EFFECT OF DIFFERENT ENERGY LEVELS OF COCOA HUSK-BASED DIETS ON PRODUCTIVE PERFORMANCE OF JAPANESE QUAILS.

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ABSTRACT

Cocoa husk-based diets were used to assess the effect of different energy levels on the growth performance, economics of production and dressing percentage of Japanese quail *(Coturnix coturnix japonica)* in South Western Nigeria. The assessment period was at 4 to 7 weeks of age. Four isonitrogenous (22% crude protein) diets incorporating graded levels (0, 3.5, 7.0 and 14%) of cocoa husk meal (CHM) as replacement for maize, were used in the trial which involved 360, 3-week-old quail chicks. The diets had the following corresponding ME levels, viz: Diet 1, 2800; Diet 2, 2700; Diet 3, 2600 and Diet 4, 2500 kcal/kg. Each dietary treatment was replicated thrice. Weight gain was similar (P> 0.05) among the diets while feed intake was higher (P< 0.05) on Diet 4 than Diets 1 and 2. Caloric intake, feed conversion and calorific efficiency did not differ significantly (P> 0.05) among the treatments. Though feed cost and feed price/100 kcal ME decreased numerically across treatments, feed cost/kg gain was similar (P>0.05). Dressing percentage was not influenced (P> 0.05) by dietary energy levels. Results of this study indicated that dietary energy levels of 2500 to 2800kcal/kg ME of cocoa husk-based diets are suitable for overall acceptable productive performance of Japanese quails during 4 - 7 weeks of age in South Western Nigeria.

Key words: Dietary energy level, cocoa husk meal, quail productive performance.

INTRODUCTION

More people are daily becoming aware of the health implications of animal fat in their diets. As the knowledge of the health hazards of animal fats spread, many people are likely to opt for less fatty animal products. According to Teeter *et al.* (1996), consumer demand for leaner poultry meat products at nominal costs will increase in the 21st century.

Quail meat is reknowned for its low caloric value in addition to having high quality protein of high biological value (Haruna *et al.*, 1997a). These qualities especially the low fat content, are likely to divert the attention of people, especially the hypertensive-prone individuals, to quail consumption.

The effects of dietary inclusion of cocoa husk meal (CHM) in poultry diets at the expense of maize to reduce feed costs and improve profit margins have been reported (Sobamiwa and Longe, 1998; Sobamiwa *et al.*, 1998). The combined beneficial effects of feeding cocoa husk-based diets to quails on poultry farmers and consumers can thus be envisaged. Cocoa husk meal (CHM) is the dried, ground form of cocoa-pod husk, vast quantities of which result from cocoa harvest but which are left to rot on the farms. Estimates of these ranging from 800,000 - 1 million metric tonnes on dry weight basis have been reported (Adegbola, 1980; Sobamiwa, 1992).

Quail was introduced to Nigeria in 1992 by National Veterinary Research Institute (NVRI), Vom (Haruna *et al.*, 1997b). The protein requirement of the growing quail in Plateau State, Nigeria was determined by Haruna *et al.*, (1997b). The present study investigated the energy requirment of the growing quail using cocoa husk-based diets, in South Western Nigeria.

MATERIAL AND METHODS

Processing of cocoa husk meal

Freshly broken cocoa-pod husks were collected from the Fermentary Unit, Cocoa Research Institute of Nigeria (CRIN), Ibadan. Processing

TABLE 1: COMPOSITION OF THE EXPERIMENTAL DIETS (%)

Feed ingredient (%)	Energy Levels (Kcal/kg ME) 2800	2700	2600	2500
Cocoa husk meal (CHM)	-	3.50	7.00	14.00
Maize	33.50	26.00	18.00	10.00
Full fat soyabean	34.00	34.00	34.50	35.80
Corn bran	20.25	24.25	28.25	27.95
Common ingredient*	12.25	12.25	12.25	12.25
	100.00	**100.00**	**100.00**	**100.00**
Calculated analysis (%)				
Crude protein	22.09	21.99	22.03	22.10
ME (Mkcal/kg)	2.81	2.71	2.60	2.51
Crude fibre	6.50	7.23	8.01	8.88
Ca	2.12	2.12	2.12	2.12
P	1.37	1.39	1.44	1.53
Methionine	0.39	0.39	0.39	0.39
Lysine	1.26	1.26	1.27	1.30

*Contained: Fish meal, 5.50%; bone meal, 6.25%; Salt (NaCl), 0.25% and vitamin-mineral premix, 0.25%.
Premix: Agricare Broiler Starter Premix, Pfizer Nigeria PLC, Ikeja.

was as previously described by Sobamiwa and Longe (1994a).

