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Cocoa husk/*Leucaena* leaf mixture in cockerel diets

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ABSTRACT: One hundred and fifty-six, 2-week-old Nera cockerels were randomly assigned to 4 isonitrogenous dietary treatments, viz: Diet 1:0% Cocoa husk meal (CHM), 0% Leucenana leaf meal (LLM); Diet 2:7.5% CHM, 2.5% LLM; Diet 3: 11.25% CHM, 3.75% LLM and Diet 4: 15% CHM, 5% LLM. The test ingredient mixtures mainly replaced maize in Diet 1. Each dietary treatment was replicated thrice and the experimental diets were offered for 14 weeks (3-8) weeks of age, starter diets; 9-16 weeks of age, finisher diets).

At the starter phase, feed intake and body weight gain were similar (P>0.05) on diets 1 and 2 but lower (P>0.05) on Diets 3 and 4. Feed conversion was not influenced (P>0.05) by CHM/LLM inclusions. In the finisher phase, all these parameters and the feed cost/kg gain were unaffected (P>0.05) by dietary treatments. Gizzard was heaviest on Diet 4 which produced longer (P<0.05) intestine and caeca. Dressed weight and abdominal fat weight were similar (P>0.05) across treatments. It was concluded that all three test diets (or CHM/LLM mixtures) are suitable alternatives for raising cockerels to market weight.

Keywords: Cocoa husk; Leucaena; Cockerel performance; Economics of production; Carcass characteristics.

Introduction

A widely researched strategy for lessening the competition between people and poultry for cereal grains in West Africa has been the partial substitution of unconventional feed resources for maize in poultry feeds. This has been tried in Nigeria (Atteh *et al*., 1992), Ghana (Osei *et al*., 1991) and Cameroun (Teguia, 1995).

Cocoa husk meal (CHM) is one of such alternative feed resources that has received keen attention in Nigeria and Ghana. It has been studied in feeds of different breeds and species of poultry such as broiler chicks (Donkor *et al*, 1991); laying hens (Osei *et al*, 1991) and growing Japanese quails (Sobamiwa *et al*, 1999).

Studies of CHM in poultry feeds have been taking a new trend of recent. This relates to means of upgrading its nutritive value which is limited by its high crude fibre, low crude protein and low ME contents (Hutagaling and Chang, 1978; Abiola and Tewe, 1991). Urea treatment of CHM was observed to improve weight gain and onset of lay by growing pullets (Sobamiwa and Akinwale, 1995). Alkali treatment was also reported to improve cockerel growth (Abiola, 1988).

While more positive results are being unraveled through chemical treatment, it was thought worthwhile to being to explore other strategies such as cost-effective nutrient supplementation. This is necessitated by the vast deficits in crude protein and ME contents of CHM relative to maize (6% and 2000kcal/kg vs 9% and 3400 kcal/kg respectively) (Hutagahung and Chang, 1978; NRC, 1984).

The present experiment evaluated the nutritive value of CHM for cockerels through supplementation with leucaena leaf meal (LLM) which has a higher (25-30%) crude protein content (Cheeke, 1987).

Materials and Methods

Cocoa-pud husk was collected and processed as previously described (Sobamiwa and Longe, 1994). Leucaena leaf meal was prepared from fresh leucaena leaves harvested at the International Institute of Tropical Agriculture (IITA), Ibadan. The leaves were picked off the stems, sun-dried and ground.

One hundred and seventy-five Nera cockerels purchased at day-old from a reputable commercial farm in Ibadan metropolis were used in the trial. They were batch-reared to 2 weeks of age after which 156 birds were selected by culling the sickly, and runtish birds. They were randomly allotted in three replicates (mean body weight = 80g/bird) to each of four isonitrogenous diets, viz: Diet 1 (0% CHM, 0% LIM). Diet 2 (7.5% CHM, 2.5% LLM), Diet 3 (11.25% CHM, 3.75% LLM) and Diet 4 (15% CHM, 5% LLM) (Table 1). The diets were offered *ad libitum* for 14 weeks (3-8 weeks of age, starter diets; 9-16 weeks of age, finisher diets). The diets had 18 and 16% crude protein respectively.

Feed intake was measured weekly. Body weight gain was calculated from initial and final weights. At the end of the experiment, 6 birds were slaughtered per diet. The weight of the eviscerated carcass, gizzard and abdominal fat as well as the intestinal and caecal length were measured. The feed cost/kg gain was calculated using the prevailing market prices of feed ingredients and poultry meat. Data were statistically evaluated by the Analysis of Variance (Steel and Torrie, 1980), and the Duncan's Multiple Range Test (Gomez and Gomez, 1985), was used to detect differences among means.

Results

The results of growth performance of the experimental birds are shown on Table 2. In the starter phase feed intake and body weight gain were similar ($P>0.05$) on Diets 1 and 2 but lower ($P<0.05$) on Diets 3 and 4. Feed conversion was not influenced ($P>0.05$) by CHM/LLM inclusions. In the finisher phase all these parameters and the feed cost/kg gain were unaffected ($P>0.05$) by dietary treatments.

The data on carcass characteristics of experimental birds are shown on Table 4. Diet 4 which contained the highest amount of CHM/LLM mixture yielded heaviest ($P<0.05$) gizzard and longer ($P<0.05$) intestine and caeca. There was no dietary effect ($P>0.05$) on dressed weight and abdominal fat weight.

