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Calcium requirement of Japanese quail (*Coturnix coturnix japonica*) chicks in Plateau State, Nigeria

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Abstract

A 6- week feeding trial was carried out to investigate the optimal calcium level in the diet of quail chicks in Nigeria. Four isonitrogenous (25% crude protein) diets containing 0.5,1.0,1.5 and 2.0% dietary calcium were employed in the trial which involved 480 day- old, unsexed quail chicks. The diets were also isocaloric (2750 kcal/kg M.E). Each dietary treatment was replicated three times. Responses measured included weight gain, feed consumption and feed conversion ratio. Feed intake was higher in diet A ($P<0.05$) in comparison to others. Diet D recorded lower feed intake ($P<0.05$) than Diets B and C. Weight gain was similar ($P>0.05$) for Diets A, B and C which were better than diet D ($P>0.05$). Feed conversion was better with Diets C and D ($P<0.05$) than with diets A and B. Diet A was poorer ($P<0.05$) than diet B in terms of feed conversion. Feed cost/gain ratio was lower ($P<0.05$) on Diet A than others. Percent bone ash was similar on the diets except Diet C. Results of this study indicated that dietary calcium levels of between 0.5 and 1% will support acceptable weight gain and % bone ash in the first 6 weeks of life.

Key words: Calcium level, quail chick, productive performance.

Introduction

Japanese quail (*Coturnix japonica*) are small – bodied birds of the galliforme family weighing between 180-200 grams at maturity at 6 weeks of age, about which time egg production is known to commence. They are highly prolific and hardy (Robbins, 1981; Anon, 1991). Since their introduction into the Nigerian poultry industry in 1992 they have gained tremendous interest among Nigerian populace especially because of their short generation interval, fast growth rate and less susceptibility to common poultry diseases.

Little research work has been carried out in the tropics in the area of nutrient requirement for quail chicks. As a result, feed compounders in the tropics rely a lot on the NRC or A.R.C recommended allowances for their feed formulations. Several reports have shown that environment has definite effect on feed efficiency, growth rate and on egg production (Prince, *et al.*, 1961; Homes Sreenivasaiah. and Joshi 1988). Also, nutrient requirements establishsed in temperate environment may not be entirely satisfactory in the tropics (Olomu, 1976; Njike, 1987). The present study

investigated the calcium requirement of growing Japanese quail chicks in Plateau state, Nigeria.

Materials and Methods

Birds

Four hundred and eighty unsexed day old Japanese quail chicks (*Coturnix Coturnix Japonica*) hatched at National Veterinary Research Institute, Poultry Farm Vom were selected on the basis of fitness and uniformity and housed in an already prepared brooding house. The house was partitioned into pens each housing 40 quail chicks. In all there were 12 experimental pens. Each pen was fitted with one 100 watt electric bulb while two kerosene stoves (modernized) heated the entire room. Cardboard sheets designed to keep the chicks from straying away from the heat source was kept in each pen. These measures were to achieve the desired brooding condition. All chicks were weighed together in groups before they were placed in the pens. Subsequently 25% of the chicks in each pen were weighed at weekly intervals (for six weeks). Three groups each was randomly allocated the experimented feeds. Feed and water were given *ad libitum*.

Experimental diets

Four experimental diets were formulated to contain 0.5, 1.0 (control), 1.5 and 2.0% calcium whereas phosphorus level was held at 0.5% in all the diets. All the diets were iso-caloric at 2750 kcal/kg M.E and iso – nitrogenous at 25% crude protein (Haruna *et al.*, 1997). All experimental feeds were analysed for their proximate chemical composition at the Biochemistry Department of the National Veterinary Research Institute (NVRI), Vom, using standard methods as described by A.O.A.C. (1970).

Data collection

The mean weekly body weight, weight gain, feed consumption and feed efficiency were measured and analysed by Analysis of Variance (ANOVA) with appropriate single degree of freedom comparison among treatment means. This was followed by Duncan's Multiple Range Test (Duncan, 1955). The experiment was terminated at the end of the 6th week.

Results and Discussion

Summaries of average weekly feed consumption, weight gain and feed efficiency are given in Tables 2, 3, and 4. Table 5 presents the cumulative feed intake, weight gain, and feed efficiency. To some degree, there was a significant effect of treatment diets ($P<0.05$) on feed intake, weight gain and feed efficiency. Feed consumption increased on weekly basis as the birds grew older (Table 2). On the other hand, weight gain (Table 3) increased generally up to the 4th week for all treatments except for treatment D but generally declined thereafter as the birds grew older (Table 3). Among weekly means there was very highly significant effect ($P<0.001$) of age on feed consumption and weigh gain. This is in agreement with earlier findings by Bisoi (1980) and Shrivastav (1980) who also reported significant effect of calcium diets on growth, weight gain and feed efficiency. Contrarily earlier studies by Miller (1967) reported that there was no significant effect of high or low calcium diet on feed efficiency, growth and bone ash in quail chick. The age at first egg ,which was at 6 weeks of age agreed with the reports of Martin (1987) and Robbins (1981).