Birds

Four hundred unsexed, 18-day-old Japanese quails (*Coturnix coturnix japonica*), hatched and batch-reared at NVRI, were transported from Jos by air to Lagos, then by road to the Teaching and Research Farm University of Ibadan. They were allowed three days to adjust to their new environment in two separate pens (each of 2 x 2 x 2.5m in dimension) in a conventional poultry house. Each pen was fitted with 100 watts bulb and a lighted giant lantern which provided warmth to the birds. Thick polythene sheet were spread and nailed to the sides of the pens but the tops were left open. This was done to prevent environmental heat loss while allowing some ventilation. The trial was conducted in July/August 1998 when environmental temperature averaged 25°C and relative humidity ranged between 85 and 95%. At 21-day-old, 360 birds were selected from the remaining 392 live birds on the basis of fitness and relative body weight by culling out the runts and unthrifty birds. The 360 unsexed birds were randomly allocated to 12 pens with 30 birds per pen. Three pens were assigned to each of the four dietary treatments. Feed and water were made available to the birds *ad libitum* throughout the trial.

Experimental diets

The diets were formulated to be isonitrogenous containing 22% crude protein. The protein level used was arrived at via the previous report of Haruna *et al* (1997b). The diets contained graded levels (0, 3.5, 7.0 and 14.0%) of CHM at the expense of maize with the following respective metabolizable energy levels: Diet 1, 2800: Diet 2, 2700' Diet 3, 2600 and Diet 4, 2500 kcal/kg ME. (Table 1) In the study of Haruna *et al* (1997b), 2800 kcal/kg ME was found suitable for quail chicks in Plateau State, a cooler region than South Western Nigeria.

Data Collection

The mean weekly live body weights and feed intake of birds were recorded from 4 to 7 weeks of age when the first set of eggs (total of 17 for the week) were laid. The eggs, which averaged 9 g in weight were spread among all treatments. From the body weight and feed intake data, feed conversion, caloric intake and caloric efficiency were calculated. Feed cost per diet was calculated using the prevailing market price of feed ingredients. The price of CHM was estimated at N3.00/kg taking into consideration the cost of collection, transportation and processing as calculated in an unpublished study at CRIN, Ibadan.

At the end of the trial, 8 birds (4 males, 4 females) were randomly selected from each dietary treatment and starved for about 15 hrs before being slaughtered by the throat-cut method. They were defeathered and dressed to calculate the dressing percentage (i.e. dressed weight as a percentage of live body weight).

Data collected were subjected to analysis of variance (Steel and Torrie, 1980) and the Duncan's Multiple Range Test (Gomez and Gomez, 1985) was used to separate the treatment means.

RESULTS AND DISCUSSION

Data on the productive parameters of birds are shown on Table 2. The non-significant ($P > 0.05$) effect of dietary energy level on weight gain of the experimental quails is an interesting result. In agreement with this observation, Weber and Reid (1967) reported that quail growth on 1760 - 2400 kcal/kg ME diets was not significantly altered. Perhaps one way the quail is able to thrive on such a wide range of dietary energy content may be due to its seeming ability to adjust feed intake according to the energy level of the diet as inferred by Angulo *et al* (1993), and as observed in this study (Table 2). Perhaps another reason may be the observed elastic response of the growing quail to dietary fibre. This can be inferred from the high dietary crude fibre levels (approx. 6.5 - 9.0% as shown in Table 1 which did not depress growth. Other poultry species particularly the broiler chicks have consistently demonstrated inelastic responses to dietary fibre (Sobamiwa, 1993). In the data of Sobamiwa and Longe (1994a,b) for instance, crude fibre levels above 5.8% depressed broiler chick growth.

