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Effect of dietary energy and protein on performance of guinea fowl reared in the humid tropics of Nigeria

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Abstract

The effects of varying levels of energy and protein on optimal performance of helmeted guinea fowl and carcass characteristics were investigated. Three hundred and twenty-four 7-week old guinea fowls were randomly allotted to treatments in a 3x3 factorial arrangement of a Completely Randomized Design. The birds were respectively assigned to the experimental diets of 10.46MJ, 10.87 and 11.29kcal of ME/kg diet with a corresponding protein content of 15, 16, and 17% CP. They were fed these diets from 7 to 12 weeks of age. Each dietary treatment had four replicates of 27 birds per replicate. Feed and water were provided ad-libitum. The birds were observed for feed consumption, weight gain, final weight, water consumption and mortality. There were significant (P<0.05) energy x protein interaction effect for the average final weight with birds on 10.87MJ/kg x 15%CP for FW and also for energy x protein main effects for FI, WI and WG. There were significant (P<0.05) energy main effects and energy x protein interaction for gizzard weight, back weight and breast weight with constant energy levels of 10.87MJ/kg ME and 10.46MJ/kg ME at their interaction level. Birds on 1 1.29MJ/kg ME x 15CP and 1 1.29MJ/kg ME x 17%CP gave the heaviest gizzard of 922.66 and 19.09 and in other parameters, except in Neck weight which shows no significant (p<0.05) energy and protein as well as the energy x protein interaction. But there were significant energy main effect and no significant protein main effects for wing weight as well as significant differences (p<0.05) energy and protein main effects on total dressed with 10.887MLkg ME x 17%CP gave the highest value of 717.22g. There was also a significant (p<0.05) interaction effects on average live weight with 1 1.29MJ/kg ME x 15%CP diet gave the highest value of 1.48kg/bird. The findings from this study that 10.87 MJ/kg ME and 15%Cp diet gave the best performance.

Keywords: Dietary energy and protein, performance, guinea fowls, humid tropics

Introduction

Helmeted guinea fowls are the most omnivorous of the guinea fowl species, consuming a wide range of plant and animal materials (even some toads), switching their preferences to whatever appears to be abundant at the time, but focusing on insect and arthropods during the breeding season. The quality of the bird at the onset of her production cycle will greatly determine how profitable she will be during the period of lay (Nahashon *et al.,* 2007). Special emphasis must therefore be placed on feeding the growing bird so that she may develop to its full genetic potential (Bell and Weave, 2002). The general consent stipulates determination of nutrient requirements of different types of poultry to efficiently utilize their genetic potential for specific production goals (PYM, 1990). Several studies have evaluated the Metabolizable Energy (ME) and crude protein requirements of the guinea fowl; however they are quite inconclusive and most cover the period from 0 to 16 week of age. They reported that for the growing guinea fowl, the diet should contain about 3,010kcal of ME/kg of diet and 24 to 26%CP at 0 to 4 week of age, 3,010kcal of ME/kg diet and 19 to 20% CP at 5 to 8 weeks and 3,010 kcal of ME/kg of diet and CP concentration of 16% or less at 8 to 12 weeks of age. This necessitates the search to evaluate optimum ME and CP for growth performance and egg product. Providing adequate ME and CP will in part have an important bearing on the bird's productivity during the laying period (sales and Pereez, 1997; Oke *et al.,* 2003; Nahashon *et al., 2004)*. Studies of the nutritional requirement of intensively kept birds suggested that growth performance up to 12 weeks of age is not significantly affected by different ME levels (Singh 1994). Singh (1994) reported that keets were able to adjust their energy intake within a range of 2,700 kcal to 3,000 kcal/kg of feed. Also the live weight gains were linear with increasing dietary protein levels at all ages. Singh 1994 also reported that the effect of dietary treatments on live weights and weight gain was highly significant at 8 weeks of age. Also at 12 weeks of age, energy and protein interaction had no effect on live weight (Singh, 1994). The nutrient requirements of the guinea fowl have however been assumed to be same as that of the chicken as regards the major nutrients (Oluyemi's 1982). Insects form a component feature in the guinea fowl diet, especially in the weight season which coincides with the breeding season. This suggests that protein and energy rich components predominate in the diets and are necessary for maintenance of the daily activities of the birds (Tewe, 1993). Although, the assessment of calories and protein requirements appears to be the most critical for many reasons, these two components attract the highest cost in livestock feed and also form the largest bulk by weight of compounded rations.

