
Phosphorus	0.88	1.16	0.90	0.91	0.85	0.80	0.84	0.88
ME (Kcal/kg)	3268.30	3110.95	3106.95	3025.00	3148.95	3168.70	3153.90	3162.20

<sup>+</sup>Provided the following per kg of feed: Vitamin A 12000000I.U, Vitamin D<sub>3</sub> 3000000I.U, Vitamin E 30000mg, Vitamin K<sub>3</sub> 2500mg, Folic acid 1000mg, Niacin 40000mg, Calpan 10000mg, Vitamin B<sub>2</sub> 5000mg, Vitamin B<sub>12</sub> 20mg, Vitamin B<sub>1</sub> 2000mg, Vitamin B<sub>6</sub> 3500mg, Biotin 80mg, Antioxidant 125000mg, Cobalt 250mg, Selenium 250mg, Iodine 1200mg, Iron 40000mg, Manganese 70000mg, Copper 8000mg, Zinc 60000mg, Chorine Chloride 200000mg.

## Results and Discussion

Data on the cumulative performance of broilers fed the different is shown in table 2. There were no significant ( $p > 0.05$ ) difference in body weight gain, feed intake and feed conversion ratio of birds fed the different

treatment diets and control. Birds fed diets containing 1% ginger, garlic or their mixture had higher growth values than the control. The slightly better weight gain of broilers fed diets containing ginger, garlic or their mixture may be due to the bioactive ingredient in garlic and ginger which promotes the performance of intestinal flora, thereby improving digestion and thus enhanced the utilization of energy which improved the growth of the birds (Zomrawi *et al.*, 2012; Eltazi, 2014; Amouzmehr *et al.*, 2013). Contrary to these findings Oleforuh-Okoleh *et al.* (2014) and Mohamed *et al.*, (2012) reported significantly improved final live weight and total weight gain of broiler chicks fed diets containing garlic or ginger and their mixtures. The variation in the weights may be attributed to the dietary inclusion level and processing method of the products.

Birds fed T<sub>3</sub> diet had the lowest feed intake followed by those fed the T<sub>1</sub> diet. The decrease feed intake but high weight gain recorded by birds in T<sub>3</sub> diet group tend to show more efficient nutrient utilization and an advantage over T<sub>2</sub> and T<sub>4</sub> diets. This result is in line with the findings of Eltazi (2014) and Elmakki *et al.* (2013), who reported no significant influence in the dietary consumption of birds fed garlic or ginger and their combinations with the control group. Contrary to this finding, Mohamed (2012) and Oleforuh-Okoleh *et al.* (2014) reported significant differences in feed intake among treatments fed garlic or ginger and their mixture with the control group. The variations in the results may again be attributed to the dietary inclusion level and processing method of the products.

Feed conversion ratio was slightly better in garlic and garlic-ginger mixture diets than the ginger and control groups. This may be attributed to the anti-bacterial properties of garlic and ginger which resulted in better absorption of the nutrients in the gut and finally leading to improvement in FCR. This result agrees with the report of Zomrawi *et al.* (2012) and Fadlalla *et al.* (2010) that supplementation of garlic and ginger had no significant difference on the feed conversion ratio of birds. Contrary to these reports, Eltazi (2014) reported significant differences in FCR among birds fed garlic or ginger and their mixture. The variation in FCR may again be attributed to the dietary inclusion level and processing method of the products. Costs of feed consumed and cost/kg gain was higher in birds fed diets containing the test materials.

The high cost may be attributed to the added cost of the test materials which is known to vary with season and location/region. However, ready to cook (RTC) carcass yield was higher in birds receiving ginger and garlic-ginger mixture diets. This tends to show a slight beneficial effect on performance as a result of the dietary inclusion of the test materials

Table 2: Cumulative performance of broilers fed in different diet treatments (0 – 8weeks)

PARAMETERS	T <sub>1</sub> (0%) Control	T <sub>2</sub> (1%) Ginger	T <sub>3</sub> (1%) Garlic	T <sub>4</sub> (0.5+0.5%) Garlic + ginger	SEM
Initial Body Weight (g)	41.67	41.67	41.67	41.67	0.00
Final weight (g)	2595.74	2605.37	2668.25	2725.00	31.05
Total Weight Gain (g)	2554.07	2563.70	2626.58	2683.33	31.05
Total Feed intake (g)	6091.08	6159.46	5989.01	6271.80	74.10
FCR	2.38	2.41	2.28	2.34	0.04
Daily Weight Gain (g)	45.61	45.78	46.90	47.92	0.55
Daily Feed Intake (g)	108.77	109.99	106.95	112.00	1.32
Mortality (%)	3.33	6.67	13.33	0.00	2.60
Cost of feed consumed (₦)	556.81 <sup>b</sup>	596.29 <sup>ab</sup>	619.01 <sup>a</sup>	627.25 <sup>a</sup>	10.50
Feed Cost/kg gain (₦)	217.60	233.28	235.61	234.09	3.62
Net Income of RTC Yield	749.59	796.05	726.85	751.08	21.22

ab: means with different letters superscript are significantly (p<0.05) different.

