

GROWTH PERFORMANCE AND COST BENEFITS OF BROILER CHICKENS FED DIETS CONTAINING GARLIC AND GINGER POWDER AS ADDITIVES

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Abstract

This study evaluated the growth performance and cost benefits of broiler chickens fed diets containing garlic powder, ginger powder or their combination as additives at 0-4 weeks of age. A total of 240 day old broiler chicks were randomly assigned to four dietary treatments formulated to meet nutrient requirements at the starter phase. Control diet contained neither garlic nor ginger powder. The second diet contained garlic powder at 5g/kg diet, the third diet contained ginger powder at 5g/kg diet while the fourth diet contained a combination of garlic and ginger powder each at 2.5g/kg diet. The birds were randomly allotted to the four dietary treatments in six replicates and fed ad libitum for four weeks. Data were collected on growth performance and cost estimations were made on diets and feeding. Higher ($p < 0.05$) feed intake, cost per kilogramme diet, cost of feed per bird and cost per kilogramme weight gain were recorded among birds fed diets containing the feed additives. Feed conversion ratio was lowered ($p < 0.05$) in birds fed the control diet. Mortality rate was reduced ($p < 0.05$) with inclusion of garlic or ginger at a rate of 5g/kg or their combination at 2.5g each/kg in diet of starter broilers. The study concluded that garlic powder or ginger powder (5g/kg diet) or their combination (2.5g each/kg diet) could be explored as feed additives at the starter phase of broiler chickens production where organic growth as well as effective reduction in mortality is paramount.

Key words: garlic, ginger, additive, performance, livability.

Introduction

Modern production of poultry particularly the meat type requires very short and fast production cycles and hence fast growth rate of birds to meet increasing demands. It is an interesting fact that chicks grow fast and gain up to seven times their hatch weight in the first month while building healthy digestive tract and immune system will improve their growth (AAF, 2018). The gut and general health as well as performance of the poultry are greatly influenced by the intestinal microbial community and the complex interaction with the host birds (De Guseem, 2018). Gut health and immune support tools and strategies are therefore key requirements in a starter-grower nutrition. Antibiotic or antimicrobial growth promoters have hitherto been intensively used in broiler's rations to improve health, performance and productivity (Immerseel, 2019). However, they are now infamous because of the resultant bacterial resistance and their negative impacts on the consumers' health over time. The use of safer alternatives like phytogenic feed additives which offer with affordable costs, reduced risk of toxicity, minimum health hazard, and high suitability, positive consumer opinions and acceptance, and environmental friendliness (Rehman and Munir, 2015; Jones, 2018) have been gaining popularity over the years. Phytogenics including herbs and spices and their products have flavouring properties and exert effects on the gut environment or gut cell wall of animals and enhance the effectiveness of nutrient utilization for better health and productivity (Hanieh *et al.*, 2010; Al-Shuwali *et al.*, 2015; AAF, 2018; Jones, 2018). Hence, the use of phytogenic substances such as garlic and ginger. While garlic (*Allium sativum*) has been used as natural feed additives in poultry nutrition for broiler and growers due to its antibacterial and immune-modulatory properties (Rehman and Munir, 2015), inclusion of ginger in the diet of broilers have been reported to aid weight gain and feed conversion (Safa, 2014). Al-Shuwali *et al.* (2015) opined that garlic and ginger have strong stimulating effects on immune and digestive systems of birds. Recent research works on the combination of ginger and garlic as feed additives (Issa *et al.*, 2012; Karangiya *et al.*, 2016) have shown encouraging results with regards to weight gain, feed efficiency and lowered mortality in poultry. Confusion about choice of product, perceived lack of sufficient commercial and scientific data to support the efficacy of products and whether they have real economic benefits may desuade animal producers and feed

manufacturers from using phytogenics (Jones, 2018). Therefore, according to De Guseem (2018), the next and best approach in use of alternative additives for improved gut health and animal performance is to list what has been achieved with the estimated cost per kilogramme bird produced. However, there is a dearth of report on the cost benefits of garlic and ginger as feed additive for broiler starter and this necessitated this study.

Materials and Methods

The study was carried out at the Poultry Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Nigeria. The area is located in the derived savannah vegetation zone of Southwest Nigeria with altitude 76m above sea level; latitude (7.1475°N and 3.3619°E), and an average temperature of 34°C (Google Earth, 2019).

The test ingredients, processed garlic and ginger powder were sourced from open market and incorporated into a basal starter diet formulated to contain 22% crude protein and metabolizable energy of 2873kcal/kg. The control diet had no garlic or ginger powder as additive. Diets 2 and 3 had garlic powder and ginger powder included respectively, at a rate of 5g/kg diet while diet 4 had each of garlic and ginger powder included at a rate of 2.5g/kg diet.

A total of two hundred and forty day old broiler chicks were obtained from a reputable hatchery and randomly allocated into the four dietary treatments in six replicates. The birds were reared under good animal production practices. The respective starter diet according to treatment as well as water was provided to the birds *ad libitum* for a period of four weeks. Performance parameters such as feed intake, weight gain and feed conversion ratio were recorded according to treatment and replicate. Prevailing market prices of feed and test ingredients were used to determine costs: per kilogramme diet, of feed consumed per bird and per kilogram body weight gain. All data collected were subjected to one way analysis of variance using the SAS statistical package (SAS, 2002) while significant means were separated using Duncan Multiple Range Test as contained in SAS.

