PERFORMANCE AND EGG QUALITY OF HENS FED COCOA HUSK BASED DIETS

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ABSTRACT

Lowman Brown hens, 37 - week - old, were used to study the effect of dietary inclusion of 10 and 20% cocoa husk meal (CHM) at the expense of maize on hen performance and egg quality. The trial was conducted for 10 weeks. Egg production (EP), egg weight (EW), egg mass (EM), feed consumption (FC), and feed efficiency (FE) were criteria of comparison. Others were feed cost/kg egg, shell weight, percentage shell and yolk colour index. Inclusion of 10 and 20% CHM in laying hen diets had no significant effect ($P<0.05$) on EP, EM and FE. However, FC was high ($P<0.05$) on the 20% CHM diet though this appeared to be compensated for by increased egg weight. Shell weight and percent shell were not affected by dietary treatments while the 20% CHM diet increased yolk colour index. Feed cost/kg egg was lowered by feeding the test diets. The present study has shown that laying hens can tolerate and produce eggs economically on diets incorporating up to 20% CHM.

Key words: Cocoa husk meal, hen performance, egg quality.

INTRODUCTION

In Nigeria in recent years, the once prosperous poultry industry has virtually collapsed due to the shortage and high cost of feed ingredients particularly maize. Since commercial feeds in the country contain an average of 50% maize and 90% of the feeds are consumed by poultry (Olayemi, 1989), the situation has not been a surprise. The predicament is, however being aggravated by the ever-increasing demand for maize as both staple food for man and an industrial raw material. As Nigeria has no recourse to cheap imports or increased supply of maize, the option has been to source locally for available alternative plant materials which are not components of man's food.

The search has focussed on cocoa husk meal (CHM) among other farm by-products. CHM has various potential as a partial replacement for maize in livestock feeds in Nigeria (Sobamiwa; 1989: 1994). Several reports on broiler feeding trials (Atuahene *et al;* 1985; Boa-Amaponsem *et al,* 1985; Sobamiwa and Longe, 1994a, b) showed that up to 10% dietary level of CHM has also been observed to be suitable at up to 25% in pig rations (Barnes *et al,* 1985); 30% in fish nutrition (Fagbenro, 1992) and 30% in rabbit feed (Ridzwan *et al,* 1993). But data on feeding CHM to layers are rare. This experiment was therefore conducted to evaluate CHM on performance and egg quality of layers.

MATERIALS AND METHODS

Preparation of experimental diets

Freshly broken cocoa-pod husks were obtained from the Fermentary Unit of the Cocoa Research Institute of Nigeria, Ibadan. Each broken pod was chopped into 6 - 8 pieces which were evenly spread on concrete slabs to dry. Drying lasted 7 - 9 days and was carried out in the sun to constant weight during the dry season when day time temperature averaged 30°C. The dried husks were milled to a particle size of about 3mm prior to incorporation into the diets. Diets 1, 2 and 3 contained 0, 10 and 20% CHM respectively (Table 1).

Experimental design

37 - week-old Lowman Brown hens which had been reared from point- of-lay on the control diet were randomly allotted to the treatments. Ten birds were allocated to each dietary treatment with adjustments to equalize weight. Each treatment had 5 replicate pens housing 2 birds each. Feed and water were available *ad libitum.*

TABLE 1 DIET COMPOSITION (%)

Ingredients	Diets		
	1	2	3
Cocoa husk meal[1]	0.00	10.00	20.00
Yellow maize	50.10	38.98	27.82
Groundnut cake	23.52	24.64	25.80
Corn bran	15.23	15.23	15.23
Oyster shell	7.75	7.75	7.75
Bone meal	2.75	2.75	2.75
Salt (NaCl)	0.30	0.30	0.30
Premix[2]	0.25	0.25	0.25
Methionine	0.10	0.10	0.10
Total	**100.00**	**100.00**	**100.00**
Calculated analysis (%)			
Crude protein	17.00	17.00	17.00
ME (Kcal/kg)[3]	2600	2540	2300
Calcium	3.87	3.84	3.86
Phosphorus	0.71	0.70	0.69
Methionine[4]	0.36	0.34	0.32
Lysine[4]	0.56	0.55	0.53

1 Content (%): 5.9 crude protein, 1.2 ether extract, 22.6 crude fibre, 9.1 total ash and 62.2 nitrogen free extracts (Sobamiwa and Longe, 1994b).

