EFFECT OF VARYING DIETARY ENERGY LEVELS ON PERFORMANCE OF JAPANESE QUAILS CHICKENS *(COTURNIX COTURNIX JAPONICA)*

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ABSTRACT
Performance of Japanese quail (Coturnix japonica) was tested using different energy levels. Total of four hundred and fifty quail birds were randomly allotted to five different dietary treatments in a completely randomized design arrangement. The birds were further divided into three replicates per each treatment with 30 *birds per replicate. Each treatment was assigned to one of the following test diets, diet 1: 2800kcal/kg ME, diet 2: 2900kcal/kg ME, diet 3: 3000kcal/kg ME, diet 4: 3100kcal/kg ME and diet 5: 3200kcal/kg ME. The Total feed intake of birds fed diet 1, 2 and 4 were significantly (P< 0.05) higher than birds fed 3 and 5. Dietary energy levels significantly (P<0.05) affected feed intake, daily weight gain, and feed conversion ratio across the dietary energy levels. An increase in metabolizable energy from 2800kcal/kg ME to 3200kcal/kg ME resulted in linear decrease in weight gain and feed intake. The live weight, breast weight, back weight, and intestinal length were significantly (P<0.05) affected by the energy levels. The haemoglobin, PCV, MCHC, MCV, Albumin and Cholesterol were not significantly (P>0.05) affected by the energy levels. RBC, MCH, Globulin and Total protein were significantly (P<0.05) affected by energy levels.*
Keywords**: Performance, Quails, Energy,**

INTRODUCTION

Poultry production, a major subsector of the livestock industry in Nigeria is dominated by the rearing of domestic chickens. However, there are new entrants into the sector. One of the birds slowly gaining prominence is the Japanese quail *(Coturnix coturnix japonica).* Japanese quails are suited for commercial rearing, egg and meat production under intensive management (Egbeyale *et al.,* 2013). This is because of their hardiness and ability to thrive in small cages (Odunsi *et al.,* 2007). And the relative short time and cheaper cost of production (Ojo *et al.,* 2011). Quails have lower feed requirements and require minimal space compared to the chicken.

However, high cost of feed has reduced the expansion of the poultry industry and result in serious animal protein deficiency among Nigerians especially the low-income earners leading to malnutrition (Adebajo *et al.,* 2008 and Abu and Suetan, 2009). Similarly, (Owen *et al.,* 2009) reported that growth in the livestock industry in Nigeria has recently fallen below expectation due to rising prices of feed and shortage of feed supplies. In addition to the feeding problem, prevailing environmental conditions especially temperature in the tropical semi-arid zone of Nigeria has been contributing to the inefficiency in poultry production (Oluyemi and Roberts, 2000; Banerjee, 2007). Moreover, feed intake is influenced by both environmental parameters and the energy density of the feed, (Leeson and Summer, 2005). However, birds generally adjust feed intake to meet their energy requirement (Mac Donald, *et al*., 2007). Energy is the factor that is first considered during quails' ration formulation. Therefore, this study was designed to determine the growth performance of quail birds fed diets containing different energy levels.

MATERIALS AND METHODS

A total of Four hundred and fifty (450) 2-week-old quails with average initial weight of 41.66g/bird were arranged in completely randomized design. Each treatment had total of 90 quail birds, with 30 birds per replicate. Each treatment was assigned to one of the following diets. Diet 1: 2800kcal/kg Diet 2: 2900kcal/kg Diet 3: 3000kcal/kg; Diet 4: 3100kcal/kg and Diet 5: 3200kcal/kg. Water was supplied *ad-libitun.* Performance was monitored in terms of daily feed intake, daily weight gain, feed conversion ratio and mortality rate percentage.

Data collected was statistically analyzed using the General Linear Model Procedure (SAS, 2002). Differences in means were separated using Least Significant Difference (LSD).

