

## Growth Response, Body Temperature and Blood Constituents of Pullet Chicks fed Cassava Peel Meal supplemented with Cashew nut reject Meal.

<sup>1</sup>O.M. Sogunle, <sup>1</sup>A.O. Fanimu, <sup>1</sup>S.S. Abiola and <sup>2</sup>A.M. Bamgbose

<sup>1</sup>Department of Animal Production and Health, University of Agriculture, Abeokuta, Nigeria

<sup>2</sup>Department of Animal Nutrition, University of Agriculture, Abeokuta, Nigeria

### Abstract

A 3 x 4 factorial experiment was conducted with four hundred and thirty-two, 7 day old Yaafa brown pullet chicks in which the birds were divided into 12 treatment groups with 3 replications of 12 birds each. The diets consisted of 3 levels of cassava peel meal-CPM (0%, 10% and 20%) with each supplemented with 4 levels of cashew nut reject meal-CNM (0%, 10%, 20% and 30%). The study was conducted for 56 days. 20% CPM inclusion in the diets increased ( $P < 0.05$ ) the bird's body temperature and significantly ( $P < 0.05$ ) decreased the weight gain across treatments. Significant ( $P < 0.05$ ) declines were also seen in the final weight from 0% to 20% CPM inclusion levels. 0% CPM inclusion gave the highest ( $P < 0.05$ ) weight gain of 9.56 with the best ( $P < 0.05$ ) feed/gain ratio of 3.62. The cost of 1kg feed consumed (₦) and 1kg feed consumed/weight gain (₦/ g) were significantly ( $P < 0.05$ ) influenced by CPM inclusion in the diets. The lowest values of ₦38.09 and ₦4.00, respectively, were recorded in 0% CPM inclusion. The effect of CPM inclusion on the blood parameters indicated the highest values at the 20% level except in the platelet. However, the effect of CNM inclusion on the performance and cost benefits, showed that the body temperature marginally increased ( $P > 0.05$ ). Significant ( $P < 0.05$ ) differences were observed in feed intake, percentage mortality, cost of 1kg feed consumed and cost of 1kg feed consumed/weight gain with CNM inclusion. The 30% CNM inclusion level had the lowest feed intake of 33.91g/bird and the best feed/gain of 3.86. The blood parameters recorded fluctuating values with CNM inclusion. Significant ( $P < 0.05$ ) differences were observed only in the packed cell volume and the total protein. In the interaction, the highest final weight, weight gain and the best feed/gain were observed in diet 3 (0%CPM and 20%CNM). The lowest body temperature ( $P < 0.05$ ) of 37.9°C was recorded in diet 1 (0%CPM and 0%CNM) while the highest value of 41.0°C was recorded in diets 9 (20%CPM and 0%CNM) and 10 (20%CPM and 10%CNM). The results showed that the blood parameters were not affected by the protein quality of the diets as CNM inclusion levels masked the deleterious effect of CPM in the diets. It was therefore concluded that the supplementation of CPM diets with CNM enhanced the utilization of the diets by ensuring normal growth response body temperature and blood constituents.

**Keywords:** Growth response, birds' body temperature, blood constituents, pullet chicks

### Introduction

For sustainable livestock production system in the tropics, FAO (1995) predicted that the future

scenarios of resources utilization must be predicated on minimizing waste through recycling which reduces the need for raw materials and

helps to protect the environment. The utilization of cassava peel meal and cashew nut reject meal in poultry feeds is an instance.

At present, there is an increasing demand in the cultivation of cassava roots in Nigeria. This will certainly engender an increased production of peels which accounts for between 10-13% of the root by weight (Tewe and Kasali, 1986). Many workers (Obioha and Anikwe, 1982; Aina, 1990 and Esonu and Udedibie, 1993) reported extensive use of cassava peel meals as cheaper substitutes for maize in the diets of monogastric animals. Eshiett and Ademosun (1981) reported that the energy and crude protein contents of cassava peels were 2044.80kcal/kg and 5.98%, respectively, which were lower than those of maize as given by Scott *et al.* (1982). The utilization of cassava peel meal in poultry feeding is limited by its dustiness, milling difficulty, reduction in feed intake and an appreciable content of antinutritional factor specifically hydrocyanic acid (HCN) (Esser and Nout, 1989; Salami, 1999). Several processing methods have been developed over the years for cyanide reduction in fresh cassava products. These included parboiling (Salami, 1999), oven drying (Eshiett and Ademosun, 1981), sun drying (Osei and Duodu, 1988), and frozen and ensiled cassava peel meal (Ogbonna and Adebowale, 1993). Also, earlier studies (Speer, 1976; Dale and Fuller, 1979) revealed that dustiness of feed could be reduced and feed intake enhanced by the addition of dietary fat and oil to the feed. Hence, cashew nut reject meal finds an excellent supplement as both protein and energy source in the diets of poultry (Fetuga *et al.*, 1973; Onifade *et al.*, 1999 and Sogunle *et al.*, 2005). The processing of the raw nut carried out in many of the producing countries revealed that 60-65% are of commercial value while 35-40% of the processed nuts are often discarded either as broken or scorched kernels (Fetuga *et al.*, 1974). The discarded nut

