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Growth and Laying Performance of Quail Under Single Phase Feeding Fortified with Calcium and Phosphorus in a Guinea Savannah Zone of Nigeria

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Abstract
In an experiment to evaluate the growth and laying performance of quails fed single phase diets fortified with calcium and phosphorus, a total of one hundred and eighty two weeks old Japanese quail chicks were randomly divided into five treatments of 36 quail chicks per treatment. Each treatment was replicated thrice.Treatment1 for both the growing and laying phases was the control diets while the remaining four diets (T_2-T_5) for each of the phases were the single phase diets. The control diets for both phases were formulated to contain 26 %and 22% CP, and 2800 and 2750kcal/kg ME for growing and laying respectively. The four single phase diets had 20, 22, 24 and 26 % CP, and 2800, 3000, 3200 and 3400kcal/kg ME, respectively for both phases. Completely randomized design was used for the experiment. Feed and water were served ad libitum. The parameters measured were growth (body weight, body weight gain, feed intake and feed conversion ratio), and laying (hen-day and hen-house production, feed intake and feed conversion ratio). The results showed that average body weight gain of quails fed the control diet was similar ($p>0.05$) to those fed diets containing 22% CP and 3000kcal/kg ME, and those fed 24% CP and 3200kcal/kg ME. Daily feed intake of the quails fed the control diet was also similar ($p>0.05$) to quails fed diets containing 22 and 24% CP, and 3000, 3200kcal/kg ME. Hen-day and hen-house production results showed that quails fed the control diet was similar ($p>0.05$) to those fed diets containing 22 and 24% CP and 3000, 3200kcal/kg ME. The results of the study indicated that feeding diet containing 26% CP and 3400kcal/kg MEled to below optimum growth and egg laying performance of Japanese quails.

Keywords: Japanese quail, crude protein, metabolizable energy, single phase, performance.

Introduction

The livestock industry contributes largely to the animal protein demand of the ever-increasing population of the world. Poultry is a sub-sector of the livestock industry dealing with different kind of birds capable of converting plant protein feedstuffs into high quality animal protein. Japanese quails are hardy birds that thrive in small cages and are cheap to produce (Odunsi *et al.,* 2007).Poultry birds have many feeding regime; these regimes are not consistent in their changing time from one phase to the other. For Japanese quails, the National Research Council (NRC, 1994) recommends a diet with 2900kcal/kg ME at initial growth and egg production phases. Silva and Costa (2009) recommend a similar value but differentiated quail feeding into four phases: 2900, 3050,2800 and 2850kcal/kg ME from 1-21, 22-42 days of age, and in the first and second egg production phases. This study intended to eliminate the problem of inconsistency in changing period of diet from one phase to another which can affect performance of birds through adoption of single phase feeding.

The objective of the study is therefore to evaluate the growth and laying performance of Japanese quails fed these single phase diets fortified with calcium and phosphorus in place of the commonly used two phase diets.

Materials and Methods

The study was conducted at the poultry unit of the Teaching and Research Farm of the Department of Animal Production, Federal university of Technology, Minna, Niger State, Nigeria. One hundred and eighty two weeks old Japanese quail chicks were purchased from NVRI, Vom, Plateau State, Nigeria. The study lasted for 12 weeks. They were weighed and randomly distributed into 5 treatments with three replicates of 12 birds. The experimental diets were maize-groundnut cake based. The control diets for growing and laying phases were formulated to contain 26 and 22% CP, and 2800, 2750kcal/kg ME. The remaining four diets (T_2-T_5) were the single phase diets for both phases containing 20, 22, 24 and 26% CP, and 2800, 3000, 3200 and 3400kcal/kg ME, respectively (Table 1). Birds in each treatment were weighed and feed intake measured on weekly basis to know the weight gain and feed intake. Data were collected for 4 weeks (from 2-6weeks of age of quail birds) for growth phase and 8 weeks (from 7-14 weeks of age of quail birds) for laying phase. Feed and water were served *ad libitum* throughout the period of experiment and the birds were subjected to the same management practices.

Data collected on feed intake and weight gain were used to calculate feed conversion ratio collected from the experiment were subjected to analysis of variance using the SPSS version 16.0 (2011).

