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Nutritional and Economic Implications of Cashew Reject Meal in Diets of Laying Chickens

[a]Taiwo Akande, [b]Akinyinka Akinwumi and [a]Taye Abegunde

[a]Department of Animal Science Obafemi Awolowo University Ile-Ife, Osun State, Nigeria
[b]Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria.

Introduction

The subject of feed resources and their utilization represents possibly the most compelling task facing producers and scientists in poultry industry. The search for solutions is hinged on the concept of self-reliance which strives to achieve sustainability based on the use of indigenous resources. Cashew (*Anacardiaceae*) nut is an important industrial and export crop which rank third in world production of edible nuts that are traded globally. Global production is estimated by FAO at over 4M metric tonnes and Nigeria produced 19.5% of the world total (FAO, 2012).

The upsurge in the consumption of the cashew nut and its industrial applications has resulted in large-scale production for local consumption and export. However, during processing, large quantities of the kennels are discarded because they are not suitable for sale as a result of bruises, oiliness or because they are scorched during the drying process. It was estimated that up to about 30% of kernels may be lost in this manner depending on the quality of nuts. Although not suitable for sale, these reject cashew kernels have found application in animal feeding (Odunsi et al 2002, Ojewola et al 2004). According to Nambiar et al 1990, cashew nut proteins are complete; having all the essential amino acids and a kilogramme of the nut yields about 6000 calories.

The increased turn over from cashew production firm worldwide in recent times coupled with high nutrient profile of the defatted meal are good indication that cashew kernel meal could be an additional protein feedstuff for farm animals (FAO 2007, Olunloyo 1996). Concerted effort is required to develop cashew nut as additional protein source for animals to minimize the incorporation of the highly priced conventional plant protein resources in animal feed. Hence, the objectives of this study were to examine nutritional value of cashew reject meal (full fat and defatted) and their economic implication in diets of laying chickens.

Materials and Methods

Experimental site and Sample collection

The experiment was carried out at the Poultry Unit, Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Nigeria between March and May, 2012. The cashew reject meal was purchased from Olam Nigeria Limited, Oyo, Oyo State, Nigeria. The nuts after processing were graded according to quality. Those ones not suitable for human consumption are regarded as reject and were purchased for this study. Two batches were collected, one batch was defatted using hydraulic press to obtain defatted cashew reject meal (DCRM) and the second left undefatted as full fat cashew reject meal (FCRM).

Birds Management and Experimental diets

A total number of 84 shavers' pullets at 25weeks of age were procured from a reputable farm and used for the study. The birds were randomly allotted into seven dietary groups and each group subdivided into 6 replicates containing 2 birds each in a battery cage. Birds were stabilized for two weeks to adjust to the new environment before introduced to experimental diets which was supplied *ad- libitum.* All recommended vaccination and preventive medication were administered accordingly. Natural daylight of 12hr lighting regime was in effect throughout the 10-week experimentation. Seven diets were prepared (Table 1) including a standard diet as control. Diets 2, 3 and 4 consist of gradual replacement of GNC with DCRM at 50%, 75% and 100% weight for weight basis respectively while diets 5, 6 and 7 consist of gradual inclusion of FFCRM to replace 25%, 35% and 50% of GNC protein respectively.

Data Collection

The following data were collected: Chemical constituent of cashew reject meal: proximate composition, calorie level and some antinutritional factors; Performance and egg quality characteristics; some serum constituents and economic analysis. The relative worth was calculated from formula proposed by Leeson and Summers (1997).

Table 1: Diet compositions and chemical analysis of test samples

	Control	Defatted CRM diets			Full fat CRM diets			Test samples (Determined)			
Composition,%	0%	50%	75%	100%	25%	37.5 %	50%	Analysis, %	GNC	DCRM	FCRM
Groundnut cake	22.00	11.00	5.50	0.00	16.50	13.75	11.00	Phytic Acid	0.75	0.52	0.50
Defatted CRM	-	11.00	16.50	22.00	-	-	-	Aflatoxin µg/Kg	17.37	10.00	8.75
Full fat CRM	-	-	-	-	10.7	16.0	21.4	Tannin	5.80	1.51	1.02
Fixed ingredients	78	78	78	78	72.8	70.25	67.6	Ash	5.51	5.45	3.73
*Crude Protein	17.50	16.75	16.40	16.00	17.05	16.75	16.45	Crude Protein	43.10	35.40	22.10
*Crude Fat	3.35	4.10	4.30	4.50	4.98	5.20	5.40	Crude Fat	4.30	1.05	0.90
*Crude Fibre	6.54	6.45	6.40	6.38	6.48	6.46	6.44	Crude Fibre	6.00	15.10	40.23
*Metabolizable Energy, kcal/kg	2722	2768	2775	2782	2778	2806	2835	Energy, kcal/kg	4752	5035	6542

DCRM- Defatted Cashew Reject Meal, F-full fat, GNC- Groundnut Cake, *-Calculated analysis

Results and Discussion

Chemical composition of cashew reject meal

Table 1 shows the chemical composition of Cashew Reject Meal (CRM). Its high crude protein affirms its status as high protein feedstuff. The value is higher than value obtained for many oilseeds and compared closely with SBM and GNC (Aletor et al 2007 Akande et al 2012). The lower crude fibre obtained may be as a result of complete separation of the kernel during the shelling process since the roasted kernel was intended for human consumption. The higher calories in CRM may be attributed to higher residual oil content because of mechanical deoiling process used left the defatted cake with about 15% oil. Result of aflatoxin B_1 reveals moderate level between 10 and 17µg/Kg in the samples investigated which did not constitute threat to laying birds. The 1.5% tannin content which is about three times lesser than value obtained for GNC and moderate levels of phytic acid suggest that these toxins are present at low, tolerable levels and do not present any harm to laying hens. The data indicate that the rejected cashew nut could be an important alternative protein and energy contributors to compound animal feed in high producing region.

