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RESEARCH ARTICLE

Effect of Replacement of Cashew Nut Meal-Maize Offal with Maize on the Performance of Turkey Poults

[2]Ogungbenro SD, MO [2]Raji, AM [1]Bamgbose, AO [1]Oso and OM [1]Sogunle

[1]Department of Animal Nutrition,Federal University of Agricultural, Abeokuta, Nigeria; [2]Oyo State College of Agriculture, Igboora, Oyo State, Nigeria

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***Corresponding Address:**
Ogungbenro SD
rajmin4u@yahoo.com

ABSTRACT

A study was carried out using 120 turkeys of Nicolas white (R) strain to determine the effect of partial replacement of cashew nut meal-maize offal for maize on performance response, hematological parameters and nutrient digestibility of turkeys. The poults were allocated to four dietary treatment groups. Treatment was replicated thrice at 10 poults per replicate. The dietary treatment was formulated with a mixture of cashew nut meal-maize offal in ratio 2:1 partially replacing maize at 0, 10, 20 and 30% respectively. The experiment lasted for eight weeks. The experimental layout and hence the data were arranged in a completely randomized design (CRD) and analyzed by ANOVA.

Replacement of maize with cashew nut meal-maize offal resulted in a linear increase ($P<0.05$) in final line weight and weight gain. Highest ($P<0.05$) feed intake (3.9kg) and feed conversion ratio (2.61) was observed with poults fed control diet. Feed conversation ratio (2.31) and final live weight (1.6kg) were optimum at 30% replacement level of cashew nuts meal-maize offal.

Highest apparent crude protein (88.62%) and either extract (79.87%) digestibility were noticed with poults fed 10 and 30% replacement level of cashew nut meal-maize offal.

The true crude protein digestibility was significantly ($P<0.05$) influenced with highest value (85.11%) in 20% replacement level of cashew nut meal-maize offal. The Nitrogen corrected true metabolizable energy (TMEn) value were significantly ($P<0.05$) influence with highest TMEn (13.44MJ/Kg) in 30% replacement level of cashew nut meal-maize offal. The replacement of maize with cashew nut meal-maize offal resulted in a linear increase in packed cell volume and haemoglobin. It was concluded that 30% cashew nut meal-maize offal could effectively replace maize giving a good performance response, nutrient digestibility and haematological serum biochemical parameters.

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INTRODUCTION

The sustainability of livestock production in developing countries will rely not only on maximizing the productive rate of a given animal species but also on the utilization of available conventional and non-conventional feed resources. This is because most feed ingredients available for livestock nutrition competes with man as food. There is therefore need to explore alternative sources of feed ingredient which are less competitive and available within the environment, (Fanimo *et al.*, 2003). Cashew nut meal has been found to be an excellent alternative oil seeds widely available for poultry nutrition (Fatuga *et al*; 1973; Sogunle *et al*, 2006). Africa is said to be the third largest global source of cashew nut (100,000 tonnes per year) After Brazil (200,000 tonnes per year) and Indian (120,000 tonnes per year). (Olunloyo, 1996; Spore, 1997). The processing of the raw cashew nut reveals that 60-65 percent of the nut is of commercial value while the rest is often discarded either as broken or scorched nut (Fatuga *et al.*, 1973). The discarded nuts have a high crude protein content which makes it a potential feed resource base in the feeding of mono gastric animals (Fatuga *et al*, 1973). Discarded cashew nut meal

contained 95.6% dry matter, 20.36% crude protein, 2.10% crude fibre, 45.49% either extract, 3.65% ash and 28.4% nitrogen free extract (Sogunle *et al*., 2005).

In terms of chemical composition and nutritional value, cashew nut meal competes favourably with ground nut cake and soya bean cake (Fatuga *et al.,* 1973). Dietary inclusion of cashew nut meal in poultry nutrition either as replacement for cereal grain (like maize, sorghum and wheat) or other conventional oil seeds (like ground nut cake, soya bean meal etc) will increase the resultant energy content of the feed since the meal contained a higher energy value than maize (Onifade *et al.,* 1999). In view of this, there is a need to reduce the excessively high energy content of diets containing higher inclusion levels of cashew nut meal with lesser energy feed ingredients (like maize offal, rice offal and wheat offal etc) to meet the necessary energy requirement of poultry. Sogunle *et al.* (2009) included cassava peel meal in combination with cashew nut meal in diet for laying birds while Sogunle *et al.* (2006) studied the utilization of cashew nut meal in combination with rice offals in diets for broiler chicken. Research studies involving the utilization of cashew nut meal as partial replacement for maize in diets for turkey are scarce.