RESULTS AND DISCUSSION

The result of performance characteristics of Japanese quail fed varying dietary energy levels are presented in Table 1. Quails' birds fed diets 1 and 2 had significantly (P<0.05) higher feed intake compared to those fed diets 3, 4 and 5. Quails bird fed diets 3, 4 and 5 had similar daily feed intake. The feed intake ranged from 13.19 g/bird/day in diet 5 to 15.90g/bird/day in diet 1, however. There was a significant (P< 0.05) difference across the dietary treatments. The feed intake for bird feed diet 3 and 4 are statistically similar. Significant (P< 0.05) differences were observed among the diets for daily weight gain (DWG). The values ranged from 2.58g/bird/day in diet 5 to 2.75g/bird/day in diet 1. Daily weight gain (DWG) was statistically similar for diet 2, 3 and 4.

Dietary energy levels affect Daily feed intake, weight gain and feed conversion ratio. An increase in the metabolizable energy from 2800kcal/kg ME to 3200kcal/kg ME resulted in the linear decrease in feed intake and weight gain across the dietary levels.

Table 1: Effect of varying dietary energy levels on growth performance of Japanese quail

Parameters (%)	Diets					LOS	S.E.M
	1	2	3	4	5		
Initial weight (g/bird)	41.66	41.66	41.66	41.66	41.66	0.47	0.09
Final weight (g/bird)	138	134	134	134	132	0.42	0.09
Feed intake (g/bird/day)	15.90^{a}	14.58^{b}	13.45^{c}	13.65^{c}	13.19^{c}	0.04	9.42
Daily weight gain (g/bird/day)	2.75^{a}	2.64^{ab}	2.64^{ab}	2.64^{ab}	2.58^{c}	0.02	10.89
Feed gain ratio	5.78^{a}	5.52^{a}	5.10^{b}	5.17^{b}	5.11^{b}	0.02	0.40
Feed cost per gain (₦)	1.55	1.46	1.37	1.42	1.40	0.24	0.22
Mortality	0.00	0.00	0.00	0.00	0.00	0.00	0.00

a,b,c,d,e – mean with different superscripts on the same row differ significantly (p<0.05).

The effect of varying dietary energy level on performance of Japanese quail is shown Table 1. Quails' birds fed diets 1 and 2 had significantly (P<0.05) higher feed intake compared to those fed diets 3, 4 and 5. Quails birds fed diets 3, 4 and 5 had similar daily feed intake. The values in this study were within the ranged reported by Ekin and Oruwari, (2007), when fed quails corn meal and oil-based diet. The higher feed intake by quail birds on diet 1 could be as a result of the low dietary energy content.

Daily weight gain during this period ranged from 2.64 to 2.75g/day/quail. This is in disagreement with the value of 4.9g/day/quail found by Ozbey *et al*; (2004). There were no significant (P>0.05) differences among the diets for final body weight (FBW). Quail birds fed diet 1 had higher body weight. This agreed with the finding of Umoren and Ojo (2007), who confirmed that maize was the best energy source with diet of growing rabbits in their study with cassava, cocoyam and jacinia naanni. Earlier, Peterson (1969) had reported that maize promoted better growth rate than guinea corn, out or barley.

ffect of varying dietary energy levels on the heamotological and serumbiochemistry of Japanese quails

The effect of energy level on the heamotological and serum biochemistry of Japanese quails in presented in Table 2. The heamoglobin, packed cell volume, mean corpuscular heamoglobin concentration, mean corpuscular volume, albumen and cholesterol were not significantly (P > 0.05) affected by the energy levels. Red blood cell, mean corpuscular heamoglobin, globulin and total protein were significant (P < 0.05) affected energy level levels. There was significant difference (p> 0.05) among the diet for heamoglobin (Hb), ranged from 23.87 in diet 1 to 36.20 in diet 4.

There were no significant differences (P > 0.05) across the diet for pack cell volume (PVC), ranged from 50.80 in diet 1 to 54.40 in diet 2, while diets 3, 4, and 5 are statistically similar. The red blood cell (RBC) ranged from 2.87 in diet 1 to 3.75 in diet 4 the red blood cell (RBC) for diet 3,4, and 5 are statistically similar (p> 0.05).

