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Effects of Graded Levels of Ginger (*Zingiber officinale*) Meal as Feed Additive on Growth Performance Characteristics of Broiler Chicks

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Abstract: ***A 56 day experiment was conducted using ninety eight day-old Anak broiler chicks to investigate the growth performance characteristics of broiler fed graded levels of Ginger meal as feed additive. The birds were randomly assigned to four dietary treatments (T1-T4) in a completely Randomized Design (CRD). Each treatment consisted of 24 birds per treatment with 8 birds per replicate. The ginger was incorporated at graded levels of 0g, 2g, 4g and 6g per kg feed in T1 (control), T2, T3 and T4 respectively. Performance parameters such as feed intake, body weight gain and feed conversion ratio were collected and recorded weekly. Data collected were subjected to Analysis of Variance (ANOVA), there were significant differences (P< 0.05) in feed intake, body weight gain and feed conversion ratio and the best results were recorded in T4 (6g per kg of feed) which had the highest overall performance while T1 (control) had the lowest performance.***

Keywords: Ginger, Growth Performance, Feed additives and Broiler Chicks

1. Introduction

The shortage of animal protein source is alarming and evident in developing countries especially in Africa. Poultry production, however, proffers a faster and cheaper means of arresting this problem in developing countries in the world (Oluyemi and Roberts 1988, Kehinde *et al.*, 2011).As a result of the ban of antibiotic products, there has been growing interest in the use of natural herbs and medicinal plants such as ginger, garlic, onion as feed additives in poultry diets in order to maximise their potential output (Joke and Susan, 2007).

The use of ginger as substitute for antibiotic growth promoters is desirable for greater productivity of poultry, increased palatability of feed, nutrient utilization, appetite stimulation, increase in the flow of gastric juice and piquancy to tasteless food (Owen and Amakiri, 2012).

Various feed additives are used in poultry to maximize net returns and carcass quality of birds. In the past, growth-promoting antibiotics were used as feed additives; however, these were associated with storage of undesirable residues in the meat and eggs of poultry products which may be harmful to man when consumed, and have been banned or limited in many countries due to these suspected residual effects (Diarra *et al*., 2011). As a result, natural alternatives to antibiotics, such as herbs and medicinal plants, have attracted attention due to their wide range of potential beneficial effects (Manesh *et al*., 2012). Thus the use of plants such as Ginger, Garlic and Onions as alternatives to antibiotic feed additives is becoming more and more popular (Joke and Susan, 2007). The current study therefore; seek to investigate the growth performance characteristics of broiler fed graded levels of Ginger meal as feed additive

2. Materials and Methods

The experiment was carried out in the University of Port Harcourt Research and Demonstration Farm, Choba, Rivers State, Nigeria and it lasted for a period of 56 days.

98 mixed sex day old broiler chicks of Anak strain were subjected to the same management conditions. All the birds were properly housed in a deep litter system in an open sided poultry house. The pen compartments measuring 1m x 2m were demarcated with wire mesh and wooden frame. Wood shavings were used as litter material. In order to boost their immunity, the birds were vaccinated against Newcastle disease, infectious bronchitis and Gumboro disease according to the vaccination schedule. Water and feed were provided *ad-libitum*. Weekly body weight, feed intake and feed conversion ratio as well as mortality were recorded as it occurred throughout the period of the study. The birds were kept under strict hygienic conditions and confined throughout the experimental period; other poultry routine management practices such as general observation of birds to check for abnormalities, washing of drinkers and feeders and feeding of birds, cleaning of the poultry environment etc were maintained. The birds were randomly selected, weighed to get their initial body weight and then allotted to four (4) dietary treatments (T1, T2, T3 and T4) at 24 birds per treatment and 8 birds per replicate in a Completely Randomized Design (CRD).

Fresh ginger rhizomes were purchased from fruit garden, D/Line Port harcourt, Rivers State. They were washed, chopped into tiny pieces, oven dried and then milled into powder. The powdered ginger was stored in an air tight polyethene bag until required for use. Four experimental diets were formulated with powdered ginger incorporated into the formulated diets at different levels of inclusion for broiler starter and finisher diets as shown in table 1.

