Protein levels in grower diet for exotic ISA ESSOR Guinea fowl (*Numida meleagris*) in a Guinea savanna climate

G. A. TEYE, P. GYAWU & H. K. DEI
Department of Animal Science, University for Development Studies, Tamale, Ghana

ABSTRACT

A 7-week feeding trial was conducted with 120 mixed sex exotic ISA ESSOR Guinea fowl breeders to determine protein level required for the grower phase II period (63 to 112 days) of rearing these birds in the tropics. Three isocaloric diets containing 150, 160 and 170 g kg^{-1} crude protein (CP) were fed to the birds kept on deep litter. Each treatment had four replicates. The parameters studied were total weight gain (g/bird), daily weight gain (g/bird), feed intake (g/bird/day), feed conversion (g feed/ g gain), and carcass yields of only males (dressed weight, percent dressing, breast, thigh and drumstick weights). The results were 823.918 and 908 g/bird for total weight gains; 16.8, 18.7 and 18.5 g/bird/day for rate of gain; 120, 117 and 117 g/bird/day for feed intake; 7.15, 6.25 and a feed/gain ratio; 72.4, 73.6 and 73.0 for dressing percentages; 1.46, 1.56 and 1.51 kg/bird for dressed weights, for treatments containing 150, 160 and 170 g kg^{-1} CP, respectively. Weight gains and rate of gain were significantly higher ($P<0.05$) for birds fed 160 and 170 g kg^{-1} CP diets than those fed the 150 g kg^{-1} CP. Less feed ($P<0.05$) was consumed by birds on 160 and 170 g kg^{-1} CP and they were more efficient ($P<0.05$) in using the feed than birds on 150 g kg^{-1} CP. There were no significant differences observed for almost all the carcass yields, except that the thigh of birds fed 160 g kg^{-1} CP constituted a significantly higher ($P<0.05$) proportion of the live weight than those fed 150 and 170 g kg^{-1} CP. The results suggest that 160 g kg^{-1} CP should be adequate in the grower phase II diet under the Guinea savanna climatic conditions.

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RÉSUMÉ

TEYE, G. A., GYAWU, P. & DEI, H. K. : *Niveaux de protéine dans les régimes de croissance pour la pintade (*Numida meleagris*) exotique d' ISA ESSOR dans un climat savane-guinéenne.* Un essai d'alimentation de 7 semaines s'est déroulé utilisant 120 éleveurs de pintade exotique d' ISA ESSOR de sexe mixte pour déterminer le niveau de protéine exigé pour la période (63 à 112 jours) de la phase II de croissance de l'élevage de ces volailles sous les tropiques. Trois régimes isocaloriques contenant 150, 160 et 170 g kg^{-1} de protéine brute (PB) étaient donnés à manger aux volailles élevées sur la litière profonde. Chaque traitement avait quatre replicatifs. Les paramètres étudiés étaient gain de poids total (g/volaille), gain de poids quotidien (g/ volaille), consommation de ration (g/volaille/jour), conversion de ration (g ration/g gain), et les rendements de carcasse des mâles seulement (poids de corps préparé, pourcentage de la préparation, et les poids de blanc, de cuisse et de pilon). Les résultats étaient 823, 918 et 908 g/volaille pour les gains de poids total ; 16.8, 18.7 et 18.5 g/volaille/jour pour la proportion de gain; 120, 117 et 117 g/volaille/jour pour la consommation de ration; 7.15, 6.25 et un rapport de ration/gain;72.4, 73.6 et 73.0 pour les pourcentages de préparation; 1.46, 1.56 et 1.51 kg/ volaille pour les poids de corps préparés, pour les traitements contenant respectivement 150, 160 et 170 g kg^{-1} de PB. Les gains de poids et la proportion de gain étaient considérablement plus élevés ($P<0.05$) pour les volailles nourries de 160 et 170 g kg^{-1} des régimes de PB que celles nourries de 150 g kg^{-1} de PB. Moins de ration ($P< 0.05$) était consommée par les volailles sur 160 et 170 g kg^{-1} de PB et elles étaient plus efficaces ($P<0.05$) dans l'utilisation de ration que les volailles sur 150 g kg^{-1} PB. Il n'y avait pas de différences considérables observées pour presque tous les rendements de carcasse sauf que les cuisses des volailles nourries de 160 g kg^{-1} PB constituaient une proportion plus élevée ($P<0.05$) du poids vif que celles nourries de 150 et 170 g kg^{-1} de PB. Les résultats suggèrent que 160 g kg^{-1} de PB devrait être adéquat dans le régime de la phase II de croissance sous les conditions climatiques de savane-guinéenne.