is said to contain a significant quantity of high protein material which is particularly useful for feeding monogastric animals (Fetuga *et al.*, 1973).

The study was carried out to determine the effect of different combinations of cassava peel meal (CPM) and cashew nut reject meal (CNM) diets on the performance, body temperature and blood constituents of pullet chicks.

## **Materials and Methods**

### *Experimental site*

The experiment was carried out at the deep litter poultry unit of the Teaching and Research Farm, University of Agriculture, Abeokuta, Nigeria (7° 15' N, 3° 25' E). The climatic records during the period of the experiment (late wet season, July-September) showed an average temperature and relative humidity of 30.1°C and 70.5%, respectively.

### *Experimental birds and management*

Four hundred and thirty two (432), 7-day old Yaafa brown pullet chicks obtained from a commercial hatchery in Ogun State were used for the study. The birds were divided into 12 treatment groups with 3 replications of 12 birds each. They were brooded for 2 weeks using coal pot as a source of heat. They were managed intensively. Feed and water were given the birds *ad libitum*. The experiment lasted for 8 weeks (7-63 days).

### *Experimental diet*

The cassava peel and cashew nut reject (broken, slightly burnt and scorched kernels) used in the experiment were sourced from the gari processing factory and cashew nut processing factory, respectively, both at the University of Agriculture, Abeokuta. The diets (Table 1) consisted of three levels (0, 10 and 20%) of cassava peel meal with each level supplemented with four levels (0, 10, 20 and 30%) of cashew

Table 1: Composition of chick starter diets(%)

Ingredient	0%CPM			10%CPM			20%CPM			30%CPM		
	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM
Maize	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Cassava Peel Meal (CPM)	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	10.00	20.00	20.00	20.00
Cashew nut reject meal (CNM)	0.00	10.00	20.00	30.00	0.00	10.00	0.00	10.00	20.00	30.00	0.00	30.00
Soyabean meal	17.90	15.90	13.90	11.90	19.90	17.90	19.90	17.90	15.90	13.90	21.90	17.90
Wheat Offal	45.00	37.00	29.00	21.00	33.00	25.00	33.00	25.00	17.00	9.00	21.00	13.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Blood meal	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.65
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Vitamin Premix*	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

  

CALCULATED ANALYSIS	0%CPM			10%CPM			20%CPM			30%CPM		
	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM
Crude Protein%	21.22	21.31	21.40	21.49	20.98	21.07	21.16	21.25	20.74	20.83	20.92	20.10
Crude Fibre%	3.36	3.20	3.04	2.88	4.03	3.87	3.71	3.55	4.70	4.54	4.38	4.11
Calcium%	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
Phosphorus%	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
ME(MJ/Kg)	12.20	12.21	12.22	12.23	11.71	11.72	11.73	11.74	11.21	11.22	11.23	11.33

  

DETERMINED ANALYSIS	0%CPM			10%CPM			20%CPM			30%CPM		
	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM	0% CNM	10% CNM	20% CNM
Crude protein(%)	21.00	21.10	21.10	21.23	19.84	20.05	20.10	20.18	20.30	20.43	20.60	19.05
Crude Fibre(%)	3.33	3.05	3.00	2.75	3.66	3.51	3.46	3.37	4.35	4.20	4.10	3.99
Ether extract(%)	4.21	4.17	3.96	3.89	4.13	4.02	3.99	3.67	4.01	3.97	3.54	3.46
Ash (%)	37.59	39.23	40.50	41.35	38.33	40.17	42.26	43.58	38.73	39.57	39.78	40.10
Nitrogen-free extract(%)	33.87	32.45	31.44	30.78	34.04	32.25	30.19	29.20	32.61	31.83	31.98	33.40
Dry Matter(%)	92.54	90.61	89.99	89.56	88.76	88.23	88.21	87.12	89.57	89.28	89.15	88.50