Dietary metabolizable energy (ME) composition has a major impact on body composition of chicken Collin *et al*. (2003) as well as the guinea fowl. Ayeni (1980) and Nahashon *et al.* (2005) reported that semi-domesticated guinea fowl keets were found to perform best on 20-24% crude protein diet and could be reduced to 18% by eight weeks of life. Protein levels between 14% and 15% and ME of 3000kcal/kg may be sufficient from 12 weeks and above. Therefore, the objective of this study is to evaluate the optimum energy and protein level for best growth performance of guinea fowl

Materials and methods

A total of three hundred and twenty-four 7 weeks old guinea fowls were used to fowls evaluate the effect of energy and protein levels on the performance and carcass quality characteristics of guinea fowl in a 3x3 factorial in a completely Randomized Design. The birds were subjected to three energy levels (10.46, 10.87 and 11.29MJ/kg ME) and three protein levels (15, 16, and 17%CP) as main factors and were replicated 3 times weight gain, feel intake, water intake were measured while feed conversion ration SP was calculated. Feed and water were given to the birds *ad-libitum* and the experiment lasted 5 weeks. The percentage composition of the experimental diets and their proximate composition are presented in Table 1 and 2 respectively.

The 15%CP level diet produced the highest daily weight gain of (5.45g/d/b) followed by 16% diet while the 17%CP produced the lowest ($P<0.05$) DWG. The decreasing trend in weight gain as protein level increased because feed intake is a major factor that influences both the body weight gain and efficiency in meat-type poultry (Nahashon *et al.,* 2006; Nkafamiya *et al.,*

Table 1*:* Composition of the experimental diets containing different energy and protein levels

	E_1P_1	E_1P_2	EiP_3	E_2P_1	E_2P_2	E_2P_3	E_3P_1	E_3P_2	E_3P_3
Maize	18.30	9.45	-	17.41	8.89 44.46		16.53	8.62 -	
Maize offal	36.60	37.81	44.34	39.17		53.35	41.32	38.81	43.60
P/CC	36.61	47.27	35.47	30.47	35.57	36.68	24.80	35.47	34.88
GNC	5.29	2.27	8.12	9.75	7.88	7.88	14.15	10.56	9.61
Bone Meat	2.50	0.252.50	2.50	2.50	2.20	2.20	2.20	2.20	2.20
Premix	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Nacl	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Total	100	100	100	100	100	100 '	100	100	100
CP%	15.00	15.00	15.00	15.00	16.00	16.00	16.00	17.00	17.00

E_1P_1 = Energy and protein 10.46 x 15
E_1P_2 = Energy and protein 10.46 x 16
E_1Ps = Energy and protein 10.87 x 17
E_2Pi = Energy and protein 10.87 x 15
E_2P2 = Energy and protein 10.87 x 16
E_2P3 = Energy and protein 10.87 x 17
E_3Pi = Energy and protein 11.29 x 15
E_3P_2 = Energy and protein 11.29 x 16
E_3P_3 = Energy and protein 11.29 x 17

2007).

