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Effect of Feeding Pullet Chicks Cotton Seed Cake with or Without Fish Meal Supplementation

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Abstract: Two hundred and forty day-old black pullet chicks were fed diets in which Cotton Seed Cake (CSC) was used to replace soyabean meal at 0, 5, 10 and 15% in diet respectively; and the effect of supplementing such diets with fishmeal assessed. Eight experiment diets were used in achieving this aim during the 8 weeks feeding period. The chicks on the cotton seed cake replacement for soyabean meal had comparable ($p>0.05$) feed intake while the body weight gain and feed to gain ratio values were significantly different ($p<0.05$) to those of the chicks on the control diet. The feed cost kept declining with the higher levels of cotton seed cake in the diet. The chicks fed on fish meal supplemented diets had a better feed to gain ratio and profitability than chicks fed the zero fish meal supplementation. Protein retention kept decreasing as the level of cotton seed cake inclusion increased in the diet. Birds fed 1.5% fish meal supplemented diets had better protein retention. It was concluded that 15% of soyabean meal in pullet chicks ration can be replaced by cotton seed cake and supplementation of the diet with 1.5% fishmeal will improve performance.

Key words: Cotton seed cake, fish meal, pullet chicks, supplementation

Introduction

The poultry industry has undergone a remarkable growth over the years. However, the expansion of the industry has been hampered by fluctuation in supply of good quality feed. The high cost of food items, is a major reason for the high incidence of hunger and mal nutrition among the poor, especially in the under developed countries.

Efforts to reduce the high cost of feeds and the cost of poultry products have concentrated on using alternatives/unconventional feed stuffs (Adeniji and Balogun, 2001). One of the primary purposes of keeping livestock is to transform feedstuffs usually not wanted by man into high quality products like meat, milk and egg (Adeniji, 1996). Feed is therefore established as an agent for body size development, productivity of laying hen, colour of skin body fat, egg yolk and also to a limited extent the flavour of the meat and egg (Ibigbemi and Seth, 1991). Oluyemi (1985) reported that apart from genetic component of birds, the quality of the feed is the primary factor that determines the rate of growth of birds. Cotton seed cake is a by-product of cotton seed processing for oil. It's the residue from oil extraction and it is a protein rich feedstuff. Cotton seed cake is obtained from cotton after the removal of the nut followed by oil extraction from the seed either by solvent or mechanical method. It could be decorticated or undercorticated. The decorticated is higher in fibre and lower in protein. Cotton seed cake has 41-45% protein depending on the method and efficiency of oil extraction. Cotton is widely cultivated with the cake available and cheaper than most other protein supplements.

The cotton seed cake (*Gossypium species*) is one of the wide range of alternative feeding stuffs which is of the agro industrial origin whose composition, method of processing and nutritive value are being used for livestock feeding (Albreecht *et al*., 1970).

Fish meal is a very rich source of protein in diets of poultry. Although it is a conventional feedstuff but it is often used as supplements in livestock diets in order to boost its protein level. Fish meal is very rich in lysine and it is used extensively in poultry diets before the advent of commercially produced vitamin B_{12} (Ballon, 1980).

This study was therefore aimed at determining the optimum dietary level of cotton seed cake that pullet chicks can tolerate, the effect of fish meal supplementation on the performance of pullet chicks fed cotton seed cake diets and to reduce the cost of pullet chicks feed by replacing soyabean with cotton seed cake.

Materials and Methods

Two hundred and forty, day-old pullet chicks were raised in cages in the experiment that lasted for a period of eight weeks. On arrival, the birds were given anti-stress and glucose for a period of five days.

The test feed stuff cotton seed cake contained on analysis 37.52% crude protein, 1.2% ether extract, 11% crude fibre and 6.5% ash.

The eight experimental diets (Table 1) were such that Cotton Seed Cake (CSC) was fed to replace 0. 5, 10 and 15% of dietary soyabean meal with 2 levels of fish meal supplementation; (4×2 factorial experiment was adopted that is 4 level of cotton seed cake and 2 levels of fish

Table 1: Composition of Experimental Diet (Kg/100kg)

	Diets							
Ingredients	1	2	3	4	5	6	7	8
Maize	45	45	45	45	45	45	45	45
Corn barn	10.15	10.65	8.5	8.5	8.0	6.65	6.65	6.65
Wheat Offal	10	10	10	10	10	10	10	10
Cotton seed cake	0	0	5	5	10	10	15	15
Soyabean meal	27.5	27.5	22.5	22.5	17.0	17.0	11.5	10.5
Fish meal	0	1.5	0	1.5	0	1.5	0	1.5
Blood meal	2.0	0	3.65	2.15	4.65	4.50	6.50	6.0
Oyster shell	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Bone meal	3	3	3	3	3	3	3	3
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100	100	100	100
Analyzed Proximate values								
Crude protein %	22.65	22.59	20.76	21.97	21.21	20.95	22.61	22.75
Ether Extract %	4.42	4.35	3.85	8.20	5.30	4.25	3.75	4.10
Crude fibre %	5.5	5.25	6.05	6.90	5.40	7.40	6.70	7.35
Total ash %	9.45	9.20	9.50	11.81	9.50	8.75	9.05	8.07
Moisture content %	9.2	8.37	9.21	8.77	9.24	9.06	8.94	8.50