Premix (Univit: 15Roche) contained B<sub>1</sub>, 1g; B<sub>2</sub>, 6g; B<sub>12</sub>, 0.02g; K<sub>1</sub>, 3g; E, 30g; Biotin, 0.05g; Folic acid, 1.5g; Choline Chloride, 250g; Nicotinic acid, 30g; Ca-Pantothenate, 15g; Co, 0.4g; Cu, 8g; Fe, 32g; I, 0.8g; Zn, 40g; Mn, 64g; Se, 0.16g; BHT, 5g.

nut reject meal. The crude protein (%) and metabolizable energy (MJ/kg) contents of the feed were balanced within the recommended range (NRC, 1994) by altering the percentage composition of both soyabean meal and wheat offal in the diets.

*Chemical analysis*

The proximate compositions of the test ingredients and diets were determined by the method of AOAC (1990).

*Haematological and biochemical analyses*

At the 63<sup>rd</sup> day of the experiment, blood samples (2ml each) were collected via the wing vein of 3 birds per replicate group into ethylene diamine tetra-acetate (EDTA) bottles for biochemical (Total protein, Albumin, Globulin, Uric acid, Creatinine, and Glucose) and haematological (Packed cell volume, Haemoglobin, Red blood cell, White blood cell and Platelet) analyses. Packed cell volume (PCV), Haemoglobin concentration (Hb) and red blood cell (RBC) were determined using Wintrob's microhaematocrit, colorimetry cyanomethaemoglobin method and improved Neubauer haemocytometer, respectively (Lamb, 1991).

*Data collection*

Data were collected daily on the birds' body temperature (°C) which was measured via the wing web using a digital clinical thermometer. Also, data on weight gain, feed intake, feed/gain, mortality, protein intake, protein efficiency ratio and the cost benefits of the diets used.

*Cost benefits*

The prevailing market prices of the ingredients at the time of the study were used to calculate the cost of 1kg feed consumed and the cost of 1kg feed consumed/weight gain.

*Statistical analysis*

The experimental layout was a 3x4 factorial arrangement. The data obtained were subjected to analysis of variance using SPSS (1999). Significant (P<0.05) means among variables were separated using Duncan Multiple Range Test (Duncan, 1955).

**Results and Discussion**

The proximate compositions of Cassava Peel Meal (CPM) and Cashew nut reject Meal (CNM) presented in Table 2 agreed with the range of values obtained by Agunbiade *et al.* (1999) for CPM and Sogunle *et al.* (2005) for CNM.

**Table 2: Proximate composition of CPM and CNM (Air-dry basis)**

Fraction (%)	CPM	CNM
Dry matter	80.95	95.40
Moisture content	19.05	4.60
Crude	5.50	21.20
Crude protein	21.36	2.15
Ester extract	0.67	46.21
Ash	5.98	3.68
Nitrogen-free-extract	66.49	26.76

CPM = Cassava peel meal

CNM = Cashew nut reject meal

The inclusion levels of CPM shown in Table 3 revealed significant ( $P<0.05$ ) differences in all the parameters considered except in the recorded mortality. The effect of CPM inclusion levels on the average birds' body temperature reflected an increase ( $39.3^{\circ}\text{C}$ -  $40.9^{\circ}\text{C}$ ) in the temperature across treatments thus signifying that the birds were stressed with increasing levels of CPM. There were significant ( $P<0.05$ ) declines in the final weight and weight gain from 0% to 20% CPM inclusion levels. These results agreed with the findings of Esonu and Udedibie (1993) that the feed intake and weight gain were significantly ( $P<0.05$ ) depressed with replacement of maize with CPM. The results also revealed that more feed were taken in by birds on 20% CPM inclusion with an attendant lowest feed/ gain of 4.12. The cost of 1kg feed consumed (N) and 1kg feed consumed per weight gain (N/g) were significantly ( $P<0.05$ ) influenced by CPM inclusion in the diets. The lowest values of N38.09 and N4.00, respectively, were recorded in 0% CPM inclusion. The single effect of CPM on the haematological and biochemical indices of pullet chicks fed the experimental diets recorded the highest value at 20%CPM inclusion level except in platelets (g/dl). Significant ( $P<0.05$ ) differences were observed only in the haemoglobin concentration (g/dl) and the albumin (g/dl). These results showed that 20% CPM inclusion level did not affect the protein quality which is often reflected by significant variations in blood total protein, uric acid and blood cell volumes (Allison, 1955 and Eggum, 1970).