Introduction

Though Guinea fowls (*Numida meleagris*) are indigenous to West Africa (Payne, 1990), there have been few studies on the birds locally (Awotwi, 1987; Huges & Sloan, 1984; Managa & Haule, 1998). The productivity (body weight, growth rate, and egg laying) of the captive bird is still as low as in the wild. Hodasi (1976) reported the mature body weight of the local Guinea fowl to range from 0.8 to 1.2 kg. To improve the productivity and income generation of the local bird, mixed sex exotic ISA ESSOR Guinea fowls were imported from Belgium by the Smallholder Agricultural Development Project (SADEP) and distributed to farmers in northern Ghana for crossbreeding with the local birds. Successful acclimatization of these exotic birds will largely depend on proper feeding.

The objective of this study was to determine the suitable protein level in the grower (63 - 112 days) diet of exotic birds under Guinea savanna climatic conditions.

Materials and methods

Location of project

A 7-week feeding trial was conducted at the Nyankpala campus of the University for Development Studies, Tamale. Nyankpala is within the Guinea savanna zone and located on latitude 9.5° N and between longitudes 0° and 1° W. The zone is characterized by wide diurnal temperature variations during the dry season (Nov - Apr); however, yearly or seasonal variations are small, generally less than 10 °C (NAES, 1998). The annual mean temperature is 28.3 °C, with average minimum and maximum temperatures of 15 and 30 °C, respectively, during the coolest months (Dec and Jan) when the area is under the full effect of the harmattan winds (Kasei, 1988). The temperature rises to a minimum of 23 °C and a maximum of 42 °C in the hottest months (Feb - Apr). The average annual rainfall is 1060 mm. The experiment was conducted between July and September 1998, with the mean temperature of 27 °C and relative humidity of 84 per cent.

Brooding, selection, and rearing of birds

Two hundred day-old mixed sex ISA ESSOR breeder Guinea keets were provided by the Institut de Sélection Animalè, Belguim. They were raised in a deep litter brooder house (10.06 m^2 floor space) and managed according to ISA recommendations (ISA management manual) for 8 weeks. At the end of the brooding period, 10 thrifty keets with mean live weight of 1.2 kg ± 0.1 were selected and randomly divided into three treatment groups of 40 in quadruple (10 birds per replicate). Each replicate consisted of six males and four females. They were raised in 12, 2.4 m × 1.8 m floor deep litter, open-sided, and naturally ventilated pens. Wood shavings were used for bedding and 12 h of natural light per day was used. Feed and water were given *ad libitum*. The birds were vaccinated against fowl pox when they were 14 weeks old, and dewormed fortnightly with piperazine.

Experimental diet

Three isocaloric experimental diets containing three levels of crude protein (P_1, 150 g kg^{-1}; P_2, 160 g kg^{-1} and P_3, 170 g kg^{-1}) (Table 1) were formulated for the grower feeding phase (9-16 weeks of age). Each experimental diet contained 11.30 MJ kg^{-1} metabolizable energy recommended for ISA ESSOR Guinea fowl (ISA management manual).