Average weekly feed intake was recorded by subtracting feed left over from quantity of feed given during the week. Weekly body weight was also recorded and total body weight gain was determined after the experiment by subtracting the initial body weight in the first week from the final body weight in the last week of the experiment, feed conversion ratio was determined using the methods of Contreras-Castillo et al (2008) by dividing the total feed intake by the total body weight gained per treatment. Average weekly and daily feed intake, average weekly and daily body weight gain were also calculated. Mortality was recorded throughout the period of the study as it occurred.

All data obtained were subjected to the analysis of Variance (ANOVA) according to Steel and Torrie (1980) and their means separated using Duncan Multiple Range Test (DMRT) according to Duncan (1955) using the Statistical Package for Social Science (SPSS) software.

3. Results and Discussion

The feed intake (g/bird) of broilers as influenced by dietary inclusion levels of ginger supplemented to broiler feed is presented in Table 2. Statistical analysis of data on feed intake revealed significant differences between treatment groups with treatment 4 (T4) having the highest total feed intake of 4,270g/bird and treatment 1, T1 (control) having the lowest total feed intake of 4,070g/bird. Treatment 2 (T2) had a total feed intake of 4,175g/bird while treatment 3 (T3) had a total feed intake of 4,196/per bird.

There were also significant differences between the body weights and weight gains of birds in the different treatments. T4 had the highest final body weight of 2,350g/bird and an average body weight gain of 2,317g/bird while T1 (control) had the lowest final body weight of 1949.67g/bird and an average body weight gain of 1916.67g/bird. T2 had a total body weight of 2074.67g/bird and an average body weight gain of 2041.67g/bird while T3 had a body weight of 2,195g/bird and an average body weight gain of 2162g/bird.

Result also shows a significantly lower ($p<0.05$) feed conversion ratio with broiler fed ginger meal when compared with those in the control treatment; this implies that there was a significant difference in feed conversion ratio between the different treatment groups. The mortality recorded in treatment 1, 2, 3 and 4 were; 1%, 2%, 1% and 2% respectively. Results showed that feed intake was significantly influenced by the dietary treatment. Feed intake was higher in diets containing ginger. This result is similar to the work of Ademola *et al.*, (2009) who reported higher feed intake of broilers on diet supplemented with ginger. The results were however at variance with the report of Herawati, (2010) who stated that broilers fed 2% dried supplementary ginger meal had significantly lower feed intake than those on the control diet. High feed intake of birds placed on ginger diets could be attributed to the property of ginger as an appetizer and its components which enhance the activities of gut micro flora, Ademola *et al.*, (2009). Appetite increase invariably increases feed intake and the higher the level of ginger contained in the feed, the higher the appetite thus the higher the feed intake Ademola *et al.*, (2009).

Results showed that body weight gain was significantly influenced by the dietary treatment. Decreased feed intake in T1 (0g of ginger/kg of feed) and T2 (2g of ginger/kg of feed) resulted in a corresponding decrease in body weight gain whereas the improvement in weight achieved by ginger supplementation over the control indicates that ginger has a positive impact on the growth of the birds. This improvement is due to improved gut environment and micro flora achieved with ginger supplementation Ademola *et al*., 2009. This effect is attributed to the fact that the susceptibility of pathogenic gram positive bacteria to the antibacterial components of ginger are higher than that of the physiological desirable intestinal bacteria *(*Reeds *et al., 1993; Cullen et al., 2005)*. This observation is in line with the findings of Shi et al., (1999) and Javandel *et al. (2008)*. It is also backed up by the findings of Conley (1997) who observed that ginger acts as stimulant for feed digestion and conversion which increase body weight gain. Its active compounds which improves feed digestion and stimulates enzymes thus enhancing feed conversion ratio which lead to an increase body weight gain as th researchers noticed in during this study. Onimisi *et al.*, (2005) and Ademola *et al.*, (2009) also observed that ginger increased body weight when up to 2% level where included in broiler diet, Garcia *et al*., (2007) and Al-Homidan (2005) also found an increase in weight gain of broiler when fed 2% and 6% ginger. This observation however, contradicts the reports of Omage *et al., (2007), Ademola et al (2004)* and *Horton et al., (1991)* who reported that the inclusion of ginger did not improve the weight gain of broilers.