From the results showed in Table 4 on the single effect of CNM on the performance and cost benefits of pullet chicks fed the experimental diets, it could be observed that the bird's body temperature ( $^{\circ}\text{C}$ ) was not affected ( $P>0.05$ ) by CNM inclusion in the diets. Also, final weight (g/bird), weight gain (g/bird/day), feed/gain,

protein intake (g/bird) and the protein efficiency ratio were not influenced by increases in CNM inclusion. However, significant ( $P<0.05$ ) differences were observed in feed intake, mortality, cost of 1kg feed consumed and cost of 1kg feed consumed/weight gain. The 30% CNM inclusion level had the lowest feed intake of 33.91g/bird and the best feed/gain of 3.86. These results agreed with the observation of Pesti (1982) that as the level of metabolizable energy in diets increases or decreases, feed intake changes inversely. The results obtained on the single effect of CNM on the blood parameters are comparable to the single effect of CPM on the blood parameters except that the lowest values were obtained mostly at 30% CNM inclusion level. The quality of proteins in the diets could be responsible for the comparable ( $P>0.05$ ) creatinine values across the groups. The values were within the range reported by Kaneko (1989). In addition, the absence of variations in the albumin content could be attributed to the comparable protein intake across the groups. The total proteins and albumin contents observed in this study were within the normal ranges reported by Mitruka and Rawnsley (1977).

Table 5 showed the interactive effects of CPM and CNM on the performance and cost benefits of pullet chicks fed the diets. Significant ( $P<0.05$ ) differences were observed in the birds' body temperature across treatments. The lowest value of  $37.9^{\circ}\text{C}$  was observed in diet 1 (0%CPM and 0%CNM). This however fell below the standard values of  $40.0^{\circ}\text{C}$  to  $41.5^{\circ}\text{C}$  for birds (Swick, 1989). Diets 9 (20%CPM and 0%CNM) and 10 (20%CPM and 10%CNM) showed the highest body temperature of  $41.0^{\circ}\text{C}$ . Significant ( $P<0.05$ ) differences were observed in the final weight (g/ bird), feed intake (g/bird), feed/gain, mortality, cost of 1kg feed consumed and cost of 1kg feed consumed /weight gain. The highest final weight ( $709.72\text{g/bird}$ ), weight gain ( $10.32\text{g/bird/day}$ ) and

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**Table 3: Single effect of CPM on the performance, cost benefits and blood parameters of pullet chicks fed the experimental diets.**

Parameter	CPM inclusion levels		±SEM
	10%	20%	
Ave. bird body temp. °C	39.3 <sup>b</sup>	40.7 <sup>a</sup>	0.32
Initial wt. (g/bird)	136.46 <sup>a</sup>	129.04 <sup>b</sup>	2.58
Final wt. (g/bird)	671.69 <sup>a</sup>	608.55 <sup>b</sup>	11.83
Wt. gain (g/bird/day)	9.56 <sup>a</sup>	8.62 <sup>b</sup>	0.23
Feed intake (g/bird/day)	34.46 <sup>b</sup>	33.81 <sup>b</sup>	0.29
Feed: gain	3.62 <sup>b</sup>	3.99 <sup>a</sup>	0.11
Protein intake (g/bird)	23.23 <sup>a</sup>	22.05 <sup>c</sup>	0.20
Protein efficiency ratio	0.41 <sup>b</sup>	0.39 <sup>ab</sup>	0.10
Mortality (%)	0.69 <sup>a</sup>	0.69	0.65
Cost of 1kg feed consumed (N)	38.09 <sup>c</sup>	38.38 <sup>a</sup>	0.002
Cost of 1kg feed consumed/wt gain (N/g)	4.00 <sup>b</sup>	4.52 <sup>a</sup>	0.01
<b>Haematology</b>			
Packed cell volume (%)	38.33	39.67	0.55
Haemoglobin (g/dl)	12.92 <sup>b</sup>	13.53 <sup>a</sup>	0.15
Red blood cell (g/dl)	4.31	4.43	0.07
White blood cell (x 10 <sup>3</sup> /l)	6.05	6.15	0.77
Platelet (g/dl)	163.30	170.00	3.42
<b>Biochemical</b>			
Total protein (g/dl)	60.83	62.67	0.89
Albumin (g/dl)	37.42 <sup>b</sup>	39.42 <sup>ab</sup>	0.45
Globulin (g/dl)	23.42	23.25	0.75
Uric acid (mg/dl)	3.69	3.68	0.07
Creatinine (mg/dl)	1.66	1.70	0.03
Glucose (g/dl)	73.33	75.00	1.30