Birds on diet A consumed more feed than those on diets B, C and D. Feed consumed by quail under diet D was lower than for those under diets B and C and the differences were also significant ($P<0.05$). Diet D recorded lower weight gain than diet A ($P<0.05$) but the weight gain was not better than for diets B and C ($P>0.05$). Quail under Diets C and D had better feed conversion ratio

Table 1: Composition of Experimental Diets (%)

	Diets			
	T1	**T2**	**T3**	**T4**
Ingrdients (kg)	0.5%	1%	1.5%	2%
Maize	19.70	18.20	18.30	17.00
Soyabean cake	21.70	22.00	23.40	23.60
Wheat offal	25.00	25.00	20.00	20.00
Guinea corn	10.00	10.00	12.00	12.00
Full fat soya	20.00	20.00	20.00	20.00
Fish meal	2.00	2.00	2.00	2.00
Bone meal	0.40	0.50	0.50	0.50
Limestone	0.50	1.60	3.10	4.20
Common salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
	100	100	100	100
Calculated Composition				
Ca	0.57	1.00	1.52	2.00
P	0.50	0.52	0.52	0.52
Analysed Composition				
Ca	0.66	1.22	1.56	2.31
P	0.51	0.58	0.58	0.60
Cost/100 kg (₦)	3,577.65	3,559.25	3,607.65	3,582.95

Naira, (N) = Nigerian currency . 140 Naira is equivalent to one US Dollar (2004 exchange rate).

compared to diets A and B ($P<0.05$). Birds under Diet B were better converters of feed ($P<0.05$) than those on diet A.

Haruna *et al* (1997) had reported generally poor efficiency of feed conversion among growing Japanese quail. This must be the reason for the general decline in feed conversion for all the treatments as the birds grow older. (Table 4.)

Even though Bisoi (1980) had recommended a dietary calcium level of 0.7% for growing Japanese quail, from this study, the 0.5% of calcium diet supported greater weight gain than the 2% diet ($P<0.05$) but was not significantly better ($P>0.05$) than the 1.0and 1.5% Calcium diets. Since feed cost is a major determinant of gain in poultry production, the 1.0% Calcium diet is recommended because it has the lowest feed cost per 100kg in Naira, and because it recorded less feed consumed than the 0.5% calcium diet.

Conclusion

Japanese quail has been successfully adapted in Nigeria. Relevant information on the nutrient requirement at various stages of development remains to be established in our particular environment. Feed cost must play an important

Table 2: **Average feed consumption of quail chicks per treatment (g/bird)**

	Diets			
Weeks	**0.5% (A)**	**1.0% (B)**	**1.5% (C)**	**2.0% (D)**
1.	48.95	44.96	49.58	47.81
2.	53.60	54.99	57.21	56.35
3.	73.48	62.18	71.66	68.25
4.	18.48	74.34	75.97	81.22
5.	151.97	126.12	135.10	108.34
6.	174.88	170.31	145.13	132.93
Total:	**584.36**$\pm$4.9^{b}	**532.9**$\pm$4.9^{a}	**534.65**$\pm$4.9^{a}	**494.90**$\pm$4.9^{c}

$^{a, b,c}$: Values with common superscripts are not significant ($p>0.05$)

Table 3. Average weight gain of quail chicks per treatment

	Diet			
Weeks	**0.5%(A)**	**1.0%(B)**	**1.5%(C)**	**2.0%(D)**
1.	16.3	14.10	13.37	13.77
2.	15.0	17.20	15.13	20.33
3.	28.33	26.33	21.0	30.0
4.	43.5	28.0	44.33	20.0
5.	14.0	22.0	19.83	21.83
6.	9.83	15.33	15.17	14.83
TOTAL	136.32$\pm$1.18^{a}	122.96$\pm$1.18^{ab}	131.83$\pm$1.18^{ab}	120.76$\pm$1.18^{b}

^{a,b}: Values with common superscripts are not significant($P>0.05$).

Table 4. Feed conversion ratio of quail chicks

	DIETS			
Weeks	**0.5%(A)**	**1.0%(B)**	**1.5%(C)**	**2.0%(D)**
1.	3.0	3.19	3.71	3.47
2.	3.57	3.19	3.78	2.77
3.	2.59	2.36	3.41	2.28
4.	1.87	2.66	1.71	4.06
5.	10.86	5.73	6.81	4.96
6.	17.79	11.11	9.57	8.96
MEAN	7.46± 0.14^{b}	6.13±014^{a}	4.82±0.14^{c}	4.82±0.14^{c}

^{a,b,c} :Values with common superscripts are not significant (P>0.05).

Table 5. Effect of different calcium levels on productive performance of Japanese quails at 1 to 6 weeks of age.

	Calcium levels (%)				
Parameters	**0.5**	**1.0**	**1.5**	**2.0**	**SEM**
Wt gain (g)	136.32^{a}	122.96^{ab}	131.83^{ab}	120.76^{b}	1.18
Feed Consumption	584.36^{b}	532.9^{a}	534.65^{a}	494.9^{c}	4.90
Feed conversion	7.46^{b}	6.13a	4.82c	4.82c	0.14
Feed cost/gain	26.24	28.95	27.37	29.67	-
Percent bone ash	47.30	47.30	45.14	47.50	-

^{a,b,c} :Values with common superscripts are not significant(P>0.05).

role in the level of nutrients established for Japanese quail chicks in Nigeria. Therefore, even though there was no significant difference between the 0.5 and1.0% dietary calcium levels in this study, the 1.0% Calcium diet is recommended because it is cheaper.

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