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Original Article

Effect of Different Protein and Energy Levels on Reproductive Performance of Guinea Hens

Alli, O.I. and Ayorinde, K.L.
Department of Animal Production, University of Ilorin, P.M.B. 1515, Ilorin. Nigeria
E-mail:olu627@yahoo.com

ABSTRACT

The effect of different protein and energy levels on the reproductive performance of guinea hens was studied using one (100) hundred hens that were randomly allocated to one of the treatment groups. The treatment groups consist of 5 levels of protein (16%, 18%, 20%, 22% and 24%) and 2 levels of energy (2750 and 2850kcal/kg) in a 5 x 2 factorial design. In the experiment that lasted 52 weeks, data were collected on age at first egg, body weight at first egg, egg number, egg weight, egg mass, hen day production and egg quality. The protein levels had significant influence (P<0.05) on age at first egg, egg number, egg mass and hen day production. Feed intake averaged 88.8 – 89.1g on 16 and 22% protein diets and were significantly (P<0.05) lower than 18% (102.0g) and 24% (104.7g). The group on 20% protein performed better (P<0.05) than other protein groups. Body weight at onset of lay and average egg weight did not differ (P>0.05) between the protein groups. The energy levels had no significant effect ((P>0.05) on the different parameters measured. The result of the study suggests that 20% crude protein and 2750kcal/kg ME improve performance of guinea hens in the tropics.

***Keywords**: Guinea hens, protein, energy, egg production*

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INTRODUCTION

Guinea fowls are reported to grow slowly and to utilize feed less efficiently than chickens [1], thus taking them a longer time and more feed to reach mature weight and age at lay. Ayorinde [2] reported that though exact dietary requirement of the helmet guinea fowl is not completely known, studies have indicated requirements of several nutrients. It has observed that the assessment of calorie and protein requirements appear to be the most critical considering that the two components attract the highest cost in livestock feed and also form the largest bulk by weight of compounded rations. It is known that the poultry specie eats to satisfy their energy needs and this is affected by the calorie density of the feeds. Similarly, the ratio of calorie to protein has been scientifically verified to remarkably affect the biological productivity, physiological well being and carcass composition of animals, especially monogastrics.

Most wild birds breed during a restricted period of the year irrespective of the latitude at which they are found [3]. This restriction is usually imposed by the seasonal availability of the appropriate food source required for feeding and fledging the young. The female would also require sufficient food to form her eggs. Guinea fowls in the wild are known to have access to insects and grasses especially in the wet season which coincides with the breeding season. This suggests that protein and energy rich components predominate in their diets and this appears necessary for maintenance of daily activities [4]. Under domestication therefore, reproductive performance appears to be guaranteed with the availability of adequate nutrients. This study is aimed at investigating the effect of five protein and two energy levels on the reproductive performance of the domesticated guinea hen.

MATERIALS AND METHODS

The experiment was carried out at the pavilion of Department of Animal Production, University of Ilorin, Ilorin, Nigeria. A total of 100 guinea hens at 20 weeks of age were selected from an existing

base population previously established from hatched eggs collected from peasant keepers in Northern Nigeria and randomly assigned to one of the treatment groups of five levels of dietary protein (16%, 18%, 20%, 22% and 24%) and two levels of energy (2750 and 2850kcal/kg). The birds were kept in individual battery cages and feed (Table 1) and water supplied *ad libitum* for the 52 weeks duration of the experiment.

Data Collection

Feed intake: Total feed consumed was monitored and recorded fortnightly.

Body weight: The body weight of each hen was taken fortnightly using a top loading weighing scale.

Feed Efficiency: The weight gained over a period of time for each replicate was expressed as a percentage of feed intake over same period.

Age at first egg: The age at which each group started to lay was recorded.

Body weight at onset of lay: The weights of the birds were recorded at the age of first egg.

Egg weight: Eggs laid were weighed on a daily basis, and the average weight for each group taken.

Egg number: Total eggs laid for each group during the experimental period was recorded.

Hen Day Production: This was calculated using the formula:

(No of eggs laid/No of days) x 100

Egg mass (EM): This was calculated using the formula:

Total number of eggs laid x Average egg weight

Statistical Design and Analysis:

Data collected were analyzed using a 5x2 Factorial design using Genstat Release 10.3DE and means for each combination of protein and energy levels separated using DMRT [5].

