Ife Journal of Agric Vol. 4 Nos 1 & 2 (1982)

Requirement of the Nigerian indigenous fowl for protein and amino acids.

J.A. OLUYEMI, O. LONGE, & T. SONGU.,
Department of Animal Science,
University of Ibadan,
Ibadan.

Abstract

A total of six hundred 28 weeks old Nigerian indigenous hens were randomly alloted to 10 diets containing either 15 or 18% crude protein and varying levels of lysine and sulphur amino acids. Different dietary levels of fish meal and blood meal were used to achieve the above. Dietary protein level had no effect (P > 0.05) on egg production, egg quality, feed efficiency and mortality, while egg size was increased (P< .05) by amino acid profile. Egg production tended to increase with better amino acid profile but both egg production (30.8 - 42.4%) and egg size (39.7 - 43.5g) appeared to be generally low. However, egg size and Haugh Unit were considereably improved (54.39%) and 77.48% respectively) in a second experiment using a dietary regime with 21% crude protein and the high levels of fish meal and blood meal used in the first experiment.

Introduction

Available information on the Nigerian indigenous fowl suggest that the fowl is a light strain, possessing a small mature body size (Oluyemi and Oyenuga, 1973; Oluyemi, 1980). It may therefore be expected that, in common with light breeds like the Leghorn, the indigenous fowl is potentially a prolific egg layer. Production records by Hill and Modebe (1960) and Akinokun (1971) indicated that the indigenous fowl compared favourably with some imported light and heavy strains in egg production; but the generally low level of performance of the different strains made this evidence inconlcusive on the potentiality of the indigenous fowl.

The performance of the domestic fowl is largely determined by environmental factors of which the nutritional regime is an important component. A review of the nutritional requirements in the tropics by Olomu (1978) indicated a range of 15-18% crude protein for layers. According to NRC (1971) the minimum dietary energy for layers is 2850 kcal/kg.

This study is an attempt to determine the requirement of the Nigerian indigenous fowl for dietary protein and amino acid.

Materials and Methods

In a first experiment, a total of 600 indigenous chickens were used. These were the fifth generation of parents which orginated from five states of Nigeria namely: Oyo, Ondo, parts of Ogun, Kwara and Lagos lying on the Western part of River Niger. The birds were 28 weeks old, having laid for about eight weeks on a layer's diet containing 15% crude protein, 2850 kcal/kg metabolizable energy and adequate levels of minerals and vitamins. The birds were thereafter transferred from floor to cages and randomly allotted in duplicate groups of 30 to ten experimental diets. The diets contained 15 or 18% crude protein; and for each dietary protein level, fish meal at 0.0, 1.5, 3.0, 4.5, or 6.0% combined respectively with 0.0, 1.0, 2.0, 3.0, or 4.0% blood meal (Table 1).

In a second trial, eighty 28 weeks old indigenous pullets housed as in the first trial were randomly grouped into 4 lots of 20 birds each. These were in turn allotted randomly and in duplicate groups to 2 dietary regimes, which contained 21% CP, 2850 kcal/kg, 3 and 6% fish meal combined with 2 and 4% blood meal respectively.

In both trials, egg production, egg quality, feed consumption, broodiness and mortality were recorded at four-week intervals for forty weeks. Data were subjected to variance analysis (Steele and Torrie, 1960) and the significant differences between means were determined using multiple range test (Duncan, 1955).