Results showed that feed conversion ratio was significantly affected by ginger supplementation. Feed conversion ratio in ginger diets were significantly higher in ginger diets thereby indicating better feed conversion efficiency. This could be attributed to the accumulation of the active ingredients in ginger which gives rise to the formation of more stable intestinal flora and improved feed conversion efficiency as a consequence of better digestion (Tekeli, 2007). These results agree with the work of Moorthy *et al*., (2009) and Onimisi *et al*., (2005) who reported significantly better feed conversion ratio in ginger fed groups of broilers compared to control. Authors such as Herawati (2006); Tollba (2003); Herawati (2010); Moorthy *et al*., (2009) and Onimisi *et al.*, (2005) also illustrated that birds fed with diets containing ginger up to 2% recorded better feed conversion ratio than birds fed with un-supplemented diets, this finding was however contrary to Ademola *et al.*, (2004) who observed no significance when supplementing ginger in broilers ration and Wafaa *et al.*, (2012) who also reported no significant difference among birds fed on 0.5%, 1% and 1.5% ginger powder on feed conversion ratio.

4. Conclusion

It is evidence that ginger meal as feed additive in the diets of broiler birds enhanced growth performance characteristics of broiler chicks. The results suggest that

ginger can be included at these levels in broiler starter and finisher diets without adversely affecting their performance; however greater performance is attained at the level of 6g of ginger/kg of feed.

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Table1: Ingredient composition and calculated analysis of Broiler Diets

Ingredient	T1	T2	T3	T4	T1	T2	T3	T4
	Broiler Starter				Broiler Finisher			
Maize	48.00	48.00	48.00	48.00	57.00	57.00	57.00	57.00
Soya bean meal	24.00	24.00	24.00	24.00	15.00	15.00	15.00	15.00
Ground nut cake	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Wheat bran	10.00	9.95	9.90	9.85	10.00	9.95	9.90	9.85
Oyster shell	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin/mineral premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ginger	0	0.05	0.10	0.15	0	0.05	0.10	0.15
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Calculated Analysis								
Crude Protein	23.41	23.44	23.46	23.48	20.25	20.28	20.30	20.32
ME (Kcal/kg)	2722.04	2722.85	2723.66	2724.47	2813.12	2813.93	2814.74	2815.55
Crude Fibre (%)	4.49	4.50	4.50	4.49	4.27	4.27	4.28	4.28
Lysine (%)	1.15	1.15	1.15	1.16	0.94	0.94	0.94	0.95
Methionine (%)	0.42	0.42	0.42	0.43	0.37	0.37	0.37	0.37
Calcium (%)	1.45	1.46	1.46	1.46	1.43	1.43	1.44	1.44

Table 2: The effect of treatment (Ginger) on the production parameters of broiler birds

Production Parameters	T1 (0g of ginger/kg feed)	T2 (2g of ginger/kg feed)	T3 (4g ginger/kg feed)	T4 (6g ginger/kg feed)
Initial Body Weight (g/bird)	33.00	33.00	33.00	33.00
final Body Weight (g/bird)	$1{,}949.67 \pm 5.49^{d}$	$2{,}074.67 \pm 1.45^{c}$	$2{,}195.00 \pm 1.53^{b}$	$2{,}350.00 \pm 4.04^{a}$
Total Body Weight Gain(g/bird)	$1{,}916.67 \pm 5.48^{d}$	$2{,}041.67 \pm 1.45^{c}$	$2{,}162.00 \pm 1.52^{b}$	$2{,}317.00 \pm 4.04^{a}$
Ave. weekly Body Weight Gain (g/bird)	239.58 ± 0.68^{d}	255.21 ± 0.18^{c}	270.25 ± 0.19^{b}	289.62 ± 0.50^{a}
Total Feed Intake (g/bird)	4070.00 ± 3.22^{d}	4175.00 ± 2.89^{c}	4196.00 ± 4.58^{b}	4270.00 ± 2.00^{a}
Ave. Weekly feed intake (g/bird)	508.75 ± 0.40^{d}	521.88 ± 0.36^{c}	524.50 ± 0.57^{b}	533.75 ± 0.25^{a}
Feed Conversion Ratio (FCR)	2.12	2.04	1.94	1.84

a, b, c: Means in the same column with different superscripts are significantly(P value<0.05) different