## Conclusion

It is concluded that 1% dietary inclusion of ginger, garlic or ginger-garlic mixture in broiler diets, respectively, could improve the performance of broilers without any adverse effects. Further research work on different dietary inclusion levels of the products in broiler diets is worthwhile.

## References

- AOAC (2006). Official methods of analysis. Association of Official Analytical Chemist. Washington DC.  
 Abbas, T.E.E. and Ahmed, M.E. (2010). Effect of supplementation of *Nigella sativa* to the broiler chicks diet on the performance and carcass quality. *International Journal of Agriculture Science*, 2(2):09-13.

- Adeyemi, A. (2011). Complete guide to Nigerian tourism, local culture and investment opportunities [www.cometonigeria.com](http://www.cometonigeria.com).
- Chrubasik, S., Pittler, M.H. and Roufogalis, B.D. (2005). *Zingiberis rhizome*: a comprehensive review on the ginger effect and efficacy profiles. *Phytomedicine*, 12(9):440-449.
- Ademola, S.G., Farinu, G.O., Ajayi-Obe, A.O. and Babatunde, G.M. (2004). Growth, haematological and biochemical studies on garlic and ginger fed broiler chicken. *Moor J. Agric. Res.*, 5(2):122-128.
- Ademola, S.G., Farinu, G.O. and Babatunde, G.M. (2009). Serum lipid growth and hematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agricultural Science*, 5 (1): 09-104.
- Elmakki, A.M., AbdelAtti, K.A., Dousa, B.M., Elagib, H.A.A., Malik, H.E.E. and Elamin, K.M. (2013). Effect of dietary ground ginger (*Zingiber officinale*) root additives on broiler performance. *Global Journal of Animal Scientific Research*, 1(1):76-83.
- Eltazi, S.M.A. (2014). Response of broiler chicks to diets containing different mixture levels of garlic and ginger powder as natural feed additives. *International Journal of Pharmaceutical Research and Allied Sciences*, 3(4):27-35.
- Fadlalla, I.M.T., Mohammed, B.H. and Bakhiet, A.O. (2010). Effect of feeding garlic on the performance and immunity of broilers. *Asian Journal of Poultry Science*, 4(4):182-189.
- Fayed, R.H., Razik, A.A. and Ouf, G. (2011). Effect of dietary garlic supplementation on performance, carcass traits and meat quality in broiler chicken. *XVISAH Congress*, Vienna.
- Mohamed, A.B., Al-Rubaei, A.M.M. and Jalil, A.Q. (2012). Effect of ginger (*Zingiber officinale*) on performance and blood serum parameters of broiler. *Int. J. Poult. Sci.*, 11: 143-146.
- Oleforuh-Okoleh, V.U., Chukwu, G.C. and Adeolu, A.I. (2014). Effect of ground ginger and garlic on the growth performance, carcass quality and economics of production of broiler chickens. *Global J. Bio-Sci. Biotechnol.*, 3: 225-229.
- Omage, J.J., Onimisi, P.A., Adegbite, E.K. and Agunbiade, M.O. (2007). The effect of ginger (*Zingiber officinale* Roscoe) waste meal on growth performance, carcass characteristics, serum lipid and serum cholesterol profiles of rabbit. *Pakistan Journal of Nutrition*, 6(4): 359-362.
- Puvaca, N., Glamocic, D., Levic, J., Peric, L., Stanacev, V. and Milic, D. (2013). Beneficial effects of phytoadditives in broiler nutrition. *World's Poultry Science Journal*, 69: 27-34.
- Raeesi, M., Hoseini-Aliabad, A., Roofchaei, A., Zarehshahneh, A. and Pirali, S. (2010). Effect of periodically use of garlic (*Allium sativum*) powder on performance and carcass characteristics of broiler chickens. *World Academy of Science, Engineering and Technology*, 44.
- Steiner, T. (2009). *Phytogenics in animal nutrition, natural concepts to optimize gut health and performance*. Nottingham University Press, Nottingham.
- Zomrawi, W.B., Atti, K.A.A., Dousa, B.M. and Mahala, A.G. (2012). The effect of ginger root powder (*Zingiber officinale*) supplementation on broiler chicks' performance, blood and serum constituents. *Online J. Anim. Feed Res.*, 1: 457-460.