

PERFORMANCE OF BROILER CHICKENS FED THREE DIFFERENT SOURCES OF CALCIUM AND PHOSPHORUS MINERAL SUPPLEMENT.

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ABSTRACT

Eight weeks study was carried out to evaluate the serum biochemistry of broiler chickens at finisher phase. Birds were fed commercial diet (T₁) as control and different dietary sources of calcium and phosphorus mineral nutrients in on-farm formulated diets fortified with bone meal (T₂), eggshell meal (T₃) and limestone (T₄). Ninety six unsexed broiler birds were raised through the starter phase (week 1-4) to the finishers phase (week 4-8) before random allotment into the four treatment groups. The experimental diets were fed to four groups of 24 broilers and each treatment group was replicated thrice of 8 birds in a Completely Randomized Design (CRD) experimental model. Data obtained were subjected to statistical Analysis of Variance (ANOVA). The result obtained at the end of the experiment showed that birds on eggshell meal, bone meal and limestone performed comparably well ($P < 0.05$) with the birds on control diet (commercial feed) in terms of final weight, weight gain, total, weekly and daily feed intake. Furthermore, there was no significant different ($P > 0.05$) in FCR. However, T₄ recorded the poorest FCR which may be attributed to the level of calcium concentration in limestone in T₄. It may be concluded from this study that eggshell meal and one meal are excellent sources of calcium and phosphorous mineral at 3% level of inclusion for the overall better performance of broiler. The use of limestone should be accompanied with readily available source of phosphorus for adequate calcium and phosphorus balance for better feed utilization.

Keywords: Broiler chicken, performance, egg shell meal, bone meal, limestone.

INTRODUCTION

Food and Agriculture Organization (FAO) (1995) asserted that the most critical in the global basket crisis is animal protein. In Nigeria, the major source of animal protein is the livestock industry. Over the years, the contributions of the livestock industry sub sector to Gross Domestic Product (GDP) have decreased from 5.61% in 1960 to about 2.64% in 2010 (CBN 2010). This is even worst in the post COVID-19 pandemic era. One of the greatest limitations to the industry is the high cost of feed ingredients which account for over 70% of the total production cost (Adeyemo and Longe, 2007). McDonald *et al.* 1992 also noted that calcium and phosphorus represent the third most expensive nutrient after energy and protein. This high cost of feeding consequently affects the availability and supply of poultry products. This high cost of feeding consequently affects the supply of poultry products.

Organic sources of calcium and phosphorus are inexpensive and readily available except for their high demands by the livestock industry. The availability of discarded abattoir bones, eggshell, limestone found locally within the study area as mineral supplement to alleviate deformities and physiological disorders in broiler birds forms the objective of this experiment. The experiment also has potential advantage to recycle farm and industrial waste materials for wealth generation in this post pandemic era.

MATERIALS AND METHOD

The research work was conducted at the Poultry Unit of the Teaching and Research farm of Kogi State University, Anyigba. Anyigba lies between latitude 7° 28' 51.39" N of the equator and longitude 7° 11' 14.86" E of the Greenwich meridian. Ninety-six of the broiler chicks were subjected to four (4) dietary treatments. Commercial feed (with unknown source and quantity of calcium and phosphorus mineral) as T₁, on-farm prepared diets consisting Bone meal (T₂), Eggshell meal (T₃), and Limestone (T₄).

Birds at week five (5) were allotted in a Completely Randomized Design into four (4) treatments and three (3) replicates each such that each treatment had twenty-four (24) birds and eight (8) birds in a replicate. The day old chicks were brooded for three (3) weeks and reared up to finisher phase for the commencement of trial up till eight (8) weeks.

Data obtained were subjected to statistical analysis of variance (ANOVA). Significant mean levels were separated using Least Significant Difference (LSD).

RESULTS AND DISCUSSION

Dietary Composition

The summary of gross composition and calculated analysis of commercial and on farm formulated finishers diets supplemented with Different sources of Calcium and phosphorus is presented in Table 1 below.

Table 1: Gross Composition of Commercial and Formulated Finisher Diets Supplemented with Different Sources of Calcium and Phosphorus.

Nutrients	T ₁ (Commercial based feed Diet)	T ₂ (Bone Meal)	T ₃ (Eggshell Meal)	T ₄ (Limestone)
Maize	-	45.00	45.00	45.00
Soyabean Full Fat	-	24.00	24.00	24.00
Palm Kernel Cake	-	8.00	8.00	8.00
Maize offal	-	15.00	15.00	15.00
Fish Meal	-	4.20	4.20	4.20
Bone Meal	-	3.00	-	-
Eggshell Meal	-	-	3.00	-
Limestone	-	-	-	3.00
Methionine	-	0.25	0.25	0.25
Salt	-	0.30	0.30	0.30
Premix	-	0.25	0.25	0.25
Total	-	100.00	100.00	100.00
Calculated Analysis				
Metabolizable Energy (Me Kcal/kg).	2900.00	2822.64	2822.64	2822.64
Crude Fat	6.00	7.26	7.26	7.26
Crude Fiber (C F%)	6.00	4.45	4.45	4.45
Phosphorus (P %)	0.40	0.47	0.41	0.39
Calcium (Ca %)	1.00	1.40	1.45	1.46
Crude protein (Cp %)	18.00	19.00	19.00	19.00
Methionine (Met. %)	0.30	0.30	0.30	0.30
Lysine (%)	0.85	0.94	0.94	0.94