Table 1: Diet Composition.

Energy (kcal/kg)	2750					2850				
Protein level	16	18	20	22	24	16	18	20	22	24
Ingredient (%)										
Maize	59.03	59.03	55.83	38.00	36.00	63.13	59.75	58.42	40.00	36.00
Wheat offal	5.00	3.00	3.00	5.00	0.00	1.50	3.48	1.00	0.00	0.00
BDG	0.00	0.00	0.00	20.00	32.4	0.00	0.00	0.00	34.00	32.40
Fish meal	2.00	3.80	5.00	2.50	3.00	2.00	3.50	5.20	2.50	3.50
GNC	20.00	20.80	22.80	7.00	6.00	20 .00	19.90	22.01	6.20	7.70
SBM	3.40	3.40	3.40	9.20	11.20	3.40	3.40	3.40	10.50	13.60
Oyster shell	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Bone meal	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

RESULTS AND DISCUSSION

Average daily feed intake (Table 2) was significantly ($P<0.05$) influenced by protein level, but not by the energy level and there was no significant interaction ($P>0.05$) between protein and energy.

Feed intake was highest at 24% protein and similar to 18%. Birds on other levels had significantly ($P<0.05$) lower feed intake. Feed intake based on energy levels were similar; this might be as a result that the levels were comparable in meeting the needs of the birds as poultry are generally known to eat to satisfy their energy requirement. There were no significant differences ($P>0.05$) in the values obtained for body weight at first egg based on the protein and energy levels. Birds fed 16% protein and 2850kcal/kg ME had the highest body weight at onset of lay (1181g) while 20% protein and those on 2750kcal/kg ME had the lowest weight (1080g). The results agree with the reports of Joseph *et al* [7] that dietary protein intake had no influence on body weight in broiler breeders. Body weights obtained at onset of lay for all groups are slightly higher than was reported by Ayorinde and Ayeni [7] but similar to the reports of Oke *et al* [8] who reported higher body weight at onset of lay for birds fed 16% protein and 2750kcal/kg ME. Age at first egg was significantly influenced ($P<0.05$) by protein levels but not energy level. Birds on 20% protein came into lay at 196.9days while those on 16% protein did not come into lay till 15 days later. This is an indication that birds fed lower protein diets could not attain the body weight threshold required for initiation of egg production early enough. This is contrary to the reports of Joseph *et al* [5] who obtained no significant effect of

dietary protein on age at sexual maturity. There was significant (P<0.05) interaction between protein and energy levels (Table 2).

Table 2: Effect of dietary protein and energy levels on performance of guinea hens.

	Average Feed Intake (g/b/day)	Body Weight at first Egg (g)	Age at first Egg (days)	Egg No	Average Egg Wt (g)	Egg Mass (g)	Hen Day Production (%)
Protein							
16%	89.1[b]	1158	211.90[a]	30.7[c]	34.56	1065[c]	8.43[c]
18%	102.0[a]	1152	204.40[b]	54.9[b]	33.49	1832[b]	15.08[b]
20%	89.1[b]	1106	196.90[c]	62.9[a]	33.61	2108[a]	17.28[a]
22%	88.8[b]	1149	205.30[b]	50.5[b]	35.02	1769[b]	13.88[b]
24%	104.7[a]	1124	204.60[b]	53.9[b]	35.20	1894[ab]	14.81[b]
SED	5.55	54.0	3.04	0.49	1.19	118.6	0.88
Energy							
2750kcal/kg	94.1	1139	205.24	50.9	34.12	1734	13.99
2850kcal/kg	95.4	1137	204.00	50.2	34.14	1733	13.80
SED	3.51	34.2	1.93	2.03	0.75	75	0.56
Protein x Energy	NS	NS	*	*	NS	*	*

Means within each group followed by different superscripts differ significantly (P<0.05)
NS: Not Significant
*: Significantly different