a,b,c: Means in the same row with different superscript differ significantly (P<0.05)  
 CPM = Cassava peel meal; SEM = Standard error of Mean

Table 4: Single effect of CPM on the performance, cost benefits and blood parameters of pullet Chicks fed the experimental diets.

Parameter	CPM inclusion levels				±SEM
	10%	20%	30%	40%	
Ave. bird body temp. °C	39.9	39.9	40.7	40.6	0.24
Initial wt. (g/bird)	131.02	131.95	130.09	129.63	1.93
Final wt. (g/bird)	632.15	636.57	624.54	622.52	8.87
Wt. gain (g/bird/day)	8.95	9.01	8.83	8.91	0.17
Feed intake (g/bird/day)	34.86 <sup>a</sup>	34.76 <sup>ab</sup>	34.56 <sup>ab</sup>	33.91 <sup>b</sup>	0.21
Feed: gain	3.94	3.88	3.97	3.86	0.08
Protein intake (g/bird)	22.55	22.73	22.73	22.48	0.15
Protein efficiency ratio	0.40	0.40	0.39	0.39	0.01
Mortality (%)	0.92 <sup>a</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.93 <sup>a</sup>	0.49
Cost of 1kg feed consumed (N)	36.31 <sup>d</sup>	37.59 <sup>c</sup>	38.99 <sup>b</sup>	39.94 <sup>a</sup>	0.002
Cost of 1kg feed consumed/wt.gain (N/g)	4.09 <sup>b</sup>	4.20 <sup>ab</sup>	4.49 <sup>a</sup>	4.50 <sup>a</sup>	0.01
<b>Haematology</b>					
Packed cell volume (%)	40.56 <sup>a</sup>	39.33 <sup>ab</sup>	38.78 <sup>b</sup>	38.22 <sup>b</sup>	0.41
Haemoglobin (g/dl)	13.43	13.33	13.46	13.37	0.11
Red blood cell (g/dl)	4.41	4.43	4.37	4.30	0.05
White blood cell (x 10 <sup>3</sup> /l)	6.18	6.02	6.00	6.04	0.58
Platelet (g/dl)	163.33 <sup>b</sup>	165.56 <sup>b</sup>	175.56 <sup>a</sup>	164.44 <sup>b</sup>	2.57
<b>Biochemical</b>					
Total protein (g/dl)	62.56	61.22	62.56	62.22	0.66
Albumin (g/dl)	39.00	37.67	38.33	39.00	0.34
Globulin (g/dl)	23.56	23.56	24.22	23.22	0.56
Uric acid (mg/dl)	3.71	3.73	3.72	3.69	0.06
Creatin ine (mg/dl)	1.70	1.69	1.68	1.68	0.02
Glucose (g/dl)	75.00	75.00	75.00	74.44	0.98

Ab-c: Means in the same row with different superscript differ significantly (P<0.05)  
 CPM= Cassava peel meal. SEM= Standard error of Mean

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Table 5: Interactive effects of CPM and CNM on the performance characteristics and cost benefits of pullet fed the Experimental diets