The study was carried out to determine the performance response, nutrient digestibility and haematological and serum biochemical parameters of turkeys fed experimental diets.

MATERIALS AND METHODS

The study was carried out in the Turkey unit of the Teaching and Research farm, University of Agriculture, Abeokuta, Nigeria ($7^0 15^1$N, $3^0 25^1$E). The cashew nut meal used in the experiment was obtained from the cashew nut processing company limited, Eleyele, Ibadan. The maize offal used in the experiment was obtained from nearby market in Abeokuta, Nigeria. A total of 120 day-old mixed sex poults (Nicolas White$^{(R)}$ Strain) were obtained from Obasanjo farm Nigeria limited, Ogun State, Nigeria.

The 120 poults were randomly allocated to 12 brooding units. Each unit housed 10 poults and then brooded for 4 weeks using coal pots as sources of heat. Each treatment was assayed in replicate of 10poults each. Diets 1 to 4 contained 0 percent, 10 percents, 20 percents and 30 percents of cashew nut meal and maize offal in ratio 2:1 respectively in (Table 1). The diets were fed to the poults from day old to 8th weeks. At the 7th weeks of the experiment, 3 poults were randomly selected from each treatment and transferred into the metabolic cage for digestibility trials. Three days acclimatization period was observed followed by a day fasting before the commencement of the trail. Feed intake and total faecal output were recorded for 4 days while the wet faecal outputs were oven dried to constraint weight. The proximate compositions of feed and dried faecal outputs were determined by the methods of AOAC (1990). The procedure of Vogtmann *et al.* (1975) was used in calculating the percentage digestibility of protein, fat, crude fibre and nitrogen extract. This was done by multiplying the proximate composition of the feed by the digestion coefficient.

Table 1: Gross composition of experimental diets 0-8 weeks old poults

	Replacement level			
	0%	10%	20%	30%
Ingredients (kg)	T1	T2	T3	T4
Maize	41.00	36.90	32.80	28.70
Maize offal	-	1.36	2.74	4.10
C N M	-	2.74	5.46	8.20
SBM	38.00	38.00	38.00	38.00
Limestone	3.40	3.40	3.40	3.40
Bone meal	2.40	2.40	2.40	2.40
Salt	0.30	0.30	0.30	0.30
DL-Methonine	0.20	0.20	0.20	0.20
Lysine	0.25	0.25	0.25	0.25
Mycofix	0.20	0.20	0.20	0.20
Broiler Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Determined Composition				
Metabolizable				
Energy (MJ/Kg)	12.20	13.04	13.87	14.71
Crude protein(%)	21.99	23.11	24.23	25.35
Crude fibre(%)	3.61	4.10	4.59	5.08
Ether extract(%)	2.77	4.01	5.27	6.51
Calcium(%)	2.11	2.12	2.13	2.13
Phosphorous (%)	0.47	0.48	0.48	0.48

A kg premix contained Vitamin A: 110,000,000 I.U, Vitamin D: 2,500,000 I U, Vitamin E: 20,000mg, Vitamin K3:.3000mg, Vitamin $B_{3:}$ 3000mg, Vitamin.B2: 7000mg, Vitamin $B_{6\ 5000mg}$, Vitamin $B_{12:}$ 25mg, pantothenic acids 10,000mg, Iron : 4000mg Folic acid, 8000mg,Biotin 50mg, Manganese80, 000mg, Zinc, 60,000mg, Copper 8,000mg, Cobalt, 250mg, Iodine, 1,000mh, Selenium (180):150mg.Chlorin:200,000mg and Antioxidant 100,000mg

Table 2: Nutrient digestibility of turkey poults (0-8 weeks) fed experimental diet