Egg number was significantly increased (P<0.05) by dietary protein. The lowest level of protein, 16% had the lowest egg number (29.4). Highest egg number (63.4) was recorded for 20% protein. The other protein levels had similar egg number (50.6 – 56.4). Result obtained is similar to the report of Brake et al (1985) who obtained an increase in egg production in hens fed additional protein. Egg weight was not different (P>0.05) among the different protein and energy levels. The results agree with the findings of Oke *et al* [6] that there is no difference in egg weight of guinea hens fed different dietary protein and energy levels and in broiler breeders by Joseph *et al* [5]. There was interaction (P<0.05) between energy and protein levels for egg number. Except for the 16% protein diets, all the protein levels had better egg number at 2750kcal/kg energy. Egg mass was significantly (P<0.05) influenced by the protein levels. Birds fed the 20% protein had highest egg mass (2108g) while those on 16% protein diet had the least (1069g). There was significant (P<0.05) interaction between protein and energy level. Hen day production was highest (P<0.05) at the 20% protein level (17.28%) and lowest at 16% (8.43%) protein level. There was significant interaction (P<0.05) between protein and energy levels on hen day production, with 2750kcal/Kg energy having better hen day production for the protein levels except for 16 and 18%.

Table 3: Interaction between Protein and Energy levels for different parameters.

Energy (kcal/kg)	Protein (%)	Age at first egg (days)	Egg Number	Egg Mass (g)	Hen Day production (%
2750	16	209.40[ab]	29.4[c]	1002[c]	8.07[c]
	18	209.60[a]	50.6[b]	1655[b]	13.90[b]
	20	199.20[b]	63.4[a]	2129[a]	17.42[a]
	22	200.80[b]	56.4[ab]	1988[ab]	15.50[ab]
	24	207.20[ab]	54.8[a]	1896[ab]	15.05[ab]
2850	16	214.40[a]	32.0[c]	1127[c]	8.79[c]
	18	199.20[b]	59.2[ab]	2009[a]	16.26[ab]
	20	194.60[b]	62.4[a]	2086[a]	17.14[a]
	22	209.89[a]	44.6[b]	1550[b]	12.25[b]
	24	202.00[b]	53.0[b]	1891[a]	14.56[b]

Means along each column followed by different superscripts differ significantly (P<0.05)

CONCLUSION

The diet containing 20% protein was associated with the best responses for several of the parameters (body weight at first egg, age at first egg, egg number, egg mass, hen day production) observed in this study. For all parameters measured, there were no differences as a result of the

energy level. It is concluded that a protein level of 20% and 2750kcal/kg ME is ideal for optimum egg production in the tropics.

REFERENCES

1. Olomu, J.M. (1983). Aspect of the nutrition of the guinea fowl. In: The Helmet Guinea Fowl (Eds Ayeni, J.S.O., Olomu, J.M. and Aire, T.A.), Kainji Lake Research Institute, new Bussa, Nigeria. pp. 108 – 120.
2. Ayorinde, K. L. (1987). Combating problems of intensive guinea fowl production in Nigeria. In Proceeding: 11th Annual conference of the Nigerian Society for Animal Production. Pp 79 - 83.
3. Sharp, P.J. 1996. Strategies in avian breeding cycles. Animal Reproduction Science 42: 505 – 513.
4. Tewe, O.O. 1983. Nutrient requirement of the guinea fowl. In: The helmet guinea fowl (Numida meleagris galeata) edited by J.S.O. Ayeni. KLRI, New Bussa, Nigeria. Pg 97 – 107.
5. Duncan, D. B. (1955), Multiple range and Multiple F tests. Biometrics 11: 1 – 42.
6. Joseph, N.S, Robinson, F.E, Korver, D.R. and Renema, R.A. (2000). Effect of dietary protein intake during the pullet-to-breeder transition period on early egg weight and production in broiler breeders. Poult. Sci. 79 (12): 1790 – 1796.
7. Ayorinde, K.L., Ayeni, J.S.O. and Oluyemi, J.A. (1988). Laying characteristics and reproductive performance of 4 indigenous helmeted guinea fowl varieties (Numida meleagris galeate Pallas) in Nigeria. Trop. Agric. (Trinidad) Vol 66 No 3. Pp 277 – 280.
8. Oke, U.K., Herbert, U. and Akinmutimi, A.H. (2003). Early Lay Characteristics and Haematology of Pearl Guinea Fowls as Influenced by Dietary Protein and Energy Levels. International Journal of Poultry Science 2 (2): 128-132.