Parameters	Diet												±SEM
	1	2	3	4	5	6	7	8	9	10	11	12	
	0%/CPM 0%/CNM	0%/CPM 10%/CNM	0%/CPM 20%/CNM	0%/CPM 30%/CNM	10%/CPM 0%/CNM	10%/CPM 10%/CNM	10%/CPM 20%/CNM	10%/CPM 30%/CNM	20%/CPM 0%/CNM	20%/CPM 10%/CNM	20%/CPM 20%/CNM	20%/CPM 30%/CNM	
Av. Body temp. °C	37.9 <sup>c</sup>	38.6 <sup>c</sup>	40.5 <sup>b</sup>	40.1 <sup>b</sup>	40.8 <sup>a</sup>	40.4 <sup>b</sup>	40.8 <sup>a</sup>	40.9 <sup>a</sup>	41.0 <sup>a</sup>	41.0 <sup>a</sup>	40.9 <sup>a</sup>	40.9 <sup>a</sup>	0.16
Initial wt. (g/bird)	130.56	141.67	131.94	141.66	130.56	127.78	133.33	126.39	131.94	126.39	125.00	120.84	1.29
Final wt. (g/bird)	657.88 <sup>b</sup>	670.83 <sup>b</sup>	709.72 <sup>a</sup>	648.61 <sup>c</sup>	625.00 <sup>d</sup>	618.06 <sup>d</sup>	573.61 <sup>e</sup>	609.72 <sup>c</sup>	613.89 <sup>c</sup>	620.83 <sup>d</sup>	590.28 <sup>e</sup>	609.22 <sup>c</sup>	5.92
Wt. gain (g/bird)	9.41 <sup>b</sup>	9.45 <sup>b</sup>	10.32 <sup>a</sup>	9.05 <sup>c</sup>	8.83 <sup>d</sup>	8.76 <sup>d</sup>	7.86 <sup>f</sup>	8.62 <sup>d</sup>	8.61 <sup>d</sup>	8.83 <sup>d</sup>	8.31 <sup>e</sup>	9.06 <sup>c</sup>	0.12
Feed intake (g/bird/day)	35.06 <sup>a</sup>	35.07 <sup>a</sup>	34.79 <sup>b</sup>	32.92 <sup>c</sup>	34.31 <sup>bc</sup>	33.41 <sup>b</sup>	34.45 <sup>bc</sup>	33.08 <sup>c</sup>	35.21 <sup>a</sup>	35.79 <sup>a</sup>	34.46 <sup>bc</sup>	35.74 <sup>a</sup>	0.72
Feed: gain (g/bird/day)	3.77 <sup>b</sup>	3.71 <sup>b</sup>	3.37 <sup>b</sup>	3.64 <sup>b</sup>	3.91 <sup>bc</sup>	3.84 <sup>bc</sup>	4.38 <sup>a</sup>	3.84 <sup>bc</sup>	4.13 <sup>a</sup>	4.08 <sup>a</sup>	4.16 <sup>a</sup>	4.11 <sup>a</sup>	0.26
Protein intake	23.41	23.66	23.51	22.32	22.03	21.61	22.49	22.06	2.21	22.94	22.19	23.05	0.09
Protein efficiency ratio	0.40	0.40	0.44	0.41	0.41	0.41	0.35	0.40	0.39	0.39	0.38	0.38	0.005
Mortality (%)	2.78 <sup>a</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	2.78 <sup>a</sup>	0.33
Cost of live feed consumed	35.99 <sup>b</sup>	37.39 <sup>b</sup>	38.79 <sup>bc</sup>	40.19 <sup>c</sup>	36.55 <sup>b</sup>	37.59 <sup>bc</sup>	38.99 <sup>bc</sup>	40.39 <sup>c</sup>	36.39 <sup>b</sup>	37.79 <sup>bc</sup>	39.19 <sup>c</sup>	39.24 <sup>c</sup>	0.002
Cost of live feed consumed/vt.gain	3.85 <sup>c</sup>	3.96 <sup>c</sup>	3.76 <sup>c</sup>	4.45 <sup>a</sup>	4.17 <sup>b</sup>	4.32 <sup>b</sup>	4.96 <sup>a</sup>	4.69 <sup>a</sup>	4.26 <sup>b</sup>	4.31 <sup>b</sup>	4.73 <sup>a</sup>	4.37 <sup>b</sup>	0.05

Abc: Means in the same row with different superscript differ significantly (P<0.05)  
 CPM= Cassava peel meal  
 SEM= Standard error of Mean

Table 6: Interactive effects of CPM and CNM on the haematological and biochemical indices of pullet chicks fed the experimental diets.

