GROWTH PERFORMANCE AND EGG QUALITY CHARACTERISTICS OF LAYING GUINEA FOWL (*NUMIDAMELEAGRIS*) FED OYSTER SHELL AND BONE MEAL MIXTURES

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ABSTRACT
A total of 75 Pearl laying guinea fowls, aged 32 weeks old were used to determine the growth and egg production quality performance when fed oyster shell and bone meal mixture. The research was carried out at the Teaching and Research Farm of the Faculty of Agriculture, Ekiti State University, Ado Ekiti. The birds were divided into 5 treatment groups with 15 birds each of 3 birds per replication, in a completely randomized design. The birds were fed iso-caloric and iso-nitrogenous experimental diets and water *ad libitum* for 84 days. Bone meal and oyster shell were mixed in ratio 1:1 w/w and included in the diets to supply calcium at 2.5%, 3.0%, 3.5%, 4.0%, and 4.5%, designated as T1, T2, T3, T4 and T5, respectively. Data collected were subjected to one-way ANOVA statistical analysis at 5% probability ($p<0.05$) using SAS. Results showed that the average daily feed intake, egg weight and hen day included production significantly influenced the growth performance. However, egg quality indices affected significantly egg length, egg width, albumen height, albumen width and yolk height. Best hen day production was observed for birds fed diet T3 while those on T1 had the highest values for egg length, egg shell weight, egg shell thickness, albumen height, yolk height and yolk width. It is concluded that birds fed diet T3 have the highest hen day production. Further research should be carried out to come up with diet that can provide a combination of better growth performance and egg quality.

Key words: Calcium Source, Feed Intake, Egg quality, Hen Day Production and Laying Guinea Fowl

INTRODUCTION
Guinea fowl (*Numida meleagris*) originated within Africa and can still be found in their wild form, representing a source of protein and income in rural communities (Dei and Karbo, 2004). Moreover, guinea fowl plays an important role in the socio-cultural livelihood of many tribes (Teye and Adam, 2000). In addition to high protein, guinea fowl meat is also characterized by low fat content, thus it is highly prized compared to chicken meat (Abdullahi *et al.*,2018). The birds are free from most poultry diseases (Moreki and Seabo, 2012). Other advantages of rearing guinea fowl include low production costs, greater capacity for utilization of green feeds, easy control of pests, better ability to protect itself against predators and lower requirements for labour and management (Sayila, 2009).
The use of mineral metabolites in the diets of domestic chicken has received a wide range of acceptance among potential farmers. Because of the peculiarity of Guinea fowl eggshell thickness, it is assumed to require more calcium in the diet than other domestic chickens (Nahashon *et al.*, 2006). Recent studies revealed that 3.25%-3.75% dietary calcium and 0.35% - 0.40% of available phosphorus will be adequate for Pearl grey guinea fowl. Oyster shell and bone meal are known to be good sources of calcium and phosphorus for feeding farm animals (Ajakaiye *et al.*, 2003)). Therefore, this study was designed to evaluate the influence of oyster shell and bone meal on performance and egg quality characteristics of laying guinea fowl (*N. meleagris*).

MATERIALS AND METHODS
A total of 75pearl laying guinea fowls, aged 32 weeks old from the Teaching and Research Farm of the Faculty of Agriculture, Ekiti State University, Ado Ekiti were used for the study. The birds were raised on

floor pen (2x4x4m) constructed using wire mesh. The birds were divided into 5 treatment groups with 15 birds each of 3 birds per replication, in a completely randomized design. The birds were fed with iso-caloric and iso-nitrogenous experimental diets as presented in Table 1.Feeds and water were given *ad-libitum* throughout the duration of the study.

Table 1: Experimental Diets Composition and Calculated Analysis

Ingredient	TREATMENT				
	T1	T2	T3	T4	T5
Maize	51.57	51.66	51.75	51.84	51.93
wheat offal	12.00	11.76	11.48	11.22	10.96
soybean meal	12.00	12.00	12.00	12.00	12.00
groundnut cake	9.00	9.00	9.00	9.00	9.00
fish meal	6.00	6.00	6.00	6.00	6.00
palm kernel meal	5.00	5.00	5.00	5.00	5.00
Lysine	2.50	2.50	2.50	2.50	2.50
Premix	0.50	0.50	0.50	0.50	0.50
methionine	0.30	0.30	0.30	0.30	0.30
Salt (Nacl)	0.25	0.25	0.25	0.25	0.25
Oyster shell + Bone meal mixture	0.88	1.05	1.22	1.39	1.56
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analyses					
Crude Protein (%)	17.98	17.99	17.96	17.98	17.99
Crude Fibre (%)	9.15	9.37	9.60	9.78	9.98
Ash (%)	3.98	4.20	4.51	4.81	5.10
ME (Kcal/kg)	2626.52	2626.22	2626.57	2626.32	2626.12

ME = Metabolizable Energy.