Results and Discussion

Effect of inclusion of powdered garlic, ginger or their combination as feed additive on the growth performance of broiler chickens at the starter phase is presented in Table 1. Dietary inclusion of ground garlic, ginger or their combination had no influence ($p>0.05$) on final weight and daily weight gain of starter broiler chickens. Non-significant effects observed in the final weight and daily weight gain of 0-4weeks old broiler chickens in this study showed that the phytogenic additives used did not influence those parameters. This is in agreements with findings (Demir *et al.*, 2003; Issa *et al.*, 2012) that inclusion of garlic in diets for broiler chickens did not influence performance. However, daily feed intake (DFI), feed conversion ratio (FCR) and mortality of starting broiler chickens were significantly ($p<0.05$) influenced by dietary treatments. Birds fed the control diet recorded least DFI and FCR (57.88g/d and 1.56, respectively). These were higher and similar among additives treatment groups. High feed intake was observed among birds on phytogenics based diets. This is in line with findings (Mohammed *et al.*, 2012 and Karangiya *et al.*, 2016) that inclusion of ginger powder in the diets of broilers resulted in positive effect on feed intake. The report of Javandel *et al.* (2008) showed that higher levels of feed consumption was obtained when broiler chickens were fed diets with garlic inclusion. However, Oloyede *et al.* (2017) reported lower feed consumption of garlic based diets. This was not the case in the present study as the birds under this dietary treatment had higher feed intake.

Birds in all the treatment groups had similar final weight and daily weight gain, indicating that the stimulating effect of ground garlic, ginger or their combination on feed intake did not translate to higher weight gain in the birds. This probably explains why the feed conversion ratio was poor for the birds in the phytogenic treated groups. Disparity between the results obtained in this trial and those of other researchers could be due to variations in actual bioactive ingredient intake due to variations in composition of the phytogenic material which could be affected by climate, harvesting conditions among other factors as exposited by Maurin (2018).

No mortality was recorded for birds fed diets containing garlic, ginger or their combination. However, birds on the control diet recorded mortality rate of 0.83% indicating that the phytogenic feed additives impacted better immunity on the birds and hence higher livability. This suggests beneficial effects of phytogenics on the health of the birds. The report of Rehman and Munir (2015) and Karangiya *et al.* (2016) indicated that the use of these phytogenics improved immune system of birds give credence to the result obtained in this trial.

Table 1: Growth performance of broiler chickens fed diets containing garlic and ginger as additives at starter phase (0-4 weeks)

Parameters	Control (0g/kg)	Garlic (5g/kg)	Ginger (5g/kg)	Garlic (2.5g/kg) + Ginger (2.5g/kg)	P-value	SEM
Initial weight (g/b)	40.00	40.00	40.00	40.00	0.000	0.000
Final weight (g/b)	1082.00	1015.50	1063.50	1048.33	0.52	15.674
Daily weight gain (g/b)	37.21	34.84	36.55	36.01	0.52	0.55978
Daily feed intake (g/b)	57.88 ^b	62.64 ^a	62.59 ^a	62.76 ^a	0.01	0.661
Feed conversion ratio	1.56 ^b	1.80 ^a	1.71 ^{ab}	1.77 ^a	0.025	0.032
Mortality (%)	0.83 ^a	0.00 ^b	0.00 ^b	0.00 ^b	<0.001	0.085

^{ab} - means within same row having different subscript differ significantly ($p < 0.05$, $p < 0.01$, $p < 0.001$)

All the feed cost parameters measured were significantly ($p < 0.001$) influenced by the dietary treatments. Cost per kilogramme feed (CKF) increased ($p < 0.001$) with inclusion of the phytogenic feed additives. Diet with garlic powder as additive had highest ($p < 0.001$) CKF (₦190.15/kg) while the control diet had the least (₦174.90/kg). Values recorded for feed cost per bird (FCB) and feed cost per kilogramme weight gain (FCKWG) were similar across the phytogenic groups while birds in the control group recorded significantly ($p < 0.001$) lower FCB (₦283.46) and FCKWG (₦272.70). Increased cost of feed as well as higher cost of feed consumed per bird with the inclusion of garlic and ginger in the diet is obviously due to additional cost of the garlic and ginger powder added to the diet. In the same vein, high feed cost per kilogramme weight gain obtained for birds fed diets containing garlic, ginger or their combination was due to the higher cost of feed coupled with their higher values of feed conversion ratio. As opined by Maurin (2018), costs of utilizing phytogenics like ginger and garlic are non-negligible while the expensive nature of their use may be due to low exploration and the need to use them in appreciable quantities.

Table 2: Cost benefits of broiler chickens fed diets containing garlic and ginger as additives at starter phase (0-4 weeks)

Parameters	Control (0g/kg)	Garlic (5g/kg)	Ginger (5g/kg)	Garlic (2.5g/kg) + Ginger (2.5g/kg)	P-value	SEM
Feed cost per kilogramme diet (₦/kg)	174.90 ^d	190.15 ^a	189.10 ^c	189.62 ^b	<0.001	1.332
Cost of feed consumed (₦)	283.46 ^b	333.51 ^a	331.40 ^a	333.20 ^a	<0.001	5.153
Feed cost per kilogramme weight gain (₦/kg)	272.70 ^b	342.05 ^a	324.02 ^a	334.77 ^a	<0.001	7.364

^{abcd} - means within same row having different subscript differ significantly ($p < 0.001$)

Conclusion

Feed intake, cost per kilogramme diet, cost of feed per bird and cost per kilogramme weight gain were increased with inclusion of garlic or ginger at a rate of 5g/kg or their combination at 2.5g each/kg in diet of starter broiler chickens. Poor feed conversion ratio was obtained when garlic or ginger or their combination was included in the diets of starter broiler chickens. No mortality was recorded for the birds in the phyto-genic fed groups. It is therefore recommended that garlic powder or ginger powder at inclusion rate of 5g/kg diet or their combination (2.5g each/kg diet) can be explored as feed additives at the starter phase of broiler chickens for improved livability of birds.

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