TABLE 2: EFFECT OF COCOA HUSK BASED DIETS WITH DIFFERENT ENERGY LEVELS ON PRODUCTIVE PERFORMANCE OF JAPANESE QUAILS AT 4 TO 7 WEEKS OF AGE.

	Energy Levels (Kcal/kg ME)				
	2800	2700	2600	2500	SEM
Final weight (g)	144.9	141.0	145.0	147.8	-
Initial weight (g)	53.0	53.0	53.0	53.0	-
Weight gain (g)	91.9	88.0	92.0	94.0	4.3
Feed intake (g)	428.7^{b}	422.0^{b}	471.9^{ab}	541.1^{a}	6.0
Caloric intake (Kcal)	1200.4	1139.4	1226.9	1352.8	9.8
Feed/gain ratio	4.66	4.80	5.13	5.71	0.6
Kilocalorie/gain ratio	13.1	12.9	13.3	14.3	1.3
Dressing percentage	73.1	73.7	72.7	72.7	1.6
Feed cost (N/kg)	27.9	26.3	24.9	23.2	-
Feed cost/100 kcal ME (N)	1.0	0.97	0.96	0.92	-
Feed cost/kg gain (N)	130.1	126.1	127.7	132.4	2.6

ab - means with different superscripts differ significantly ($P < 0.05$).

A similar observation was made by Weber and Reid (1967). These observations contrast sharply with the established trend of increased weight gain as dietary energy level increased for other poultry species, viz: broiler (Lott et al, 1992); turkey (Gonzalez-A and Pesti, 1993); growing pullet (Hussein et al., 1996) and cockerel (Sobamiwa *et al.*, 1998).

From the results, the growing quail appears to be able to keep body growth at a constant rate over a wide range of dietary energy levels. Birds on diet 4 (2500 kcal/kg ME) apparently ate more feed to adjust caloric intake, which like feed conversion was similar ($P>0.05$) for all the treatments. Generally, however, feed conversion for quails was poor compared to reports for chickens (Sobamiwa and Longe, 1994a,b). This generally poor feed conversion has been observed by Weber and Reid (1967) as due to the quail being much less efficient in feed utilization than chicks, and the greater feed wastage characteristc of the quail. Similar observations were made in this study and may be due to the fidgety nature of the birds.

In terms of cost/kg and cost/100 kcal ME, Diet 4 was the cheapest (Table 2). The data on the latter indicated that Diet 4 was the least - cost ration in terms of energy content. However, feed cost/kg gain was similar (P> 0.05) among treaments. Since the main objective of feed formulation should be to maximise profits, that is, the difference between returns (growth response) and cost (feed intake) (Gonzalez-A and Pesti, 1993), the diets can therefore be judged to be equal in economic terms.

Another interesting observation in this study was in connection with the dressing percentage of birds which was not influenced (P> 0.05) by the dietary energy levels. In other words, feeding low-energy diets to growing quails by the partial-replacement of maize with CHM had no influence on the quantity of edible meat, viz: dressed weight. This observation might have been due to similarity in final weight of the different dietary treatments. The data on dressing percentage (72.7 - 73.7) as shown in Table 2 ranked at par with those for broiler chickens of same age (Palo *et al.*, 1995).

In conclusion, the results of this study indicate that dietary energy levels of 2500 to 2800 kcal/kg ME realised through partial (14.0, 7.0, 3.5 and 0%) replacement of maize with CHM supported acceptable and economic productive performance of quail chicks at 4 to 7 weeks of age (i.e finisher growth phase) in south Western Nigeria during the rainy season. There is a need for further studies on the upper limits of inclusion of CHM and dietary fibre in growing quail diets. The optimum level of inclusion of CHM diets of broiler chicks and cockerels have been established as 10% (Sobamiwa and Longe, 1994a,b; Sobamiwa *et al.*, 1998). It will be interesting to know if the quail can economically utilize levels of CHM higher than the 14% observed in the present study and possibly energy levels lower than 2500kcal/kg.

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