Premix supplied the following = Vit. A = 5000iu, Vit D3 = 800,000iu Vit. E = -12,000mg, Vit. K = 1,500mg, Vit. B1 = 1000mg, Vit. B2 = 2000mg, Vit. B6 = 1,500mg, niacin = 12000mg, panthotenbic acid = 20.00mg, biotin = 10.00mg, Vit B12 = 300.00mg, folic acid = 150,000mg choline = 60,000mg, manganese 10,000mg, iron = 15,000, zinc = 800.00, copper = 400.000mg, Iodine = 80.00mg, selenium = 8,000mg.

Oyster shell and bone meal were the main sources of calcium which were mixed at 50:50 or 1:1 ratio weight for weight included in the diets at 2.5%, 3.0%, 3.5%, 4.0%, and 4.5%, designated as T1, T2, T3, T4 and T5, respectively and fed to the experimental animals for a period of 84 days. The following parameters were measured:

DATA COLLECTION

The birds' initial weights were determined and the following parameters were also calculated:

Average Daily Feed Intake (ADFI)

A known quantity of feed offered in the morning and the left over measured the next morning, the differences were determined to compute ADFI.

$$\text{ADFI} = \frac{\text{Quantity of Feed Supplied (g)} - \text{Quantity of feed left over (g)}}{\text{Number of Birds}}$$

Body Weight Gain (BWG)

The actual body weight was subtracted from the weight of the previous week.

BWG = actual body weight (g) – Previous weight (week)

Feed Conversion Ratio (FCR)

This is defined as the quantity of feed consumed to affect a unit weight gain

FCR = Feed Intake ÷ Body Weight Gain

Hen Day Production = Total Number of Eggs Laid by Flock/Product of the number of days and the Number and of hens alive

$$\text{Hen Day Production} = \frac{\text{Total Number of Eggs Laid by Flock}}{\text{Product of the number of days and the Number of hens alive}}$$

$$\text{Protein Efficiency Ratio} = \frac{\text{Weiht Gained}}{\text{Weight of Protein consumed}}$$

Egg internal and external qualities were measured every week throughout the experimental period. With the aid of a scalpel, the eggs were broken and the content emptied into a petri-dish. Egg Weight, Egg Shell Weight, Albumen Weight and Yolk Weight were determined using a sensitive top loading Mettler balance. Egg Length, Egg Width, Albumen Height, Albumen Width, Yolk Height and Yolk Width were measured using a micrometre -screw gauge while the Egg Shell Thickness was determined using a vernier calliper. All the data collected were subjected to one-way ANOVA statistical analysis at 5% probability ($p<0.05$) using SAS (1987).

RESULTS AND DISCUSSION

The performance of laying guinea fowl fed oyster shell and bone meal is presented in Table2.Significant difference in ($p<0.05$) Average Daily Feed Intake and Hen Day Production were recorded, however, Body Weight Gain, Feed Conversion Ratio and Protein Efficiency Ratio were not ($p>0.05$).Birds on T3 produced highest ($p<0.05$) number of eggs (76.00±2.33%) which was similar to values obtained from birds fed T1and T5 with 66.20±2.37% and 65.90±2.41%, respectively. ADFI was highest ($p<0.05$) for birds on T4 with 72.20±4.46g, which did not differ significantly ($p>0.05$) from the values obtained from birds on T2 and T3 with62.70±4.56g and 62.50±4.0g respectively. Birds on T1 and T5 had lowest ($p>0.05$) ADFI with 56.12±4.66g and 52,00±4.46g, respectively.