TABLE 1 – COMPOSITION OF THE EXPERIMENTAL DIETS

Ingredients			*Experiment 1*						*Experiment 2*			
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Miaize	67.24	67.74	68.26	68.78	69.29	63.10	63.61	64.14	64.67	65.67	55.27	60.14
Palm oil	–	–	–	–	–	–	–	–	–	–	–	–
Groundnut cake	17.31	13.04	8.76	4.48	0.20	26.00	21.64	17.27	12.90	8.53	27.35	18.82
Fishmeal	0.00	1.50	3.00	4.50	6.00	0.00	1.50	3.00	4.50	6.00	3.00	6.00
Bloodmeal	0.00	1.00	2.00	3.00	4.00	0.00	1.00	2.00	3.00	4.00	2.40	4.00
Rice bran	4.95	6.22	7.48	8.74	10.01	0.40	1.75	3.09	4.43	5.77	–	–
Oystershell	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70
Bonemeal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Vitamin-mineral premix*	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Chemical analyses (calculated)												
Metabolizable energy (kcal/kg)	2850	2850	2850	2850	2850	2850	2850	2850	2850	2850	2850	2850
Crude protein (%)	15.10	15.30	15,20	15.40	15.50	18.10	18.10	18.30	18.40	18.40	21.00	21.00
Methionine (%)	0.200	0.226	0.250	0.274	0.298	0.213	0.238	0.262	0.285	0.310	0.280	0.325
Cystine (%)	0.245	0.250	0.262	0.270	0.278	0.271	0.280	0.287	0.295	0.303	0.325	0.334
Lysine (%)	0.432	0.523	0.614	0.808	0.795	0.519	0.609	0.698	0.789	0.878	0.937	0.979

*Vitamin-mineral premix supplying the following per kg of ration: Vitamin A, 8,000 I.U.: Vitamin D_3, 2000 I.U; Vitamin E, 2.5 I.U.; reboflavin, 4.2mg; Vitamin K 2.0 mg; Vitamin B12, 0.01 mg; pantothenic acid 10.0 mg; nicotinic acid, 31.10 mg; choline chloride, 0.1mg; folic acid, 0.5mg; pyridoxine, 4.0 mg; cobalt, 1.2mg; copper, 10.0mg; manganese, 56.0 mg; zinc, 50.0 mg; iron, 20.0 mg, methionine, 200 mg and ethoxyquin, 125 mg.

Results and Discussion

In the first trial, there were no (P > 0.05) differences between the two levels of dietary protein for the various parameters listed in Table 2. These parameters with the exception of egg weight were not (P > 0.05) affected by dietary combinations of fish meal and blood meal (Tables 2 and 3).

TABLE 2 – EFFECT OF 15% AND 18% DIETARY PROTEIN LEVEL ON THE PERFORMANCE OF LOCAL HENS

	Percent protein in diet									
	15	*15*	*15*	*15*	*15*	*18*	*18*	*18*	*18*	*18*
Feed consumption (g/bird/day)	83.25	82.87	80.22	87.43	78.17	84.84	71.11	83.04	85.35	72.14
Percent hen day production	38.73	42.23	33.80	31.30	31.92	30.83	29.54	42.39	37.83	40.37
Egg weight (g)	41.74	41.53	39.69	42.99	43.51	40.59	42.39	43.11	42.60	42.17
Haugh unit	66.16	63.25	66.30	63.82	64.83	66.07	61.82	66.44	62.99	71 36
Shell thickness (mm)	0.39	0.37	0.35	0.36	0.35	0.38	0.37	0.36	0.35	0.36
Mortality (%)	0.00	12.00	42.00	8.00	3.00	0.00	33.30	25.00	16.60	33.32

TABLE 3 – EFFECT OF DIETARY LEVEL OF FISHMEAL AND BLOODMEAL ON THE PERFORMANCE OF LOCAL HENS.

	Level of Fishmeal + Bloodmeal in diet				
	0% + 0%	*1.5% + 1.0%*	*3% + 2%*	*4.5% + 3%*	*6 % + 4%*
Feed consumption (g/bird/day)	84.04	76.99	81.63	86.39	75.15
Percent hen day production	.34.78	35.88	38.09	34.56	36.14
Egg weight (g)	41.06^{b}	41.69^{ab}	41.40^{ab}	42.70	42.84^{a}
Haugh unit	66.11	62.52	66.37	63.40	68.09
Shell thickness (mm)	0.385	0.370	0.355	0.355	0.355
Mortality (%)	0.00	22.60	33.50	12.30	18.16

Figures in the same horizontal line differently superscripted are significantly different at 5%.

Egg weight was greater ($P < .05$) with diets containing 4.5% or 6.0% fish meal combined with 3.0% and 4.0% blood meal respectively than with neither fish meal and blood meal but not with any other combinations. However, the range in egg size appears of little practical significance to egg grading. There was no interaction ($P > .05$) between dietary protein on one hand and the combination of fish meal and blood meal on the other hand.