There were significant ($P<0.05$) protein main effect. Protein intake value of 15% CP diet was the highest (8.11) followed by 16%CP while that of birds on 17%CP diet was the lowest (4.58). This shows that consumption of diets decreases as level of dietary protein increases. This shows that the protein requirement of growing guinea fowls is met at 15%CP dietary level. With regards to energy x protein interaction, birds on 15% CP dietary level. With regards to energy x protein interaction, birds on 15% CP x 10.87 MJ/kg ME and 15% CP x 11.29 MJ/kg ME diets had similar but highest intake values, followed by birds on 15%CP x 11.29 MJ/kg ME; 16%CP x 10.46 MJ/kg ME and 17% Cp x 10.46 MJ/kg diets, which were similar.

Birds on 17%CP x 10.87MJ/kg ME and 17% x 11.29 MJ/kg. ME diets had similar but lowest feed intakes. This observation is consistent with the report of Nahashon *et al.* (2006), which state that birds consume feed primarily to meet their body ME requirement. The rate of feed consumption decreases when birds are fed a high energy diet (Nahashon *et al.,* 2005) due to heat increment, which does not encourage high feed intake but rather encourage high water intake.

Nahashon (2006) also suggested that the effect of dietary energy on performance of growing birds is dependent on the bird's capacity to alter feed intake to meet changing demand for calories. Previous studies (Plavnik *et al.,* 1997; Nahashon *et al.,* 2005) have also suggested that as dietary energy increases, birds satisfy their energy needs by decreasing feed intake. Decreased feed intake with high energy in the diets is supported by Veldkamp *et al.* (2005) which also observed that feed conversion ration (FCR) were significant (PO.05) protein and energy Birds that consumed 17%CP diets had the poorest FCR followed by those fed 15 and 16% CP diets which were similarFCR of birds onlO.46 MJ/kg ME diet was similar to that of birds on 11.29MJ/kg ME diets but poorer

Table 2: Effect of dietary energy and protein on performance of guinea fowls reared in the humid tropics of Nigeria

	Energy									
	Protein			Protein			Protein			
	1	2	3	1	2	3	1	2	3	SEM
FW	1008.43^{bc}	977.78^{c}	1020.00^{a}	1201.67^{b}	1076.39^{a}	1061.90^{bc}	1078.33^{b}	1002.78^{bc}	1061.91^{bc}	140.33
WG	5.10^{ab}	4.76^{ab}	2.09^{c}	6.00^{a}	3.93^{bc}	4.59^{ab}	5.24^{ab}	4.72^{ab}	2.53^{c}	1.47
DPI	6.48^{b}	6.49^{b}	6.10^{bc}	8.11^{a}	5.53^{c}	4.74^{a}	7.82^{bc}	5.74^{b}	4.58^{c}	2.05
FC	129^{c}	1.37^{bc}	2.16^{a}	1.38^{bc}	1.41bc	1.07^{c}	1.50^{bc}	1.29^{c}	1.80	3.03
DWI	15.91^{b}	12.76^{c}	12.34^{a}	19.19^{a}	12.89^{c}	10.97^{b}	18.64	12.88^{c}	11.06^{c}	29.60
Mortality	0	0	0	0	0	0	0	0	0	

Means in the same and in the cells bearing different superscripts are significantly different ($p<0.05$), SEM = Standard Error of Means, SEM for energy, protein and for EXP interaction, NS - Not Significant, Significant

Table 3: Effect of dietary energy and protein on performance of guinea fowls reared in the humid tropics of Nigeria

	Energy									
	Protein			Protein			Protein			
	1	2	3	1	2	3	1	2	3	SEM
SW	1.17c	1.25abc	1.20bc	1.20bc	1.40abc	1.40abc	1.48a	1.23abc	1.47ab	0.44
DW	608.33	625.00	666.67	725.00	733.33	693.33	683.33	641.67	708.33	22.53
WW	17.55	19.05^{bcd}	16.25^{d}	14.04^{d}	21.49^{bc}	20.42^{bcd}	28.77^{a}	18.70^{bcd}	23.56^{ab}	0.66
NW	4.11	5.51	5.14	4.52	5.65	5.89	6.73	5.10	6.58	1.82
DS	12.50	12.23	11.58	10.89	10.97	11.19	11.69	11.88	11.76	2.44
BRW	21.23	18.48	21.53	15.05	21.79	24.67	31.17	22.64	28.47ab	0.75
BW	13.95b	14.60^{b}	15.14^{b}	13.89^{a}	16.30^{b}	17.59^{ab}	22.66^{a}	16.13^{b}	19.09^{ab}	0.55
GW	4.11^{ab}	4.08^{ab}	4.00^{ab}	3.60^{b}	3.77^{ab}	3.99^{ab}	4.38^{a}	3.90^{ab}	4.33^{a}	1.33