2 Content: Vitamins A. D3, K, B12; ribolavin; panthothenic acid; folic acid; choline chloride; selenium; phosphorus; calcium, iodine' copper; zinc; iron, Anti-oxidant; Anti-caking; agent; Terramycin; Yolk colourant (Agricare-Mix, Prizer Products PCL, Lagos).

3. Estimated for cocoa husk meal using the formula: ME (Kcal/kg) = 37 x % protein + 81.8 x % fat + 35 x % NFE (Pauzenga, 1985).

4. Estimation did not include the contribution of cocoa husk meal.

Data Collection

Egg production was recorded daily and pooled weekly. FC (feed per hen per day), and FE (EM/FC) were calculated weekly. To determine shell weight, percentage shell and yolk colour index, an egg whose weight was closest to the average per treatment was selected weekly per replicate. Each egg was weighed and broken around the equator, care being taken to keep the yolk intact. Yolk colour index was assessed each week by a group of 2-4 persons using the Roche colour fan (F. Hoffman - La Roche Ltd., Basle, Switzerland). Shells were washed with membranes intact, air-dried and weighed. Percentage shell was calculated relative to EW. The price of CHM was established using that of a similar feedstuff, rice bran.

Statistical analyses

Results were evaluated using the anlysis of variance (ANOVA) procedure (Steel and Torrie, 1980). Differences among means were detected by Duncan Multiple Range Test (Gomez and Gomez, 1985).

RESULTS AND DISCUSSION

Inclusion of 10 and 20% CHM in layer diets had no significant effect ($P>0.05$) on EP, EM and FE (Table 2). At 20% level, both FC and EW increased significantly ($P<0.05$). Feed cost/kg egg was lowered on the test diets relatively to control. Shell weight and percentage shell were not significantly different across treatments while yolk colour was deeper ($P<0.05$) on Diet 3. The critical factors in the interpretation of these results are the FE and feed cost/kg egg. Feed efficiency was similar among diets indicating that they were equally utilized. Relatively lower feed cost/kg egg on the test diets suggest

TABLE 2: PERFORMANCE AND EGG QUALITY OF HENS FED COCOA HUSK BASED DIETS

MEASUREMENT	PERCENTAGE COCOA HUSK MEAL			
	0	10	20	SEM
Egg production (EP) (%)	63.04	64.71	64.91	5.70
Egg weight (EW) (g)	58.80b	57.60b	61.30a	1.60
Egg mass (EM) (g/b/d)	37.04	37.27	39.78	2.10
Feed consumption (FC) (g/b/d)	107.57b	105.18b	127.87a	5.7
Feed efficiency (FE)	0.34	0.35	0.32	0.02
Feed cost/kg egg (N/kg)	64.80	59.36	59.38	-
Shell Weight (g)	5.73	5.72	6.24	0.41
Percentage shell (%)	9.83	10.10	9.72	0.52
Yolk colour index (Roche fan No.)	8.32b	8.6b	9.81b	0.51

a,b - different superscripts within the same row indicate that the means are significantly different ($P<0.05$).
SEM - Standard error of means.

that they are economically viable alternatives.

Feed consumption is a function of dietary energy content (National Research Council, 1984). It is apparent that birds on Diet 3 ate more food to cater for the lower dietary energy (Table 1). This factor, however, may not sufficiently justify the significant difference between FC on Diet 3 and others. The high FC on Diet 3 may have been due to the heavier EW.

Loss from cracked eggs is a major problem on commercial egg farms. Highly negative correlations have been established between percentage of cracked eggs and percentage shell and shell weight (Abdallah *et al*, 1993). Since percentage shell and shell weight were similar ($P>0.05$) on the diets, they were presumed to have supported equal egg shell strength.

Although having no influence on the nutritive value of eggs, golden yellow colour is preferred by consumers in most parts of the world (Jiang *et al*, 1992, Anon, 1993). The present results have indicated that the diet having the highest CHM content produced significantly darker egg yolks, though yolk colour score was generally high (>8) on all dietary regimens. The generally high yolk colour index possibly accrued from two main sources. The layers vitamin - mineral premix incorporated into the diets (Agricare - Mix, Pfizer Products PLC, Lagos) contained yolk colourant. Also, yellow maize, a rich source of xanthophyll (the pigmenting carotenoid) was used in the diets. These two sources of yolk pigmentation may possibly be responsible for the high yolk colour index recorded on all the diets. In conclusion, this present study has demonstrated that laying hens can tolerate and produce eggs economically on diets incorporating up to 20% cocoa husk meal.

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