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KOLA-POD HUSK AS A PARTIAL SUBSTITUTE FOR MAIZE IN LAYERS MASH

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Target Audience: Smallholder poultry farmers in South Western Nigeria, livestock feed millers, poultry nutritionists.

ABSTRACT

The potential for kola-pod husk (KPH) to partially replace maize in layer diets was investigated. Black Nera hens, 12 months in lay, were used in the 10-week trial. The birds, kept 2 per battery cage, were allocated at 5 groups per dietary teatment in a complete randomised design. The treatments included the control diet (CD, 50 % maize) and three diets in which KPH substituted the maize in CD at 20, 40 and 60% levels. Results revealed that up to 60% maize substitution with KPH had no significant (P>0.05) effect on percentage egg production, egg weight and feed efficiency. Feed intake was higher (P<0.05) at the 40 % maize replacement level (40 MRL) but the diet had superiority (P<0.05) in egg mass production over the control and 20 MRL based diets. The test diets recorded similar (P<0.05) egg shell percentage as CD. Feed cost/kg egg decreased linearly with increased dietary inclusion of KPH. The study suggests that KPH could suitably substitute up to 60 % maize in layers mash with a concomitant increase in profit margin.

Key words: Kola-pod husk; maize; replacement laying hen; performance; economics of production.

DESCRIPTION OF PROBLEM

The continued search for alternative feed resources for poultry in Africa is necessitated by the competition between people and poultry for cereal grains. Several farm and agro-industrial by-products have been evaluated for this purpose in West Africa (1, 2, 3). One of such by-products, cocoa-pod husk (CPH) has shown promises in studies carried out on laying hen diets in Ghana and Nigeria (4,5,6).

Another farm by-product sharing several similarities with CPH but of higher crude protein and lower crude fibre contents is kola-pod husk (KPH) (1, 7). Nigeria produces 70% of world kola (8) consequently the bulk of KPH which is estimated at about 2 million tonnes annually (9).

The present study investigates the partial replacement of maize with KPH in layer diets in South Western Nigeria. This is the region of kola production and it is characterised by smallholder poultry farms which mix own feeds and can therefore easily adopt the findings of the study if found positive.

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MATERIALS AND METHODS

Freshly broken KPH were collected from the Kola Unit of Cocoa Research Institute of Nigeria (CRIN), Ibadan. They were spread on thick polythene under direct sunlight. Sun-drying took 4-6 days.

Table 1. Comparative chemical composition of kola-pod husk, cocoa-pod husk and maize (% DM).

Parameter	Kola-pod[7] husk	Cocoa-pod[18] husk	Maize[19]
Crude protein	10.22(15.00)*	6.00	8.80
Crude fibre	16.43(10.40)	22.00	2.20
Crude fat	1.00 (0.97)	1.00	3.80
Table ash	6.05(6.86)	9.10	2.20[20]
NFE	66.30(66.77)	61.90	83.00
Methionine	0.01 -	0.15[21]	0.20
Lysine	0.17 -	0.24[21]	0.27
ME (Kcal/kg)	- -	2000[21]	3430

*Values in parenthesis for KPH were determined by present authors. 7, 18, 19, 20, 21 values in superscripts are sources of data (See References).

Forty NERA Black chickens in their 12th month of lay were used in the 10-week experiment. The birds were housed 2 per pen; five of this represented a treatment. The diets included the control (CD; 50% maize) and three others in which the maize in CD was substituted with KPH at 20, 40 and 60% levels (Table.2).

Feed intake per replicate group was measured weekly. Eggs were collected daily per replicate and pooled weekly to calculate percentage egg production and average egg weight. Feed efficiency was calculated from the feed intake and egg mass data. During the 5th, 7th and 10th week, 10 eggs were randomly selected per dietary treatment to determine shell percentage. Feed cost and feed cost /kg egg were calculated using the prevailing market prices of feed ingredients. The cost of KPH was fixed at N3.00 /kg since the methods of collection and processing was similar to that of CPH whose cost has been worked out at that price.

Proximate composition of KPH was determined using the AOAC methods (10). Data from the trial were statistically analysed using the Analysis of variance (11), while differences among means were detected through the Duncan Multiple Range Test (12).

Table 2: Diet composition (%)

Ingredients	Maize Replacement level (%)			
	0	20	40	60
Kola-pod husk	0.00	10.00	20.00	30.00
Maize	50.00	40.00	30.00	20.00
Common ingredients[1]	50.00	50.00	50.00	50.00
	100.00	100.00	100.00	100.00
Calculated contents (%)				
Crude protein	17.46	17.60	17.74	17.88
M.E. (Kcal/kg)[2]	2555	2493	2431	2369
Crude fibre	4.30	5.75	7.20	8.65
Methionine	0.26	0.24	0.22	0.20
Lysine	0.78	0.77	0.76	0.75

[1] Common ingredients contained in percentages: Soyabean meal, 10.00; Groundnut cake, 7.00; Fish, 2.00; Wheat bran, 10.00; Brewers Spent Grain, 10.00; Oyster shell, 8.20; Bone meal, 2.25; Salt (NaCl), 0.30; Vit. Min. Premix, 0.25.
Premix (Agricare-Mix, Pfizer Production Plc, Lagos) contained: Vitamins A, D3, K, B12; riboflavin; panthotenic and folic acids; iodine; copper; zinc; anti-oxidant; anti-caking-agent; terramycin, yold colourant.

