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REPLACEMENT VALUE OF COCOA HUSK MEAL FOR MAIZE IN DIETS OF GROWING PULLETS

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Target audience: Poultry farmers, livestock feed millers, poultry nutritionists.

ABSTRACT

The effects of incorporating cocoa husk meal (CHM) at the expense of maize in isonitrogenous diets of growing pullets were investigated. The feeding trial lasted 16 weeks and involved 108 10-week-old Nera pullets. They were reared to 20 weeks of age on the control diet (CD) and 100, 150 and 200 g/kg CHM diets (CHMDs) in which CHM replaced maize. From 21 to 26 weeks of age all birds were raised on a common 18 % corn-soyabean meal layers mash. Up to week 20, all CHMDs depressed ($P < 0.05$) weight gain and feed efficiency. Percentage egg production to week 20 was higher on CD but egg weight was lower ($P < 0.05$). Feed cost per bird was at least 10% higher and onset of lay faster on CD than on the other diets. By week 23, egg production, egg weight and mass, and feed intake were similar in all treatments. Feed efficiency was lower ($P < 0.05$) on the 200 g/kg CHMD than on the control by week 23. By week 24, however, this depression had disappeared. These results indicate (1) a rapid overcoming of the effects of dietary CHM by the growing pullet during the egg laying phase (2)up to 200 g/kg CHM could be incorporated in growing pullets' mash at the expense of maize without jeopardizing subsequent laying performance and with significant cost-saving effect.

Key words : Cocoa husk meal; pullet growth; laying performance

DESCRIPTION OF PROBLEM

The tremendous potential of crop residues (at least 52 million tonnes in quantity) in upholding the aims of livestock production in Nigeria has been highlighted (1). Cocoa husk meal (CHM) is a by-product derived from cocoa-pod husk, through slicing or chopping and drying when in the fresh state. Estimates by various investigators have put the amount of cocoa-pod husk that goes to waste in Nigeria's cocoa farms annually at about one million tonnes on dry weight basis.

Several reports have been made on the possible inclusion of CHM in livestock feeds. An extensive review on this (2) showed that whereas the

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broiler and the laying chickens have been subjects of many CHM studies, information is scarce on the growing pullets. But apparently, the energy diluent nature of CHM (2) should allow for relatively more use of it in the diet of growing pullets, due to their lower dietary energy requirement (3). Hence this study investigated the effects of including 100, 150 and 200 g/kg CHM at the expense of maize in isonitrogenous growing pullet diets.

MATERIALS AND METHODS

Freshly broken cocoa-pod husks were collected from the Fermentary Unit, Cocoa Research Institute of Nigeria, Ibadan. Processing was as previously described (4). 108 ten-week-old Nera pullets were allocated in triplicates in a completely randomised design to four isonitrogenous dietary treatments. The treatments were equalized for weight (average of 0.7 kg body weight per bird). The rations included the control diet (CD) and 100, 150 and 200 g/kg CHM diets in which CHM replaced maize. The composition of these diets is shown in Table 1.

Table 1. Composition of Experimental diets (%)

Ingredients	Growing pullets				
	Control	100g/kg CHM*	150g/kg CHM	200g/kg CHM	Layers
Cocoa husk meal	0.00	10.00	15.00	20.00	
Maize	57.80	48.00	38.00	33.00	
Soybean meal	17.05	18.13	18.68	19.20	28.00
Corn bran	32.40	31.32	30.77	30.25	26.15
Oyster shell	1.50	1.50	1.50	1.50	5.60
Bone meal	0.50	0.50	0.50	0.50	8.00
Salt (NaCI)	0.30	0.30	0.30	0.30	1.80
Vitamin/mineral					0.30
Premix**	0.25	0.25	0.25	0.25	.25
Methionine	-	-	-	-	0.10
	100.00	100.00	100.00	100.00	100.00
Calculated analyses(%)					
Crude protein	15.06	15.06	15.06	15.06	18.10
ME(Kcal/kg)	2716	2594	2501	2433	2716
Ca	0.78	0.82	0.83	0.85	3.65
P	0.47	0.45	0.45	0.44	0.58
Methionine	0.28	0.27	0.27	0.26	0.40
Lysine	1.65	1.35	1.20	1.04	0.90

* Cocoa husk meal

** Agricare premix,Pfixzer Products Plc, Ikeja, Lagos, contains the following vitamins,A, D3,E,B12 and riboflavin; pantothetic, nicotinic, and folic acids, choline chloride and selenium; P, Ca, I, Cu, Mn, Zn, Fe, Teramycin, anti-oxidant and anti caking agent.

The four diets were fed to the birds up to 20 weeks of age. Thereafter, all groups were switched to a common 18 % crude protein corn-soya bean meal layers' mash to 26 weeks of age. During the 16-week trial, the birds were kept three per battery cage. Three adjacent cages constituted a replicate. Feed and water were supplied *ad libitum* .

Body weights of birds were measured at the beginning of the experiment and at the end of weeks 20 and 26. Feed intake was measured weekly per replicate. Feed efficiency was calculated for weeks 10 to 20 and for weeks 21 to 26. Each set of three birds housed together was weighed on the day the first egg was laid. Age of birds at first egg was also noted. Total number of eggs produced per replicate from first lay to the end of week 20 was recorded.

Feed cost from week 10 to 20 was calculated per replicate using the market value of ingredients. The price of CHM was established using that of a similar feedstuff, rice bran. During weeks 21 to 26 the following parameters of production were measured: percentage egg production, egg weight and mass, feed intake and efficiency. Results were statistically evaluated by analysis of variance (5) while differences among means were detected using Duncan's multiple range test (6).