Means in the same column and in the cells bearing superscripts are significantly different ($p<0.05$). SEM = Standard Error of Mean
NS - Not Significant, * = Significant

than the FCR of birds on 10.87 MJ/kg-ME diet. There was significant (P<0.05) energy x protein interaction effect. effect of 10.87 MJ/kg ME and 17%CP, 10.$6 MJ/kg x 15% CP and 11.29 MJ/kg x 16% Cp gave the best FCR of 1.07. Birds fed diet containing 10.46 MJ/kg and 17CP had the lowest FCR, FCR influence the biological components of the birds. This is accordance with the ratio of calories to protein as verified by remarkable effect on biological productivity, physiological well being and carcass composition. Feed conversion ratios which ranged between 1.07 - 2.16 recorded in the current study are lower than the recommended values; 3.5 - 4.5 (lesson, 2000). Nagu and Alawa (1995) argued that the wild behavior of guinea fowls the characteristic timid but very active. Flighty and noisy temperature contributes to poor feed conversion efficiency through high energy output. The lower FCR recorded in this experiment could be because the birds were raised under confined condition. The average daily water intake (ml/day/bird) of the guinea fowls as influence by dietary energy and protein level were significantly different (P<0.05) protein x energy interaction effects. Highest significant means of daily water obtained from 15% CP x 10.87 MJ/kg ME and 15%CP x 11.29 MJ/kg ME interactions followed by 15%CP x 10.46 MJ/kg interactions. The 16%CP and 17%CP interactions with all the three energy levels had similar but the lowest water intake. Water requirement of guinea fowls is most likely to be met with varying energy levels while keeping the protein level constant at 15%CP. This means that energy level had no significant effect on water intake.

Energy and protein interaction showed no significant effect on mortality. The cause of zero mortality may be largely due to the nutrient combinations which can be judged safe and satisfactory for the survivability of guinea fowls. This observation agrees with the findings of Embury (2001) who report that survival rate of keets is remarkably improved through proper brooding and feeding. Marizuikuru *et al.* (2008) also reported an insignificant mortality of 5% in their study.

Conclusion and Recommendation

The effect of different energy and protein levels on the growth performance and carcass quality of the guinea fowls showed that 10.87 MJ/kg ME and Cp diet gave the highest significance effects on the performance of guinea fowls and also gave the highest dressed weight. Therefore, it would be appropriate to feed guinea fowls raised in the humid tropics with energy diet of 10.87 MJ/kg ME x 15%CP for optimum growth parameters. The significant increase in body weight is consistent with the findings of Nsoso *et al.* (2003; 2006) where guinea fowl had similar live weight at the same stage of growth and development. They have slow growth rate compared to broilers which reach 1.5 to 2kg in 6-8 weeks. The continuous increase in the neck length is adaptive feature to the environment to enable birds have clear view of their surrounding and to detect any danger and/or see their predators in advance. Since the energy x protein interactions was not significant. It implies that any of the combinations of ME and CP can be used to produce average neck weight which is an adaptive feature to see their predators in the wild. The energy and protein on the drum stick weight did not differ significantly (p<0.05) on both interaction and main effects. This observation indicates that drum stick weight could be achieved using any of the dietary combinations of ME and CP. This trend suggests early maturing trait and this is supported by the fact that a strong drum sticks and its weight are needed to support the whole body frame.

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