	Replacement Level				
	(0%)	(10%)	(20%)	(30%)	SEM
Parameters	T_1	T_2	T_3	T_4	
Apparent Digestibility (%)					
Dry matter	89.06	89.02	89.04	89.09	0.01
Crude Protein	85.87^b	88.62^a	87.77^a	87.86^a	0.51
Crude Fibre	50.87	55.33	64.86	67.01	3.33
Ether Extract	71.05^c	75.99^b	79.56^a	79.87^a	1.78
Ash	56.65	55.78	56.75	54.73	0.41
True Digestibility (%)					
Dry matter	85.11	85.01	84.92	85.23	0.06
Crude Protein	82.33^b	84.66^a	85.11^a	84.91^a	0.56
Crude Fibre	51.67	52.23	53.96	54.21	0.54
Ether Extract	69.11	71.19	72.45	70.11	0.62
Ash	51.12	53.24	54.55	51.77	0.66
Metabolizable energy values (MJ/Kg)					
AME	12.09	12.42	12.92	13.23	0.22
AMEn	11.45	11.88	12.12	12.25	0.15
TME	12.56	12.97	13.10	13.45	0.16
TMEn	12.33^b	12.60^a	13.00^a	13.44^a	0.21

^{Abcd} Mean within the same row with different superscripts differ significantly ($P<0.05$)

Also, at the 8th weeks of the experiment blood samples (6mls each) were collected using sterilized needle and syringe through the wing vein from 3 turkeys per treatments into ethylene diamine tetra-acetate (EDTA) bottles and heparinised tube for haematological and serum biochemistry analyses respectively. Packed Cell Volume (PCV), Hemoglobin concentration (Hb), red blood cell (RBC) and White Blood Cell were determined using the improved Neubauer haemocytometer as described by

Table 3: Performance characteristics of Turkey poults (0-8 weeks)

Parameters	Replacement Level (0%) T_1	(10%) T_2	(20%) T_3	(30%) T_4	SEM
Initial Weight(g)	50.00	50.00	50.00	50.00	
Final live Weight(g)	1,570.00^{b}	1,660.00^{a}	1,610.00^{ab}	1,660.00^{a}	18.87
Weight gain /bird(g)	1,520.00^{b}	1,610.00 ^{a}	1,510.00^{b}	1,610.00^{a}	23.81
Feed intake (g)	3,966.95	3,799.643	884.55^{b}	3,711.35^{d}	47.62
Protein intake/bird (g)	1,057.99^{c}	1,044.90^{d}	1,100.49^{a}	1,082.60^{b}	10.76
FCR	2.61^{b}	2.36^{a}	2.49^{b}	2.31^{a}	0.06
PER	1.44	1.54	1.42	1.49	0.02
Mortality (%)	1.00	1.00	1.00	0, 50	1.11
Cost of feed consumed/bird(₦)	361.55	344.55	350.35	323.91	6.84
Cost of feed consumed/weight(₦/kg)	237.86	213.01	224.58	206.70	5.94

Ab cd Means within the same row with different superscripts differ significantly (P<0.05)

Baker and Silverton (1985). Serum total protein, albumin and globulin were analyzed in the automatic blood analyzer.

The market cost of the ingredients at the time of the study was used to calculate the cost of feed kg-^{1} diet (₦), costs of feed consumed turkey^{-1} (₦), and the cost of feed consumed/weight again (₦).

All data obtained were arranged in a completely randomized design (CRD) and subjected to analysis of variance (Nousis, 1999). Mean value of variables showing significant (P<0.05) difference were separated using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The nutrient digestibility of turkey poults is presented in Table 2. The apparent crude fibre, ether extract, and digestibility increased in a linear form from diets 1 to 4 with increasing cashew nut meal inclusion. Also, apparent & true metabolized energy value increased with increasing cashew nut meal inclusion from Diets 1-4 respectively.

However, the crude protein content of the diets did not follow any specific trend. Sogunle *et al.* (2006) reported similar result that ether extract and metabolizable energy increased from diet 1 to 4 as cashew nut meal level of inclusion increased while crude protein content of the diets did not follow any specific trend. The performance of the turkeys fed experimental diets is presented in Table 3.