Delavit Premix which contained the following per Kg: Vit A; 4,000,000IU; Vit D: 8,000,000 IU; Vit E: 10IU; Vit K: 1'IU; Vit B_1: 0.48g; Vit B_2: 1.12g; Nicotinic acid: 6.4g: Folic acid: 0.16g; Biotin; 0.01g; Vit C: 24g; Chlorinchloride: 4.8g; Zinc: 6.4g; Min: 16gg; Fe: 10g; Copper: 0.32g; I:0.25g; Co: 0.04mg: Se:0.16mg

Table 2: Performance Characteristics of Pullet Chicks Fed Cotton Seed Cake with or Without Fish Meal Supplementation

Dietary treatment Levels of C.S.C. (%)	Initial body wt. (g/b/d)	Final body wt. (g/b/d)	Feed intake (g/b/d)	Body wt. gain (g/b/d)	Feed to gain ratio	*Feed cost 1kg of diet (N)	Cost of rearing the birds (N)	Selling price (N/kg)	Gross profit (N)	Profitibility (%)
0	50.10	343.40	37.46	5.24^{b}	7.15^{b}	43.67	236.99	264.28	14.00	5.30
5	50.20	446.89	35.52	7.08^{a}	5.02^{a}	41.64	227.02	343.92	92.72	26.96
10	50.23	487.40	38.68	7.81^{a}	4.95^{a}	40.29	221.10	375.10	109.54	29.20
15	50.13	489.47	40.10	7.85^{a}	5.12^{a}	38.76	214.11	376.69	111.90	29.71
SEM			6.07^{NS}	1.82	0.05					
Fish Meal levels (%)										
0	50.18	450.62	38.51	7.15^{a}	5.38^{b}	38.60	214.15	346.80	94.45	27.24
1.5	50.17	459.76	37.59	7.31^{b}	5.14^{a}	42.30	209.32	353.83	89.54	24.95
SEM			5.74^{NS}	1.36	0.04					
Interaction CSC×FM			N.S	N.S	N.S					

•not analyzed, Mean in the same column followed by the same superscripts are not significantly different, N.S-Not significant, C.S.C.- Cotton Seed Cake, F.M.-Fish Meal, *1$ = N130 (As at September, 2006 when the experiment was conducted)

meal supplementation). 0.05% ferrous sulphate was added to each diet to block the anti nutritive effect of gossypol in cotton seed cake (Claivson *et al.*, 1977).

Feed and water were supplied *ad libitum* throughout the experimental period. Gumboro vaccine was administered orally at 2nd weeks of age and the booster given at the 5th week. Lasota was administered orally at the 3rd week while Kumorov was given intra- muscularly at the 6th week of age. Fowl pox vaccine was administered by wing stabbing at the 4th week of age. All vaccinations were followed by oral administration of anti-stress for 4 days.

Nutrient retention trial was conducted at the last week of experiment. The cage was constructed such that the underneath has fine wire mesh to trap the faeces and it was collected in a tray. The total feacal collection method was adopted in which feacal samples were collected over 3 consecutive day.

Records kept include: Initial body weight, weekly weight gain and daily feed intake. Feed to gain ration and feed costs were calculated. Proximate analysis of the test ingredients, the diets and faecal samples was carried out using the procedures described by A.O.A.C. (1980). Data obtained for each response criterion were subjected to analysis of variance appropriate for the factorial design and where significant treatment mean were compared by the Duncan's multiple range test (Steel and Torrie, 1980).

Results

The effects of feeding pullet chicks cotton seed cake with or without fish meal supplementation are presented in Table 2. Although, it appeared that the birds consumed more feed as the level of cotton seed cake (C.S.C.) increased in their diets, these difference in values were not significant ($p>0.05$). The feed intake values ranged

Table 3: Effects of Feeding Cotton Seed Cake and Fish Meal Supplementation on Nutrient Retention by Pullet Chicks

Dietary Treatment	Protein Retention %	Fat Retention %	Crude fibre Retention %
Levels of C.S.C.,%			
0	70.94[a]	80.85[ab]	27.96[c]
5	72.38[a]	84.37[b]	53.38[b]
10	67.84[a]	83.78[ab]	22.00[a]
15	61.39[b]	76.80[a]	18.95[a]
SEM	1.59	1.97	1.55
Fish meal Levels, %			
0	66.56[a]	83.38[a]	20.77[a]
1.5	68.50[a]	80.27[a]	28.58[b]
SEM	1.12	1.39	1.09
Interaction			
C.S.C.×FM	N.S	N.S	N.S

N.S-Not Significantly different, C.S.C.-Cotton Seed Cake, F.M.-Fish Meal

between 40.10 and 35.52g obtained from the birds fed the 15% C.S.C. diets and those fed the 5% C.S.C. diet. The interaction between the cotton seed cake and fish meal on feed intake showed no significant difference ($p>0.05$). The feed intake tended to decrease as fish meal increased in the diets.