Table 2: Performance of Laying Guinea Fowl Fed Oyster Shell and Bone Meal

Parameter	T1	T2	T3	T4	T5	SEM
Initial Body Weight (g)	1269.30±1.11	1305.6±1.11	1100.0±0.09	1261.0±1.02	1261.0±0.08	205.6
Final Body Weight (g)	1333±0.47	1366.70±0.31	1166.70±0.05	1335.00±0.50	1333.30±0.04	200.0
Hen Day Production (%)	66.20±2.37^{ab}	61.10±2.30 ^{b}	76.00±2.33^{a}	61.13±0.50^{b}	65.90±2.41^{ab}	15.3
Average Daily Feed Intake (g)	56.12±4.66 ^{b}	62.70±4.56^{ab}	62.50±4.0^{ab}	72.20±4.46 ^{a}	52,00±4.46^{b}	12.4
Body Weight Gain	64.10±6.75	61.11±5.55	66.71±6.70	72.21±4.81	72.20±5.73	13,6
Feed Conversion Ratio	0.94±0.10	1.03±0.09	0.94±0.99	1.02± 0.10	0.73±0.08	0.03
Protein Efficiency Ratio	3.40±0.39	3.38±0.28	3.71±0.22	4.02±0.29	4.02±0.29	0.46

Egg quality characteristics of laying guinea fowl fed oyster shell and bone meal mixture as calcium source is shown in Table 3. The dietary treatments showed significant ($p<0.05$) effects on egg length, egg weight, egg shell weight, egg shell thickness, albumen weight, albumen height and albumen width, while, the egg width and haugh unit were not influenced ($p>0.05$). The egg length, egg shell weight, egg shell thickness, albumen height, yolk height and yolk width values were all significantly ($p<0.05$) higher in birds fed T1.Egg weight was high for birds on T1, T2 and T4 with 37.00±0.60g, 36.30±0.55g and 36.30±0.50g, respectively and lowest on birds fed diet T3 (34.00±0.61). Better mineralization of calcium

were reported from birds onT1 and T2 as the egg shell weight and egg shell thickness were of higher values, while that of T3 correspondingly recorded the least values.

Table 3: Egg Quality Characteristics of Laying Guinea Fowl fed Oyster Shell and Bone Meal Mixture

Parameter	T1	T2	T3	T4	T5	SEM
Egg Length(mm)	4.63±0.78^{a}	4.42±0.78^{ab}	4.21±0.78^{b}	4.54±0.78^{a}	4.44±0.78^{ab}	0.02
Egg Width (mm)	3.48±0.08	3.49±0.08	3.31±0.08	3.57±0.08	4.43±0.08	0.03
Egg Weight (g)	37.00±0.60^{a}	36.30±0.55^{a}	34.00±0.61^{b}	36.30±0.50^{ab}	35.0±0.50^{ab}	0.24
Egg Shell Weight (g)	6.47±0.24^{a}	5.70±0.24^{ab}	4.53±0.24^{b}	5.50±0.24^{ab}	5.07±0.24^{b}	0.23
Egg Shell Thickness (mm)	0.46±0.01^{a}	0.44±0.01^{a}	0.39±0.01^{b}	0.43±0.01^{ab}	0.43±0.01^{ab}	0.04
Haugh Unit	83.40±0.22	83.50±0.22	83.50±0.22	83.70±0.22	83.50±0.22	0.00
Albumen Weight (g)	16.40±0.30^{b}	16.70±0.30^{a}	17.10±30 ^{a}	16.00 ±0.30^{a}	17.40±0.30^{a}	0.27
Albumen Height (cm)	0.60±030^{a}	0.60±0.03^{a}	0.45±0.30^{b}	0.60±0.03^{a}	0.50±0.30^{ab}	0.24
Albumen Width (cm)	5.31±0.24^{a}	5.23±0.24^{a}	4.55±0.24^{b}	5.28±0.24^{a}	4.95±0.24^{b}	0.17
Yolk Width (g)	14.10±0.40^{a}	14.00±0.40^{a}	12.20±0.40^{b}	13.90±0.40^{a}	12.50±0.40^{b}	0.49
Yolk Height (cm)	1.53±0.70^{a}	1.24±0.70^{b}	1.53±0.70^{a}	1.50±0.70^{a}	1.49±0.70^{a}	0.01

CONCLUSION

Birds fed diet T3 have the highest hen day production, while those on T1 have higher values of egg length, egg shell weight, egg shell thickness, albumen height, yolk height and yolk width value.

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