Table 1: Composition of experimental diets fed to Japanese quails duringgrowthandlaying phases (%)

Ingredient	T_{1G}	T_2	T_3	T_4	T_5	T_{1L}
Maize	46.00	50.00	52.70	54.00	59.00	47.95
Maize Offal	13.20	8.00	1.00	0.00	0.00	2.00
GNC	20.00	15.70	20.00	25.70	19.00	26.00
SBM	12.00	12.00	12.00	6.00	2.45	11.80
Fish meal	3.00	3.00	3.00	3.00	5.00	2.50
Limestone	0.50	5.00	5.00	5.00	5.00	6.50
Bone meal	2.50	3.50	3.50	3.50	3.50	2.50
Palm oil	2.00	2.00	2.00	2.00	5.00	0.00
Salt	0.30	0.30	0.30	0.30	0.30	0.25
Lysine	0.1	0.1	0.1	0.1	0.1	0.10
Methionine	0.15	0.15	0.15	0.15	0.4	0.15
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100
Calculated values						
CP	26.00	20.00	22.00	24.00	26.00	22.00
ME	2800	2800	3000	3200	3400	2750
ME:CP ratio	109.38:1	140.00:1	136.36:1	133.33:1	131.78:1	124.49:1
Crude fibre	4.10	4.07	3.57	3.50	3.10	3.70
Ca	1.20	3.42	3.43	3.29	3.67	3.20
P	0.61	0.79	0.78	0.79	0.84	0.52
Ca:P ratio	1:1.97	1:4.33	1:4.40	1:4.17	1:4.37	1:6.15
Lysine	1.18	0.94	0.90	1.00	0.09	1.07
Methionine	0.88	0.70	0.73	0.78	0.74	0.88

T_{1G} (control diet for growthphase); T_2-T_5 (single phase diets for both phases); T_{1L}(control diet for layingphase)

Results and Discussion

Quails fed the control diet had comparative performance indices (final body weight and body weight gain) as those fed diets containing 20-24% CP, and 2800-3200kcal/kg ME as shown in Table 2. This might be due to their similarity in total feed intake which apparently resulted in similar growth performances. The result of this study is in agreement with the findings of Jahanian and Edriss (2015) who worked on the effect of feeding different levels of dietary metabolizable energy and CP on performance and carcass characteristics of Japanese and Brown quails (*Coturnix coturnix Japonica; Coturnix ypsilophorus*) and came up with the opinion that Japanese quails need diets containing 3000kcal/kg ME and 26% CP during the first weeks of age to achieve optimum growth performance, and that dietary CP level can then be reduced to 24% for older birds. The result is however contrary to the findings of Abbasali *et al*. (2011) who in their studied of the effect of feeding different levels of metabolizable energy (2900 and 2700 kcal/kg ME) and CP (high, medium, low, very low) on performance of Japanese quail observed that feeding Japanese quail at starter, grower and finisher periods with diets containing 2700 kcal/kg ME and low levels of protein (22, 20 and 18%, respectively) led to suitable performance.

Table 2: Performance of growing Japanese quails fed single phase diets with varying crudeprotein and metabolizable energy levels

Parameter	T_1	T_2	T_3	T_4	T_5	SEM
Initial body weight (g)	510.00	505.00	506.67	508.33	506.67	1.88
Final body weight (g)	1333.33^{a}	1300.00^{ab}	1316.67^{ab}	1316.67^{ab}	1250.00^{b}	11.41
Body weight gain (g)	823.33^{a}	795.00^{ab}	810.00^{ab}	808.33^{ab}	743.33^{b}	11.30
Daily body weight gain (g)	29.40^{a}	28.39^{ab}	28.93^{ab}	28.87^{ab}	26.55^{b}	0.40
Total feed intake (g)	4090.00	4334.00	4046.33	3996.33	3528.67	272.92
Daily feed intake/bird (g)	13.28^{b}	14.07^{a}	13.14^{ab}	12.98^{b}	11.46^{c}	2.53
Feed conversion ratio	4.97^{a}	5.46^{b}	5.00^{a}	4.95^{a}	4.76^{a}	0.81

^{abc} = means in the same row with different superscript are significantly ($p<0.05$) different, SEM=standard error of mean, T_1=26% CP, 2800kcal/kg ME, T_2=20% CP, 2800kcal/kg ME, T_3=22% CP, 3000kcal/kg ME,T_4=24% CP, 3200kcal/kg ME, T_5=26% CP, 3400kcal/kg ME.