The average final weight, weights gain, feed intake, protein intake and feed conversion ratio were significantly (P<0.05) affected by dietary inclusion of cashew nut meal and maize offal, except for protein efficiency ratio (P>0.05). This result negate Sogunle *et al.* (2006) who reported that the values were not significant (P>0.05) different except for protein efficiency ratio (P<0.05). The highest final live weight and weight gain were obtained in diets 2 and 4 (10 and 30% inclusion level of cashew nut meal and maize offal). While Diet 1 (control diet) recorded the lowest final live weight and weight again. This supported the result obtained by Sogunle *et al.* (2006) who reported that the highest final weight and weight gain were obtained in diet 4 while the lowest final weight and weight gain were recorded in Diet 1 (control diet).

The highest feed intake (3,966.95g) was recorded in Diet 1 while the lowest feed intake (3,711.35g) was obtained in diet 4, that is, 30% inclusion level of cashew nut meal and maize offal.

Table 4: Effect of cashew nut and maize offal inclusion on heamatological and biochemical parameters of poults (0-8 weeks)

Parameters	Replacement Level (0%) T_1	(10%) T_2	(20%) T_3	(30%) T_4	SEM
Haematological value					
Packed cell volume (%)	33.00	34.00	34.00	36.00	0.54
Haemoglobin (g/dl)	10.70^{b}	10.70^{b}	11.30^{a}	11.30^{a}	0.15
- Red blood cell (x10 $^{12/L}$	2.10^{b}	2.80^{a}	2.20^{b}	2.20^{b}	0.14
While blood cell (x 10 $^{9/L}$	5.90^{b}	5.97^{a}	5.96^{a}	5.8^{b}	0.02
Biochemical values					
Total serum protein mg/dl	50.00^{c}	59.00^{a}	58.00^{a}	52.00^{b}	1.92
Serum Albumin mg/dl	17.00^{b}	16.00^{c}	20.00^{a}	18.00^{ab}	0.74
Serum globulin mg/dl	33.00^{c}	43.00^{a}	38.00^{b}	34.00^{c}	1.97
SGOT (AST) IU/L	55.00^{b}	59.00^{a}	54.00^{b}	58.00^{a}	1.03
SGPT (ALT) IU/L	4.00^{a}	3.60^{c}	3.90^{ab}	4.20^{a}	0.11
ALP IU/L	16.00^{c}	19.00^{ab}	21.00^{a}	17.00^{b}	0.96
Serum uric acid Mg/dl	0.90^{a}	0.80^{b}	0.70^{b}	0.60^{b}	0.06
Creatinine Mg/dl	0.30	0.30	0.30	0.20	0.02

Ab cd Means within the same row with different superscripts differ significantly (P<0.05); AST = Aspartate aminotransferase, ALT = Alanine aminotransferase, ALP = Alkaline phosphate

The highest cost of feed consumed/bird (₦) (₦361.55) was recorded in Diet 1 while the lowest cost of feed consumed/bird (₦) (₦323.91) was obtained in Diet 4. This result negate the result obtained by Sogunle *et al.* (2006) who reported that the highest cost of feed consumed/bird was recorded in diet 4 while the lowest cost of feed consumed/bird was obtained in Diet 1. It is obvious that Diet 4 gave the best result in terms of yield per unit feed consumed.

Effect of cashew nut meal and maize offal inclusion on haematological and biochemical parameters of poults is presented in Table IV. The blood parameters measured were significantly (P<0.05) affected by the dietary treatment except haemoglobin, white blood cell, serum uric acid and serum creatinine values which were not affected (P>0.05) by the dietary treatment. The total protein, albumin and globulin contents were significantly (P<0.05) affected by the dietary treatments. However, the values were within the normal ranges reported by Jain (1986). The values obtained for uric acid decreased in a linear form across the dietary treatments. The similar quality of protein in the diets could be responsible for the comparable (P<0.05) white blood cell values across

dietary treatments. These values were within the normal range obtained for birds (Mitruka and Rawnsley, 1977).

Conclusion

The results obtained showed that 30% inclusion level of cashew nut meal and maize offal in ratio 2:1 respectively could effectively replace maize without any deleterious effect on performance, nutrient digestibility, haematological and serum biochemical parameters of experimental turkeys.

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