Table 2 below present the result of performance of broilers fed different calcium and phosphorus sources. Birds on T₁ (control) recorded a significant ($P < 0.05$) higher final weight and total weight gain of 2623.33g and 1913.30g respectively while those on T₃ and T₂ followed very closely with 2244.00g and 1716.67g, 2421.67g and 1725.00g respectively. Furthermore, T₁, T₂ and T₃ showed a significant ($P < 0.05$) similarities in final weight. T₄ significantly ($P < 0.05$) recorded the lowest final weight and weight gain of 2236.67g and 1510.00g respectively. Daily, weekly and total feed intake followed the same trend as the T₁ which recorded the highest total feed intake of 3360.00g compared with T₂, 3173.33g; T₃ 3126.67g

and T₄ 3172.00g. The result of initial weight and FCR were not significantly ($P>0.05$) affected. However the result of FCR shows that T₁ has the best result of 1.75, T₃ and T₂ followed very closely with 1.82 and 1.84 respectively, while T₄ showed the poorest FCR of 2.09. Birds on T₄ and T₃ are significantly ($P<0.05$) comparable with the birds on T₁ diet in final weight and weight gain. Though, the significant difference ($P<0.05$) of T₁ over T₂, T₃ and T₄ may be due to the form and composition of T₁ (control) diet. Birds on T₄ recorded a significant ($P<0.05$) low weight gain and final weight which reflected in their FCR despite their total feed intake comparable to the best performing birds on T₁, T₂ and T₃.

As shown in Table 2, the significance difference ($p < 0.05$) recorded in the final body weight, weight gain and total feed intake is contrary to those reported by Cheng and Coon (1990) who recorded a no significant ($p > 0.05$) level of the overall body weight of birds fed different Calcium and Phosphorus sources. The poor growth rate of the birds in T₄ may be due to the effect of poor limestone utilization in the diet. This is true to the report of Aribido *et al.*, 2009 who stated that specific effect of mineral supplementation or deficiency on productivity may be via higher or lower efficiency of ingested mineral nutrients. The organic sources of bone and eggshell meal seem to have enhanced supply of both calcium and phosphorus in diet T₂ and T₃ hence, ensuring better performance (Kebreabet *et al.*, 2005). The feed conversion ratio recorded was not significantly affected. It is worthy of note that T₁, T₂ and T₃ have similar result and this is true to the reports of Akteret *al* (2016) that FCR of birds is improved when they consume diet that contain adequate proportion of calcium and phosphorus, which otherwise, reverse is the case.

Table 2. Performance of broiler chickens fed different dietary source of calcium and phosphorus mineral supplement

Parameters	T ₁ (control) (Commercial based feed Diet)	T ₂ (Bone Meal)	T ₃ (Eggshell Meal)	T ₄ (Limestone)	SEM	LOS
Initial weight (g)	710.00	730.00	730.00	726.67	6.90	NS
Final weight (g)	2623.33 ^a	2421.67 ^{bc}	2440.00 ^{ab}	2236.67 ^c	41.63	*
Total weight gain (g)	1913.33 ^a	1725.00 ^{ab}	1716.67 ^{bc}	1516.00 ^c	43.74	*
Weekly weight gain (g)	478.31 ^a	431.25 ^{ab}	429.17 ^{bc}	379.00 ^c	10.94	*
	68.33 ^a	61.61 ^{ab}	61.31 ^{bc}	54.14 ^c	1.56	*
Daily weight gain (g)						
Daily feed intake (g)	120.00 ^a	113.33 ^{ab}	111.67 ^{ac}	113.29 ^{ab}	4.43	*
Weekly feed intake (g)	840.00 ^a	793.33 ^{ab}	781.67 ^{ac}	793.00 ^{ab}	31.70	*
	3360.00 ^a	3173.33 ^{ab}	3126.67 ^{ac}	3172.00 ^{ab}	126.78	*
Total feed intake ((g)						
Feed Conversion Ratio (g)	1.75	1.84	1.82	2.09	6.05	NS

CONCLUSION AND RECOMMENDATIONS

Result obtained from this experiment showed that birds on T₂, T₃ and T₄ performed credibly well in comparison to the birds on T₁ (control) diets in terms of final weight, total weekly and daily weight gain, total weekly and daily feed intake. FCR was not significant. It may be concluded from this study that egg shell meal, bone meal and limestone are excellence sources of calcium and phosphorus mineral for the overall better performance of broiler birds. However, the usage of limestone should be deliberately accompanied with readily available source of phosphorus for adequate calcium and phosphorus balance. Therefore, it is recommended that farmers may use any of these mineral sources as an alternative source

of calcium and phosphorus mineral supplement at 3% level of inclusion for optimum performance and wellbeing of broiler birds especially in an integrated farm or areas where they are abundant, and considered as waste.

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