Performance characteristics of laying birds fed cashew reject meal based diet

Experimental birds increased their feed intake as the energy levels of the diet decreased (Table 2). It was indicative that both defatted and full fat cashew reject meal contain more energetic component than their groundnut counterparts. This is in consonance with results of chemical analysis in Table 1. The significantly ($P<0.05$) lower feed intake recorded for the birds at 100% level of DCRM and 50% FFCRM diets may suggest that residual oil in CRM is high enough to influence voluntary intake. Meanwhile continuous and prolong consumption of high levels of fat may predispose the birds to condition called 'prolapse' as a result of accumulation of fat in laying birds. The lower ($P>0.05$) hen day production in FCDM groups can be associated to the level fat in the diet consumed which did not translate into egg production instead it appears to favor body weight gain. This was also manifested in high fat deposition in birds fed full fat cashew reject meal based diet. Fat deposition is not desirable in laying hens because of the chances of prolapse and possible decrease in egg production which may reduce the net returns to the farmers. For egg weight, the values range from 49.00-53.33g across the treatments with values slightly appreciating in CRM based diets. The similarities ($P>0.05$) in feed to gain ratio across the treatments indicate an equivalent biological efficiency of the diets.

Table 2: Performance characteristics of layers fed cashew reject meal based diets

	Control	Defatted CRM			Full fat CRM			
	0%	50%	75%	100%	25%	37.5%	50%	SEM
Performance Characteristics, g								
Av. body wt gained	10.00^{c}	15.10^{c}	15.50^{c}	44.00^{b}	55.50^{b}	155.20^{a}	144.00^{a}	13.10
Hen day Prod. (%)	63.90^{ab}	67.20^{a}	68.90^{a}	62.70^{ab}	58.60^{b}	55.80^{b}	58.60^{b}	5.00
Feed intake (g/day)	130^{a}	140^{a}	130^{a}	110^{c}	128^{a}	125^{ab}	$115b^{c}$	7.30
Abdominal fat wt	4.34^{c}	4.28^{c}	5.60^{b}	5.97^{b}	5.62^{b}	6.24^{ab}	8.01^{a}	0.55
Feed conversion R.	3.66	4.36	3.38	3.57	3.65	4.16	4.11	0.52
Egg quality								
Egg weight, g	49.7	53.7	53.83	49.00	49.83	53.00	49.00	1.5
Shell thickness, mm	0.33	0.34	0.34	0.33	0.32	0.32	0.34	0.03
Serum composition								
Cholesterol,	55.00	50.00	55.05	62.00	64.00	62.00	65.00	8.50
Protein, g/dl	4.20	3.65	3.95	3.70	3.60	3.70	4.15	0.35
Albumin, g/dl	2.40	2.20	2.00	2.30	2.10	1.90	2.30	0.25

Serum components of laying birds fed cashew reject meal based diets

From Table 3, Despite the high oil content in full fat cashew reject metal, serum cholesterol shows no significant difference across dietary treatments ($P>0.05$). This suggests that full fat soya bean meal is not high in cholesterol, its precursor or factors that influences its synthesis in laying hens. Total protein, albumin and globulin content of the blood were also the same across the treatment ($P>0.05$), meaning that there was no compromise in the health status of birds fed CRM based diets.

Economic analysis

The economic comparison takes into account protein and energy which are usually the major nutrient cost in this diet; these nutrients give 85-90% estimation of overall economic worth. Also corn and soyabean meal are usually the major energy and protein sources in poultry diets, they can be used as basis for comparison (Leeson and Summers 1997). In Table 3, the predicted cost compared to market price provides guidance to buyer on the relative worth of an ingredient. The relative worth of GNC and CRM compared to soyabean meal in this study are ₦97.25 and

₦90.00 respectively in terms of calories and crude protein estimates according toLeeson and Summers (1997). The actual market prices of these plant proteins SBM, GNC and CRM were ₦100.00, ₦85.00 and ₦25.00. It is very obvious that cashew reject meal had a comparable value worth with groundnut cake and at the same time substantially cheaper than groundnut cake. The cost of feed was higher in control than diets containing both DCRM and FFCRM. The values of feed to gain ratio across the treatments and low feed cost of CRM diets reflects the biological and economical suitability of CRM when included in diet of laying birds. For every tonnage of feed compounded in this study, about ₦9,100.00 were saved when defatted cashew reject meal (CRM) was used to replace groundnut cake. Similarly, for every tonnage of egg produced, about ₦49,000.00 could be saved when CRM completely replaced GNC in the diet. The use of CRM in this study appears to justify the assertion by (Ravindran 1995, Egbunike and Ikpi 1988) that non-conventional feeding resources are capable of inducing savings by curtailing feed production costs. Apart from the fact that cashew reject meal was cheaper to groundnut in terms of market value, its biological efficiency is commendable, with little anti nutritional compounds.

Table 3: Economic analysis of using CRM in place of GNC in diets of laying hens

Cost variables, ₦	Soyabean meal	Groundnut cake	Cashew reject meal
Actual market price	100	85.00	25.00
Relative worth	100	97.25	90.00
Av. cost of feed/kg	-	59.71	50.61
Cost of feed / kg egg weight	-	218.53	200.50
Cost save per tonnage of feed	-	-	9,100
Cost save per tonnage of egg laid			18,030

Conclusions and Outlook

In this study, it was demonstrated that defatted cashew reject meal supported satisfactory performance of laying hens at low cost and can be incorporated in the diet of laying birds for complete replacement of groundnut cake. The cost per unit of cashew nut compared to groundnut was significantly lower. Apart from low cost, its biological efficiency is impressive.

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