Experimental procedure

An all mash system of feeding was followed. Feed left overs were weighed at weekly intervals for the recording of weekly feed intake. The birds were weighed individually at weekly intervals without considering their sex. The birds were observed daily for mortality which was nil. At the end of the experiment, two cockerels per replicate were randomly selected and slaughtered for carcass analysis. Data were collected on live weight, dressed weight, dressing proportion, and weights of breast, thigh and drumstick. The data were analysed by analysis of variance (Steel & Torrie, 1980). All tests were done at 5 per cent level of probability.

TABLE 1

Ingredients and Nutrient Composition of Experimental Diet

	P_1 150 g kg^{-1} CP	P_2 160 g kg^{-1} CP	P_3 170 g kg^{-1} CP
Ingredients (g kg^{-1})			
Maize	565	550	540
Concentrate*	145	140	150
Wheat bran	225	210	190
Soyabean cake meal	45	80	100
Oyster shell	20	20	20
Nutrient composition (g kg^{-1})			
Calculated analysis (as feed basis)			
Crude protein	150.7	160.9	170.1
Crude fibre	49.4	49.0	49.0
Ether extract	36.4	35.3	34.8
Calcium	12.8	12.7	13.0
Phosphorus	4.0	4.2	4.3
Lysine	6.9	7.1	7.4
Methionine	4.0	4.9	5.7
Metabolisable energy (MJ kg^{-1})	11.33	11.3	11.3

*Concentrate comprised per kg: Fishmeal-100 g kg^{-1}, Soyabean meal-200 g kg^{-1}, Copra cake-280 g kg^{-1}, Wheat bran middlings-340 g kg^{-1} Oyster shell-51 g kg^{-1}, Salt-10 g kg^{-1}, Premix#-8.5 g kg^{-1}, Lysine-17 g kg^{-1} and Methionine-7.5 g kg^{-1}.

#Premix provided per kg: Vit. A. 13,340 I.U.: Vit. B_{12} 0.02 mg: Vit. D_3, 2680 I. U.: Vit. K, 2.69 mg: Riboflavin, 4.4 mg: Njacin, 33.34 mg:, Folic acid, 0.668 mg: Ethoxyquine, 26.68 mg and calcium proproate, 10.68 mg.

Results and discussion

Live weight gain

Table 2 shows the growth performance of ISA ESSOR Guinea fowl grown from 63 to 112 days of age on different crude protein levels. Daily weight gains, total weight gains, and final body weights were significantly higher ($P<0.05$) for birds on P_2 and P_3 than those on P_1. There was, however, no significant difference ($P>0.05$) between performance on P_2 and P_3. Apparently, the 150 g kg^{-1} CP in P_1, which is lower than the level (155 g kg^{-1}) recommended by the breeding company (ISA management manual), could not provide enough nutrients for maintenance and production, despite its high intake. The results agree with those reported by Blum, Guillame & Leclercq (1975) and Mandal, Pathak & Singh (1999) that increased protein levels in isocaloric diets increased the live weight which depended to a lesser extent on the dietary energy. They ascribed the cause of higher weight gain to improvement in the biological value of protein with its increased levels in the diet. Kari *et al.* (1978) and Huges & Jones (1980) also did not observe any specific trend of live weight gain with higher levels of dietary protein.

Feed intake and feed conversion efficiency

The feed intake decreased with increased crude protein content of the diet (Table 2). Daily feed intake was statistically higher ($P<0.05$) for birds on P_1 (120.4 g/bird) than those on P_2 and P_3 (117.1 and 116.5 g/bird, respectively). The difference between those on P_2 and P_3 was not significant ($P>0.05$). Efficiency of feed utilization significantly ($P<0.05$) improved with increasing protein contents. This trend indicates that birds on P_1 were consuming more feed than those on P_2 and P_3 to obtain sufficient protein even though Guinea