Birds in the second trial seemed to have performed better than those in the first. Percentage egg production and Haugh Unit were 53.33 – 54.39% and 74.79 – 77.48 respectively, compared with 29.54 – 42.39% and 61.82 – 71.36 for the first trial. Differences in the performance between birds in the first and in the second trial were partly due to higher dietary protein quantity and quality.

The performance of the birds during the second trial, was similar to those reported by Hill and Modebe (1960) and Akinokun (1971) who however did not provide details of the diets fed. In addition to dietary factors, differences in the performance of indigenous fowl may be due to the extent to which the birds were representative. The indigenous fowl is extremely variable in plumage colour and probably in other traits, possibly due in part, to crossbreeding with imported birds (Hill, 1954). Thus, the indigenous fowl in this experiment (from the south western part), may differ from those of other parts of Nigeria.

It is of interest to note that in the second trial, the indigenous fowl performed better than White Leghorn (42.75%), under similar climatic conditions as reported by Onwudike and Adegbola (1979). This level of performance appears low for the breed.

A high requirement of dietary protein for egg production of the birds is consistent with the high environmental temperature (average 29°C during the period) and the small body size of the fowl (about 1.1kg), both of which might limit feed intake. Thus, the levels of essential nutrients should be increased to compensate for the reduced feed intake. Requrement for crude protein might, however, not be as high as suggested by the present experiment if the energy level was reduced thereby permitting increased feed intake by the birds. Such reduction was indicated by Olomu (1978) and is worth considering in future studies. Hutt and Nesheim (1966) indicated genetic differences in the requirement of the domestic fowl for vitamins. These genetic differences may extend to other nutrients including amino acids and minerals.

It might be expected that performance on 18% crude protein would be intermediate between 15% and 21%. Probably the calculated amino acid differed from the analysed and only the 21% approached the requirements. Lewis (1966) has moreover indicated that the performance of the fowl depended on amino acid interactions arising from the ratios of the amino acids to one another.

Acknowledgement

The team is indebted to the Senate Research Grant Committee of the University of Ibadan for Providing funds for this project.

References

Akinokun, O. 1971. The problem of poultry production in Nigeria. Paper presented at the 7th Ann. Conf. of the Agric. Soc., of Nigeria (Mimeo).

Duncan, D.B. 1955. Multiple range and multiple F. – Test. *Biometrics* 11: 1-42.

Hill, D.H. 1965. Poultry production in Nigeria. Sec. Paper 67. 10th World's Poultry Congress, (Edinburgh).

Hill, D.H. and Modebe, A.N.A. 1961. Poultry production at the University College, Ibadan (1950-1958) *Tech. Bull. No. 2, Faculty of Agric.* 35pp.

Hutt, F.B. and Nesheim, M.C. 1966. Changing the chicks requirements of arginine by selection. *Can. J. Genet. Cytol.* 8: 251-259.

Lewis, D. 1966. Aspects of poultry nutrition, p.119-142. In Abrams, J.T. (ed.), *Recent advances in Animal Nutrition.* J.A. Churchill Ltd., Gloucester Place, London.

National Research Council, 1971. *Nutrient requirement of Poulty.* National Academy of Sciences, Washington, D.C.

Olomu, J.M. 1978. Protein and energy nutrition of Poultry in Nigeria. In *Breeds and nutrition of poultry in Nigeria.* World's Poultry Science Association. Nigeria Branch.

Oluyemi, J.A. and Oyenuga, V.A. 1971. A preliminary evaluation of the Nigerian indigenous fowl as table birds. *Proc. Agric. Soc. Nigeria,* 8: 22-25.

Oluyemi, J.A. 1979. Selection of the Nigerian indigenous fowl for 12-week body weight. *Nigerian J. Anim. Prod.* (In press).

Onwudike, O.C. and Adegbola, A.A. 1979. The effect of prolonged feeding of *Stylosanthes guyanensis* meal on laying performance, egg quality and hatchability. *Ife J. Agric.,* 1 : 63-71.

Scott, M.L. Nesheim, M.C. and Young, R.J. 1969. *Nutrition of chicken* . M.L. Scott and Associate, Ithaca, New York.