[2]Estimated for kola-pod husk using the formula by Pauzenga (21): ME (Kcal /kg) = 37 x % crude protein + 81.8 x % crude fat + 35.5 x % NFE.

RESULTS AND DISCUSSION

The results of this premier study on KPH as a feedstuff in layer diets are presented in Table 3. They revealed that up to 60% maize substitution with this farm waste product had no significant ($P<0.05$) effect on percentage egg

Table 3. Performance and economic returns of laying hens on experimental diets

Parameter	Maize Replacement Level (%)				
	0	20	40	60	SEM
Feed intake (g/bird/day)	110.4^{b}	106.8^{b}	119.6^{a}	110.4^{b}	7.6
Parcent egg production (%/ bird/ day)	67.5^{ab}	64.5^{b}	71.3^{a}	68.3^{ab}	5.4
Egg weight (g)	57.6	60.3	58.9	58.3	3.1
Egg mass (g/bird/day)	38.4^{b}	38.2^{b}	41.9^{a}	40.0^{ab}	3.5
Feed efficiency (egg mass / feed intake)	0.36	0.37	0.36	0.37	0.03
Egg shell percentage	9.0^{ab}	9.4^{a}	8.7^{b}	8.9^{b}	0.6
Feed cost (₦/25kg bag)	498.3	455.0	412.5	370.0	-
Feed cost/kg egg (₦)	57.4	51.0	47.1	40.9	-

[ab] Means in the same row with different superscripts are significantly different ($P<0.05$).

production, egg weight and feed efficiency. Feed intake was higher ($P<0.05$) at the 40% maize replacement level (40MRL) but the diet had significant

($P<0.05$) superiority in egg mass over other treatments except the 60MRL.

The test diests recorded similar ($P<0.05$) egg shell percentage as the control. Feed cost /kg egg decreased with increasing dietary inclusion of KPH. It was apparent that the birds on the 40% consumed significantly more feed to compensate for their higher ($P<0.05$) egg mass. What triggered the superior egg mass production could not be readily explained.

Birds of the same age and strain are expected to produce eggs of similar weight (13). Therefore it was not surprising that all treatments recorded equal ($P<0.05$) egg weight.

Feed efficiency may not speak much about the expected economic performance of a diet yet it is a good indicator of biological efficiency. The similarity of this parameter on all diets indicate they were equivalent in biological efficiency.

An excellent alternative measurement of egg shell thickness is the egg shell percentage (14). The results of this trial showed that MRL of up to 60% with KPH in layers mash will support equal shell thickness (or strength). Shell strength has been related to the percentage of broken eggs (14) which is of economic implications.

The combination of similar feed efficiency and lowered feed cost /kg egg of the test diets in comparison with the control is a welcome development. It indicates the biological and economical suitability of the use of KPH in partial replacement for maize up to 60% in laying hen diets.

When results are compared, the data in the present study showed KPH to be superior to CPH in supporting the productive performance of the laying hen. The reports (4, 5, 6 and 15) revealed that CPH could replace 10 - 40 % of the maize in layers mash. The observations of maize replacement level of up to 60% made in the present study may be due to the combination of low crude fibre and higher crude protein contents of KPH compared to CPH (Table 1). Increasing dietary fibre content is an energy diluent which has a detrimental influence on productive performance of the laying hen (15). On the other hand since egg is a high-protein material, high dietary crude protein levels enhance egg production parameters as found in this study for KPH relative to previous reports for CPH.

It should be noted that kola production is concentrated within South Western Nigeria. For comparative advantage, the use of KPH in layers mash may be restricted to the smallholder poultry farms of this region. The smallholder poultry farms constitute the majority of poultry farms in Nigeria (17). The logistics will not be complex since many of these farms mix own feeds. The farmers are likely to find the adoption of these results economically rewarding especially during the off -season of maize when prices jump to as high as 150 %.

CONCLUSIONS AND APPLICATIONS

Based on the results of this study, the following deductions and applications can be made:

1. Up to 60% maize replacement with KPH is suitable in layer diets.
2. Significant savings in cost could accrue from partial replacement of maize with KPH in layer diets.
3. Smallholder poultry farmers in South Western Nigeria who mix own feeds will find the adoption of these results easy and worthwhile.

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