The mean corpuscular volume (MCV) ranged from 137.70 in diet 3 to 149.80 in diet 5. There were significant differences (P < 0.05) across the diets. MCV in diet 4 and 5 are statistically similar (P >

0.05) while MCV for diet 1 and 2 are also statistically similar. The albumen values were similar but that for bird fed diet 2 was higher compared with that bird fed other diets.

Table 2: Effect of energy level on the haematological and serum biochemistry of Japanese quails

Parameters	Treatments					LOS	SEM
	1	2	3	4	5		
Hb (g/dL)	23.87	26.30	24.53	36.20	25.43	0.59	1.75
PCV (%)	50.80	54.40	51.00	53.30	53.00	0.90	4.29
RBC (10^6/uL)	2.87^{b}	3.53^{a}	3.70^{a}	3.75^{a}	3.66^{a}	0.001	0.10
MCHC (%)	47.13	48.20	48.23	49.20	48.00	0.71	1.44
MCH (%)	71.17^{ab}	69.85^{bc}	66.40^{c}	73.70^{a}	71.83^{ab}	0.01	1.64
MCV (*fl*)	141.01	143.90	137.70	149.70	149.80	0.41	7.19
Albumin (g/dl)	16.67	17.33	17.00	14.67	14.00	0.35	1.90
Globulin (g/dl)	28.70^{a}	24.00^{ab}	18.70^{b}	32.00^{a}	32.00^{a}	0.02	3.67
Cholesterol (mg/dl)	4.47	4.47	5.40	5.93	4.97	0.68	0.22
Total Protein (g/dl)	45.30^{ab}	41.30^{b}	35.70^{c}	46.30^{a}	46.00^{a}	0.05	4.40

a,b,c,d,e – means with different superscripts on the same row differ significantly ($p<0.05$), LOS = Level of Significance, SEM = Standard Error of Mean Hb = Hemoglobin, PCV = Packed cell volume, RBC = Red Blood Cell, MCV = Mean Corpuscular Volume, MCHC = Mean Corpuscular Hemoglobin Concentration, MCH = Mean Corpuscular Hemoglobin

Globulin in bird fed diet 3 was significantly ($P > 0.05$) lower compared to bird fed other diet cholesterol values were similar. But value for bird in diet 4 was higher compared to that in other diets. Total protein in birds feed diet 3 was significantly ($P > 0.05$) lower compared to bird fed other diets.
Heamoglobin, pack cell volume (PVC), mean corpuscular heamoglobin concentration (MCHC), mean corpuscular volume (MCV), albumen and cholesterol were not significantly affected by the energy level. Red blood cell (RBC), mean corpuscular heamoglobin (MCH), globulin and total protein were however affected by energy levels. This is in conformity with the report of Adamu *et al.* (2006) who observed that nutrition had significant effect on heamatological values like packed cell volume (PCV) heamoglobin (Hb) and red blood cell (RBC). Campbell (1988) reported Hb value of 12.0 to 15.2gm/dl and PCV (3.8 to 5.5 x 10^6/ul) for healthy quails, this is not in agreement with the Hb value of birds fed all the dietary treatment which fell above the normal range since the diets did not contain such factors the parameters could be greater.
Higher value for RBC count in this trial could be attributed to the fast growth rate of quails, this agreed with the finding of Bayyari *et al.* (1997) and Maxwell, (1993) who reported significant increase in RBC in turkey and fast growing chickens, respectively. While Brown *et al.* (2000) opined that increased RBC values are associated with high quality dietary protein and with disease free animals. The MCV value recorded across the dietary treatment ranged 78 to 101*fl* as reported by Campbell, (1988), that the significant increase in the value of MCV observed may be due to accelerated erythropoiesis that significantly increased the demand for iron during heamoglobin formation (Oluwasanmi and Temitayo, 2014).

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