TABLE 2

Effect of Different Crude Protein Levels on Live Weight, Feed Intake and Feed/Gain Ratio of ISA ESSOR Guinea Fowl Grown from 63 to 112 Days of Age

Variable	P_1 (150 g kg^{-1})	P_2 (160 g kg^{-1})	P_3 (170 g kg^{-1})
Final live weight (kg)	2.02^a	2.12^b	2.11^b
Total (7 wk) weight gain (g)	823^a	918^b	907^b
Daily weight gain (g)	16.8^a	18.7^b	18.5^b
Daily feed intake (g)	120.4^a	117.1^b	116.5^b
Feed/gain ratio (g/g)	7.15^a	6.25^b	6.29^b

Means in a row with the same letter are not significantly different ($P>0.05$)

fowl had no "protein hunger" (Blum *et al.*, 1975). Mandal *et al.* (1999) observed increase in feed intake due to increase in dietary protein levels with the explanation that at low dietary protein contents, the calorie: protein ratio is widened; hence, the low intake of feed.

On the other hand, Agwunobi & Ekpenyong (1991) reported that feed intake was unaffected ($P>0.05$) by protein contents in the diet. Similarly, Blum *et al.* (1975) have also reported that diet poor in protein was not over-consumed, and feed efficiency remained satisfactory in growing Guinea fowl. Kari *et al.* (1978) and Huges & Jones (1980) also did not find any difference in the overall feed conversion efficiency in Guinea fowls on different levels of protein. Cabel & Waldroup (1991) reported that in broiler chicken, diets with high level of protein increased feed utilization, and diets with low protein content reduced the body weight, resulting from poor feed utilization.

TABLE 3

Effect of Different Crude Protein Levels on Slaughter Weight, Dressed Weight, Dressing Percent, and Carcass Yield of Male ISA ESSOR Guinea Fowl Grown from 9 to 16 Weeks of Age

Variable	P_1 *(150 g kg^{-1})*	P_2 *(160 g kg^{-1})*	P_3 *(170 g kg^{-1})*
Live weight (kg)	1.99[a]	2.09[a]	2.04[a]
Dressed weight (kg)	1.46[a]	1.56[a]	1.51[a]
Dressing percentage	73.4[a]	74.6[a]	74.0[a]
Major carcass part as percent of live weight			
Breast	26.1[a]	27.4[a]	25.0[a]
Thigh	26.6[a]	32.0[b]	26.2[a]
Drumstick	10.6[a]	12.4[a]	10.2[a]

Means in a row with the same letter are not significantly different ($P>0.05$)

Carcass characteristics

Table 3 shows the effect of different crude protein contents on carcass yields of the randomly selected cockerels. There were no significant ($P>0.05$) differences in live weight, dressed weight, and dressing percentage among the treatments. However, birds on P_2 had higher values for live weight (2.09 kg), dressed weight (1.56 kg), and dressing proportion (74.6 per cent) than those on P_1 and P_3. Similarly, only the thigh of birds on P_2 constituted a significantly higher ($P<0.05$) proportion of the live weight. No significant ($P>0.05$) differences were observed among the other carcass components (i.e., breast and drumstick weights). The relatively lower but non-significant carcass yields observed for birds on P_1 and P_3 suggest that birds on P_1 perhaps did not receive the absolute amount of ideal protein which would allow maximum lean tissue growth (ARC, 1981). The excess dietary protein in P_3 reduced effective energy value of the diet due to deamination and the eventual lesser gain made (Whittemore, 1993), because of inadequate energy supply to drive the metabolic motors of protein anabolism.

Conclusion

The overall performance of the birds indicates that, with the quality of the protein used in this experiment, a diet containing crude protein content of 160 g kg^{-1} is optimal for raising ISA ESSOR Guinea fowl breeders and cockerels under savanna climate. Lowering the dietary protein may increase the production cost, since more feed will be consumed. Similarly, higher than 160 g kg^{-1} dietary protein may not cause any significant gain.

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