RESULTS AND DISCUSSION

Data on the growth phase are shown in Table 2. All CHMDs depressed ($P < 0.05$) weight gain to 20 weeks of age. Since all diets were isonitrogenous, this depression presumably reflected the ME content of the diets (Table 1) which was appreciably higher on CD. The ME contents of CHMDs were lowered across the treatments as CHM replaced maize. This was not unexpected because of the marked difference in the ME contents of CHM and maize (i.e. ME 2,000 vs 34,000 kcal/kg)(2). Similar reports of increased weight gain during the growing phase due to higher dietary energy have been made for pullets (7) and for broilers (8).

Feed intake (FI) was identical up to 20 weeks of age on all treatments. However, FI was expected to rise as ME content decreased across treatments in accordance with NRC theory (9) that FI of poultry is inversely proportional to dietary energy content. Similar FI on all dietary regimen corroborates recent assertions by some investigators (7, 11) that poultry FI and dietary energy are not strictly proportional.

Feed efficiency (FE) was best ($P < 0.05$) on CD up to 20 weeks of age. CD was however the most expensive feed being 15 % costlier than the 200 g/kg CHMD (Table 2). Also, feed cost per bird during this period was at least 10 % higher on CD than on any CHMD.

The early-lay characteristics up to 20 weeks of age are presented in Table 2. Onset of lay was longer ($P < 0.05$) on 150 and 200 g/kg CHMDs occurring at week 20 in comparison to week 18 on CD and 100 g/kg CHMD. This trend was very close to that of weight gain and bears some relevance to the remark of Summers and Leeson (12) that pullets may come into production early often due to heavier weights (i.e. faster rate of growth).

Table 2: Growth performace and cost of production of growing pullets fed cocoa husk-based diets during 10-20 weeks of age.

	Cocoa husk meal (g / kg)				
Parameters	0	100	150	200	SEM
Feed intake (g/b/d)	68.0[b]	68.0[b]	67.3[b]	71.3[a]	1.22
Weight gain (g/b/d)	12.6[a]	9.7[b]	8.8[b]	9.0[b]	0.65
Feed:gain	5.4[b]	7.1[a]	7.7[a]	8.0[a]	0.29
Feed cost (N/kg)	19.4	17.9	17.2	16.4	na
Feed cost (N /b /10wks)	92.4	82.9	80.9	81.9	na
Age at first egg (wks)	17.7[b]	18.0[b]	20.0[a]	19.7[a]	0.3
Body weight at first egg (kg /bird)	1.4[a]	1.3[b]	1.3[b]	1.3[b]	0.1
Egg production to week 20 (%)	36.3[a]	19.0[ab]	2.0[b]	5.3[b]	10.4
Average egg weight to week 20 (g)	32.0[b]	34.7[ab]	42.3[a]	40.7[a]	2.2

* (g / b / d) refers to g /bird /day

ab: Means differently superscripted differ significantly ($P<0.05$)

na: Values were not statistically analysed

Egg production up to 20 weeks of age was higher ($P < 0.05$) on CD while egg weight was lower ($P < 0.05$). Apparently, the higher egg production on CD accrued from earlier onset of lay. However, these eggs were very small (average of 32 g) and of less economic value. According to Keshavarz (13) faster onset of lay has the benefit of increasing the number of eggs produced but has the drawback of yielding small-sized eggs during the early stages of egg production, which do not have real market value.

Table 3 presents data on indices of egg production performance during weeks 21 and 23. The data for week 23 represent a critical point of interest in the whole study as the production parameters i.e. percentage egg production, egg weight, egg mass and feed intake, equalized on all diets and the trend continued to week 26 when the trial ended. Feed efficiency was lower ($P < 0.05$) on the 200 g/kg CHMD than the control by week 23. By week 24, however, this depression had disappeared.

The results indicate that the limitations which arose from feeding CHM-based diets to pullets during weeks 10 to 20 of age were mostly overcome within two weeks (i.e. by 22 weeks of age) following a change to a common layers' mash. This interesting trend whereby laying pullets rapidly overcame the residual effects of grower feeding regimen has been reported previously (7, 12).

Table 3: Laying performance of pullets reared on different dietary levels of Cocoa husk meal during the growing stage.

Cocoa husk meal (g/kg)	Egg production(%)	Egg weight (g)	Egg mass (g /b /d) (EM)	Feed Intake(g/b/d) (FI)	Feed efficiency (EM/FI)
		Week 21			
0	29.5[a]	47.0[b]	19.2[a]	78.5[a]	0.19[a]
100	14.6[b]	45.7[b]	10.0[b]	73.9[a]	0.15[b]
150	13.4[b]	49.0[a]	6.4[c]	78.6[a]	0.08[c]
200	7.7[c]	49.3[a]	8.7[bc]	75.1[a]	0.05[d]
SEM	1.2	0.9	1.6	2.6	0.01
	*	*	*	ns	*
		Week 23			
0	62.4	50.0	31.2	85.8	0.36[a]
100	56.7	50.0	22.5	90.0	0.24[a]
150	51.6	50.3	24.3	89.4	0.27[a]
200	40.3	47.7	18.8	89.9	0.20[b]
SEM	7.9	1.3	6.9	2.6	0.01
	ns	ns	ns	ns	*

abc: Means in the same column within the same week differently superscripted differ significantly ($P < 0.05$).

* Values above this symbol are different'($P < 0.05$).

ns: Values above these letters are not different.

CONCLUSIONS AND APPLICATIONS

From the study, the following deductions and applications are deductible viz:

1. A rapid overcoming of the effects of dietary CHM by the growing pullets occured during the egg laying phase.
2. Up to 200 g/kg CHM could be used to replace maize in pullet growers' mash without jeopardising subsequent laying performance.
3. Significant saving in cost could accrue from partial replacement of maize with CHM in growing pullet diets.

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