There was a significant difference on the observed weight gain values ($p<0.05$) of the birds fed on the CSC diets to the birds fed on the control diet. Apart from the birds on the control diet, the weight gain "seem" to be increasing with the higher levels of CSC in their diet. The feed to gain ratio of the birds fed CSC was better ($p<0.05$) than the birds fed on the control diet.

The 10% C.S.C. fed chicks seemed to have utilized their feed better than the other C.S.C. levels. Similarly, the chicks fed 1.5% fish meal supplemented diets had a better ($p<0.05$) fed to gain ratio of 5.14 compared with chicks fed with no fish meal with a ratio of 5.38.

The feed cost dropped, with the increase in the level of C.S.C. in the diet such that the feed cost was N43.67 in the control and N38.76 in the 15% C.S.C. diet. There was no mortality recorded throughout the experimental period.

Also, the cost of rearing the birds decreased with the increased level of C.S.C. in the diets. The chicks that were not fed on fish meal in terms of profitability, the C.S.C. diets tends to be more profitable than the control diet.

Effects of feeding cotton seed cake with or without fish meal supplementation on nutrient retention by chicks are presented on Table 3. The birds fed 15% CSC diet had the lowest. ($p<0.05$) protein retention value of 61.30 of all the C.S.C. fed birds and the control fed birds with 70.94.

Birds fed 5% C.S.C. diets retained the fat better ($p<0.05$) than the control fed birds and the 10% C.S.C. fed birds with values of 84.37 as against 80.85 and 83.78 respectively. The 15% C.S.C. diet had the least retention ($p>0.05$) with a value of 76.8%.

Crude fibre in the 5% C.S.C. diet was better ($p<0.05$) retained with a value of 53.38 as compared with the control, the 10% and 15% C.S.C. diets with values of 27.96, 22.00 and 18.95% respectively.

Diets supplemented with fish meal had a better ($p<0.05$) fiber retention with a value of 28.58 as against 20.77 in diet without fish meal supplementation.

Discussion

The inclusion of cotton seed cake as a protein source for replacing soyabean in pullet chicks diet can be said to be non toxic with little, if not harmful as there was no mortality recorded throughout the experimental period. The 15% CSC level was observed to have the highest intake of feed while the 5% C.S.C. diets had the least feed intake. This could probably be that the birds ate little of the feed to meet its daily nutrient requirements. The higher intake on the 15% C.S.C. could be due to the feed the birds wanted to compensate for indigestibility because the value of (18.95) fiber retained at the 15% was lower and this agrees with Ewing (1963) who reported that a bird consumes more to compensate for indigestibility. Similarly, the decrease in feed intake as fish meal was supplemented in the diet probably implies that fish meal supplementation made the diet more balanced and the chicks retained more of the nutrients hence less the feed consumed.

The weight gain increased with increased levels of CSC. This result agrees with Tanksley and Lyman (1966) who stated that excellent performance has been obtained when cotton seed cake was fed in combination with fish meal. Also, the result supports the findings of Knebe *et al.* (1979) and Haines *et al.* (1977) who have demonstrated that good performance can be obtained when cotton seed meal is used in combination with other quality high protein feed stuffs provided its nutrient content and presence of free gossypol are considered in diets.

The comparable ($p>0.05$) feed to gain ratio in the cotton seed cake diets as against the control agrees with the observation by Baliga and Lyman (1957) and Haines *et al.* (1977) who reported that good performances can be obtained when cotton seed cake is used in combination with other quality and high protein feed stuffs.

The fish meals supplemented diets had a significantly higher ($p<0.05$) feed to gain ratio and this supports the research carried out by the feeds directory U.K. (1955) whereby inclusion of 3.9% fish meal in broiler diets fed to improvement in both feed conversion efficiency and growth. This implied that despite the additional cost incurred on fish meal, the chicks still gained more weight.

The reduced feed cost at higher level of C.S.C. on diets shows that the low price of C.S.C. had a price reduction

effect. The cotton seed cake is a promising feed stuff for it only did not reduce the cost of feed but gave a better feed to gain ratio as against the control. Profitability also increased with higher cotton seed cake based diets.

The higher protein retention in the 5% C.S.C. diet suggests that low level of fibre in the diet was responsible for it. Dietary fibre has been shown to depress intake of utilizable protein (Delorme and Wojeik, 1982).

The fibre retention in the C.S.C. diets was significant ($p<0.05$) with the 5% having a higher retention even better than the control. The cotton seed cake diets had a comparable fat retention with the control but the diets supplemented with fish meal retained the fat better than those without fish meal in their diets.

It can be concluded that 15% of soyabean meal in pullet chicks diet can be replaced by cotton seed cake. The chicks on the 15% CSC diets had a insignificant ($p<0.05$) feed to gain ratio of 5.12 and with the highest profitability of N29.71. Fish meal should be included in the diet as a supplement at 1.5%. Birds on 1.5% fish meal supplemented diets exhibited a better ($p<0.05$) feed to gain ratio and a profitability of N24.95 despite the additional cost of fish meal.

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