Quails fed the control diet had similar (p>0.05) daily feed intake as those fed diets containing 22 and 24% CP, and 3000 and 3200kcal/kg ME, respectively while quails fed diet with the highest energy level of 3400kcal/kg ME had the least daily feed intake as shown in Table 3. It was observed from this study that feed intake reduced with increase in the energy level of the diets. Bawa (2012) studied the response of Japanese quail chicks to various dietary energy levels in a tropical environment and also observed decrease in feed intake as energy level increases in the diets albeit non-significantly. The similar feed conversion ratio obtained in this study between quails fed the control diet and those fed diets containing 22, 24 and 26% CP, and 3000, 3200 and 3400kcal/kg ME could be as a result of their similar feed intake and body weight gain.

Table 3: Feed intake and egg laying performance of Japanese quails fed single phase diets with varying crude protein and metabolizable energy levels

Parameter	T_1	T_2	T_3	T_4	T_5	SEM
Total feed intake/bird (kg)	1.02^{b}	0.97^{ab}	0.98^{ab}	0.97^{ab}	0.85^{a}	0.14
Hen-day production (%)	57.26^{ab}	47.38^{ab}	59.91^{a}	58.33^{a}	43.93^{b}	2.34
Hen-house production (%)	57.26^{a}	47.38^{ab}	55.12^{ab}	55.12^{ab}	43.93^{b}	1.94
Total number of eggs produced	171a	132bc	154ab	163a	123c	0.05
FCR (feed consumed (g)/dozen eggs laid)	383.16	440.00	383.38	355.58	413.66	0.02
FCR (feed consumed (g)/1g egg laid)	3.95^{b}	4.63^{d}	4.12^{c}	3.59^{a}	4.81^{e}	0.11

^{abc} = means in the same row with different superscript are significantly (p<0.05) different, SEM=standard error of mean, T_1=26% CP, 2800kcal/kg ME, T_2=20% CP, 2800kcal/kg ME, T_3=22% CP, 3000kcal/kg ME, T_4=24% CP, 3200kcal/kg ME, T_5=26% CP, 3400kcal/kg ME.

Hen-day and hen-house production were significantly (p<0.05) affected by the diets fed with quails on diets T_1-T_4 having similar performances. This could be due to the similar feed intake of the birds fed these diets. The values obtained for hen-day production were observed to be lower than the 73.70-76.88% reported by Makinde (2012), and higher than the 30.28-36.39%reported by Babangida and Ubosi (2006). Hen-house production values were much higher than the 16.81-29.50% reported by Ijaiya *et al.* (2012) when they studied egg production and egg quality characteristics of Japanese quails (*Coturnix coturnix japonica*) fed graded levels of cooked Tallow (*Detarium microcarpum*).

The values for FCR when considered on the basis of feed intake/dozen eggs laid were observed to be similar across the treatments. When considered on the basis of feed consumed per 1 egg laid however, FCR was observed to be significantly better in quails fed the single phase diet containing 24% CP and 3200kcal/kg ME. This is indicative that positive egg laying can be achieved through single phase feeding provided the protein and energy contents of the diet is 24% and 3200kcal/kg ME. The significant nature of the result is in disagreement with the findings of Babangida and Ubosi (2006) who reported no significant differences in FCR when they evaluated the effects of varying dietary protein levels on the performance of laying Japanese quail in a semi-arid region of Nigeria; it is however in agreement with the findings of Ijaiya*et al.* (2012) who reported significant FCR values (3.34-3.56)when they fed Japanese quails with graded levels of cooked Tallow (*Detarium microcarpum*).

Conclusion

It was concluded from the results of the study that the feeding of diets containing 20, 22 and 24% CP, and dietary metabolizable energy of 2800-3200kcal/kg could lead to optimum growth and egg laying performance in Japanese quail while feeding of diet containing 26.00 % CP and 3400 kcal/ kg ME had led to below optimum growth and egg laying performance of Japanese quails.

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