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Nutritional Evaluation of Two Grades of Defatted Cashew Kernel Reject Meal as Protein Substitute for Groundnut Cake in Broiler Diets

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Abstract
This study was carried out to determine the chemical composition of two grades of defatted cashew kernel reject meal (DCRM) and assess the performance characteristics of broiler chickens fed diets containing two grades of DCRM. The study used 210 day old Arbor Acre broiler chicks which were stabilized on commercial diets of 23% crude protein (CP) and 2900 Kcal/kg metabolizable energy (ME) for 2 weeks before introducedto experimental diets. Birds were randomly assigned to the seven experimental diets which consisted of a control diet without DCRM, Treatments 2, 3, 4 and 5, 6, 7consisted of 33.33%, 66.67% and 100% replacement of groundnut cake (GNC) with grade I and grade II DCRM respectively arranged in a 2 x 3 (plus 1) factorial arrangement. The study lasted for a period of eight weeks. Data were collected on body weight gain (BWG), Total feed intake (TFI), Feed conversion ratio (FCR), Feed cost and returns on investment. The results of proximate composition of both grades of DCRM showedno significant difference in crude fibre, crude protein and gross energy contents and are comparable to GNC. The performance traits measured in terms of BWG, TFI and FCR were significantly different ($p<0.05$) across the treatments with birds on both grades of DCRM showing superior performance than birds on the control diet, with 17.72% and 13.35% higher BWG. Fat deposition was notably ($p<0.05$) higher in birds fed DCRM. In economic terms, the use of DCRM reduced the heightened cost of production by 9.1%. It wasconcluded that grade I DCRM in this study could completely and favourably replace GNC in diets of chicken in terms of higher growth rate, efficiency of feed utilization and low cost.

Keywords: Defatted cashew kernel, groundnut cake, protein, broilers

Introduction
In Nigeria, the feedingpotentials of cashew kernel reject meal CRM, as animal feed ingredient has been grossly undermined. Industrially, about 30-35% cashew kernel is often discarded either as broken or scorched kernels during processing for failure to meet export or local requirement grade. Nevertheless, these rejects have high nutritional profiles for use as plant protein source for animals and are considerably available to support the expensive conventional plant protein. Scanty works have been reported on its feeding potential formonogastric animals (Ojewola *et al.,* 2004*;* Akande *et al.,* 2015*;* Carlose *et al.,* 2015*).*

Cashew ranks third in world production of edible nuts with the estimated global production of 4,439,960 metric tons and Nigeria, highest producer in Africa, ranked third on a global scale (FAO2013). FAO records alsoshow that both production and yield of groundnut, have continue to drop since 2006 in Nigeria whereas cashew nut has continued to enjoy a consistent rise in production.

The growing interest in cashew may be partly ascribed to the supposed dual role of the kennel which found application in the confectionery industry as an important source of lipids and protein (Yahaya*, et al* 2012).The nut yields two important oil; the edible Cashew kernel oil (Achal, 2002) and Cashew nut shell liquid with wide industrial applications (Ojeh 1985).Now, the defatted cake is being consideredas livestock feed. About three grades of cashew kernel reject are industrially accessible however, these grades have not been differently tested to indicate their suitability in diets of broiler chickens, hence this study.

Materials and Methods
The experiment was carried out at the Poultry Unit, Teaching and Research Farm, Obafemi Awolowo University Ile- Ife, Osun State Nigeria. One hundred and fifty kilogram each of grade Iand grade II cashew kernel rejects was purchased from Vallency Cashew Processing limited Ibafo Ogun State. Both grades were milled separately using a milling machine thereafter, were loaded into muslin clothand then mechanically pressed using an oil screw press machine for 6 hours per loading to facilitate oil extraction. Both oil and cake were preserved for subsequent use and analysis. A total of 210-day old Arbor Acre broiler chicks were procured from a reputable

farm for this study. The chicks were stabilized for 2 weeks on commercial diets 23%CP and 3000 Kcal/kg. All routine vaccination and necessary medications were applied. Birds were weighed and randomly allotted to the 7 dietary treatments. Feed and water were offered *ad libitum* for six weeks in a deep litter house. Seven experimental diets were formulated for the study. The gross composition of experimental diets for broiler starter and finisher phase are as shown in Table below.

Table 1: Experimental diet for broiler finisher

DCRM	Control	Grade I	Grade I	Grade I	Grade II	Grade II	Grade II
Level of replacement	0%	33.33%	66.67%	100%	33.33%	66.67%	100%
Maize	60.00	57.50	55.00	53.00	57.50	55.00	53.00
Cashew reject meal	-	12.50	25.00	37.00	12.50	25.00	37.00
Ground nut cake	30.00	20.00	10.00	0.00	20.00	10.00	0.00
Fixed Ingredient	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated Analysis %							
Crud protein	21.70	21.50	21.35	21.20	21.50	21.35	21.20
ME(Kcal/Kg)	3005.81	3012.82	3004.95	3000.31	3012.82	3004.95	3000.31
Calcium	1.24	1.35	1.28	1.26	1.35	1.28	1.26
Phosphorus	0.45	0.48	0.44	0.41	0.48	0.44	0.41
Lysine	0.90	0.77	0.68	1.63	0.77	0.68	1.63
Methionine	0.59	0.55	0.49	0.44	0.55	0.49	0.44
Crude fibre	3.11	2.51	1.98	1.52	2.51	1.98	1.52

ME= Metabolizable energy, DCRM –defatted cashew reject meal, FI (fish meal=2%, wheat offal=2%, palm kernel cake=2%, bone meal=2%, oyster shell=1%, Methionine.=0.25%, Lysine.=0.2%, premix.=0.25%, salt=0.3%),

On weekly basis, measured feed was given to experimental birds and at the end of each week, feed remnant was weighed back feed intake was calculated by their difference. Records of weight gain, feed intake, and feed to weight gain ratio were kept on treatment basis. The economic implication was determined by current prices of feed ingredients. Data collected were subjected to analysis of variance using the procedure of SAS (2009) while significant differences in means were separated using Duncan's multiple range tests.