Discussion

An attempt was made in the present study to use the mixtures of two relatively low-demand but locally available plant materials to replace maize in production diets for cockerels. Homogenous mixtures in terms of crude protein content were achieved through 3:1 ratios of CHM and LLM. Replacement of this iso-protein mixture at 0, 10, 15 and 20% levels in cockerel rations did not influence ($P>0.05$) overall cost-benefit ratio while maintaining similar ($P>0.05$) weight gain to market weight.

It was apparent that feed intake at the finisher level did not differ on the diets due to their ME contents which were quite close. This is in agreement with the NRC (1984) theory that poultry feed intake is inversely proportional to dietary ME content. This hypothesis however failed to prove true for feed intake at the starter phase. That phase also had diets that were more or less equicaloric. This brings up the recent assertions of some workers, Gonzalez-A and Pesti, (1993) that poultry feed intake and dietary energy are not strictly inversely proportional. Other factors beyond dietary energy affect poultry feed intake. One of these which may have also been at work in the present study is dietary crude fibre content. The growing chick particularly is very sensitive to the presence of fibre in the diet (Graham and Aman, 1987).

Table 1: Composition of experimental diets (%)

Ingredients	Diets			
	1	2	3	4
Starter Phase				
CHM	-	7.50	11.25	15.00
LLM	-	2.50	3.75	5.00
Maize	40.00	30.00	26.40	21.30
Full fat soya	19.00	20.70	21.10	21.70
Wheat bran	35.00	31.80	29.50	28.00
Palm oil	-	1.50	2.00	3.00
Common ingredients[1]	6.00	6.00	6.00	6.00
	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein(%)	18.05	18.08	18.08	18.10
	2658	2630	2632	2633
Finisher Phase				
CHM	-	7.50	11.25	15.00
LLM	-	2.50	3.75	5.00
Maize	43.80	37.00	28.80	24.10
Full fat soya	11.50	13.50	13.00	13.80
Wheat bran	39.65	32.95	36.15	34.05
Palm oil	-	1.50	2.00	3.00
Common ingredients[2]	5.05	5.05	5.05	5.05
	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein (%)	16.00	16.00	16.00	16.00
ME (Kcal/kg)	2615	2651	2653	2566

1. Contents (%): fish meal, 2.00; bone meal, 2.50; oyster shell, 1.00: vit/min premix, 0.25; salt (NaCl) 0.25. Premix as supplied 'Zoodry' (Roche, Switzerland).

2. Contents (%): fish meal, 1.70; bone meal, 1.85; oyster shell, 1.00; vit./min. premix, 0.25, salt (NaCl), 0.25.

Of particular note is the apparent superiority of bird performance (weight gain) during the finisher stage over the starter. This is in agreement with the observation of Sobamiwa and Longe (1999) that the growing bird utilizes CHM better at the finisher phase. The relatively lower ability of the starter cockerel to cope with fibrous dietary CHM (crude fibre content, >20%, Sobamiwa and Longe, 1994) may be due to its tender age as has been observed in other monogastrics (Graham *et al*, 1988; Farrell, 1994). These investigators respectively reported improved fibre utilization by pigs with increasing age, and higher tolerance of dietary fibre by the laying hen than broiler chickens.

Table 2: Growth performance of cockerels fed leucaena leaf/cocoa husk-based diets.

	Feed intake (g/bird)	Weight gain (g/bird)	Feed conversion ratio	Feed cost kg/gain
Starter Phase				
Diet 1	1282.51^{a}	423.79^{a}	3.03	na
Diet 2	1232.06^{ab}	411.29^{a}	3.00	na
Diet 3	1244.20^{bc}	339.87^{bc}	3.60	na
Diet 4	1190.26^{c}	333.46^{c}	3.57	na
SEM	17.72	19.91	0.19	na
Finisher Phase				
Diet 1	4806.75	1181.02	4.07	81.26
Diet 2	4976.35	1027.53	4.84	91.05
Diet 3	4954.20	964.94	5.13	98.73
Diet 4	5068.06	889.96	5.70	106.05
SEM	153.84	62.83	0.49	17.20

a, b, c Figures in columns with different superscripts differ significantly ($P<0.05$); na = not applicable.

Table 3: Carcass Characteristics of Cockerels fed Leucaena leaf Supplemented cocoa husk-based diets (% live weight).

	Diets				
Parameters	1	2	3	4	SEM
Abdominal fat	0.40	0.14	0.06	0.00	0.14
Dressing percentage	67.75	66.12	66.78	64.42	0.85
Gizzard Weight	2.49^{c}	2.66^{bc}	2.97^{ab}	3.29^{a}	0.14
Intestinal length (cm/100g b.wt)	2.28^{b}	2.60^{ab}	2.79^{ab}	3.16^{a}	0.17

abc Figures in rows with different superscripts differ significantly ($P<0.05$).

b.wt. Body weight.

The very low amount of abdominal fat recorded in this study on all diets is characteristic of cockerels. Enlarged gizzard and longer intestine and caeca are indicative of the fibrous nature of diets as have been reported with fibrous feeds (Longe, 1986; Lien *et al*, 1992).

The present study indicates the potential for CHM/LIM mixtureto partially substitute for maize in a cost-effective way in production diets for cockerels. Since maize undergoes periodic high cost annually in

Nigeria, this mixture may become useful in practical diets at times of high price of maize. What informed the idea of the mixture is the need to augument the crude protein content of CHM in making it a partial substitute for maize in poultry rations without reverting to costly soyabean meal or groundnut cake to balance for the deficit.

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