Results and Discussion

The proximate composition of both grades of defatted cashew kernel rejects meal and groundnut cake is as shown in Table 2. The results of chemical screening of both grades have shown that their nutrient profile is quite suitable, comparable to groundnut cake and should be adequate to meet the requirement of broilers as demonstrated in the performance traits. However, higher ether extract showed that extraction method of oil from kernel need to be improved upon. Notably, the higher crude fibre in grade II may not support adequate utilizationby young chicks. The determined nutrient content of the DCRM obtained in this study was slightly at variance with the findings of Fetuga *et al*. (1974) but closely related to the findings of Ojewola *et al*. (2004). Various factors ranging from the processing method, length of storage and species difference could be responsible for such variation.

Table 3 showed the performance traits of broiler chickens fed two grades of DCRM at varying inclusion levels. All performance traits measured showed significant differences ($p<0.05$) across the treatments. Nevertheless, the results reveal that there were no significant interaction effect in terms of inclusion level and grades of DCRM across all the treatments. The BWG of birds on both grade I and II DCRM had superior performance than birds on the control diet with 17.72% and 13.35% increase respectively. Conversely, in an experiment involving broiler chickens fed different levels of reject cashew kernels, the report showed that there were no significant differences ($p>0.05$) across treatments with respect to all the parameters tested except the cost of feeding ((Oddoye *et al.,* 2012).Feed conversion was significantly better in birds fed grade I DCRM compared to birds on grade 2 DCRM and control diets. This was reflected in better utilizationof DCRM than its counterpart groundnut cake. In lieu of the total feed intake TFI, it was observed that inclusion levels of DCRM in the diets did not follow a definite pattern, meaning thatdifferent inclusion levels of DCRM had no deleterious effect on performance traits of birds. No mortality was recorded throughout the experimental period.

Table 2: Performance of broilers fed two grades of DCRM at varying inclusion levels

Parameter	Control	Grade I			Grade II					p-value	
	T1	T2	T3	T4	T5	T6	T7				
Replacement	0%	33.33%	66.67%	100%	33.33%	66.67%	100%	SEM	G	L	G x L
IBW(g/bird)	236.11	236.11	238.89	230.56	238.89	230.50	233.33	1.24	0.86	0.25	0.16
FBW(g/bird)	2026.50	2280.50	2431.00	2521.90	2311.00	2339.70	2251.60	37.56	0.01	0.05	0.25
BWG(g/b)	1790.40	2044.40	2192.10	2291.30	2072.10	2109.20	2017.40	37.95	0.01	0.04	0.25
TFI(g)	4779.80	4765.30	4942.60	4977.60	4923.90	5217.90	5173.60	44.14	0.04	0.02	0.76
DFI(g/b/d)	113.81	113.46	117.68	118.51	117.24	124.24	123.18	1.05	0.04	0.02	0.76
FCR	2.67	2.35	2.26	2.17	2.38	2.48	2.59	0.04	0.01	0.05	0.21
Abd. fat	0.62	1.06	1.74	2.05	1.17	1.88	2.27	0.14	0.01	0.03	0.04
Mortality	0	0	0	0	0	0	0	-	-	-	-

IBW-Initial body weight, FBW-Final body weight, BWG-Body weight gain, Total Feed intake, DFI-Daily Feed Intake, FCR-Feed conversion ratio. G= grade, L= level G x L = grade and level interaction SEM: Standard error of mean; a,b,c: Means within the same row with different superscripts differs significantly(p<0.05)

As at the time of this study, cost per kilogram of GNC, DCRM grade I and grade II costs ₦180, ₦100 and ₦85.719 (Nigeria Naira) respectively. From the Table 3, cost of feed per kilogram for diets containing both grades of DCRM were substantially lower with 12.43% and 15.83% reduction than that of the control diets. To produce 1 ton of broiler feed using GNC and DCRM, the farmer will expend about ₦185, 000 and ₦165, 000 respectively. This implies that the farmer will be able to save as much as ₦20, 000 from every tonnage of feed produced using DCRM. Farmers will be able to cut about 9.1% cost with the use of DCRM in place of GNC in broiler diet.

Table 3: Economic implications of feeding broilers with diets containing two grades of DCRM

Parameters	Control	Grade I	Grade II	SEM	P-Value
BWG(g/bird)	1790.42^{b}	2175.94^{a}	2066.85^{a}	37.95	0.01
TFI, kg	4.78^{b}	4.91^{b}	5.11^{a}	44.14	0.04
Cost/kg of test ingredients (₦)	180.00^{a}	100.00^{b}	85.71^{c}	20.81	0.04
Cost of feed / kg (₦)	185.64^{a}	165.11^{b}	160.21^{b}	25.99	0.05
Cost of feed consumed / bird (₦)	884.30^{a}	810.69^{c}	818.67^{b}	15.88	0.04

^{a,b,c}: Means within the same row with different superscripts differs significantly(p<0.05)

Conclusion

Defatted cashew kernel reject meal was nutritionally superior to GNC. It adequately supportrequirement of broiler chickens for growth at lower cost.

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