Parameters	Diets												±SEM		
	1	2	3	4	5	6	7	8	9	10	11	12			
<b>Haematology</b>	Packed cell volume (%)	38.00 <sup>e</sup>	37.00 <sup>d</sup>	39.67 <sup>ab</sup>	38.67 <sup>b</sup>	43.00 <sup>a</sup>	42.00 <sup>a</sup>	37.67 <sup>cd</sup>	36.00 <sup>e</sup>	40.67 <sup>a</sup>	39.00 <sup>ab</sup>	39.00 <sup>ab</sup>	40.00 <sup>ab</sup>	1.34	
	Haemoglobin (g/dl)	12.27	12.30	13.40	13.70	14.07	13.93	13.30	12.80	13.97	13.77	13.67	13.60	0.36	
	Red blood cell (g/dl)	4.30	4.20	4.37	4.37	4.47	4.53	4.40	4.17	4.47	4.57	4.33	4.33	0.17	
	White blood cell (x 10 <sup>3</sup> /l)	6.20	5.93	6.20	5.87	6.00	6.00	5.80	6.13	6.33	6.13	6.00	6.13	0.19	
	Platelet (g/dl)	160.00	156.67	170.00	166.67	163.33	176.67	180.00	160.00	166.67	163.33	176.67	166.67	8.39	
	<b>Biochemical</b>	Total protein (g/dl)	59.67 <sup>e</sup>	58.00 <sup>f</sup>	62.00 <sup>ab</sup>	63.67 <sup>a</sup>	64.67 <sup>a</sup>	63.00 <sup>a</sup>	62.67 <sup>a</sup>	60.33 <sup>b</sup>	63.33 <sup>a</sup>	62.67 <sup>a</sup>	63.00 <sup>a</sup>	62.67 <sup>a</sup>	2.17
		Albumin (g/dl)	36.33	35.00	38.00	40.33	41.00	40.00	38.67	38.00	39.67	38.00	38.33	38.67	1.11
		Globulin (g/dl)	23.34	23.00	24.00	23.34	23.67	23.00	24.00	22.33	23.66	24.67	24.67	24.00	0.37
		Uric acid (mg/dl)	3.60	3.63	3.77	3.77	3.80	3.77	3.63	3.53	3.37	3.80	3.77	3.77	0.17
		Creatinine (mg/dl)	1.60	1.57	1.73	1.73	1.77	1.77	1.63	1.63	1.73	1.73	1.67	1.67	0.07
		Glucose (g/dl)	70.00	70.00	75.00	78.33	78.33	78.33	73.33	70.00	76.67	76.67	76.67	75.00	3.17

Abc. Means in the same row with different superscripts differ significantly (P<0.05)  
 CPM= Cassava peel meal; CNM= Castew nut reject meal; SEM= Standard error of Mean.

*Growth response, body temperature and blood constituents of pullet chicks*

**Table 7: Significant levels in analysis of variance of performance characteristics, cost benefit and blood parameters of pullet chicks fed the experimental diets**

Performance characteristics	CPM	CNM	Interaction (CPMxCNM)
Average bird body temperature ( <sup>o</sup> C)	S	NS	S
Initial weight (g/bird)	S	NS	NS
Final weight (g/bird)	S	NS	S
Weight gain (g/bird)	S	NS	S
Feed intake (g/bird/day)	S	S	S
Feed: gain	S	NS	S
Protein intake (g/bird)	S	NS	NS
Protein efficiency ratio	S	NS	NS
Mortality (%)	NS	NS	S
Cost of 1kg feed consumed	S	S	S
Cost of 1kg feed consumed/wt.gain	S	S	S
<b>Haematology</b>			
Packed cell volume (dl/l)	NS	S	S
Haemoglobin	S	NS	NS
Red blood cell	NS	NS	NS
White blood cell	NS	NS	NS
Platelet	NS	S	NS
<b>Biochemical</b>			
Total protein	NS	NS	S
Albumin	S	NS	NS
Globulin	NS	NS	NS
Uric acid	NS	NS	NS
Creatinine	NS	NS	NS
Glucose	NS	NS	NS

NS= Not Significant S=Significant (P<0.05)

CPM= Cassava peel meal CNM- Cashew nut reject meal.

best feed/gain (3.37) were obtained in diet 3 (0%CPM and 20%CNM) which confirmed the findings (Onifade *et al.*, 1999 and Sogunle *et al.*, 2005) that cashew nut reject is an excellent feed resource. The mortality recorded could not be attributed to treatment effect. The cost of 1kg feed consumed revealed that it was cheaper to include cassava peel meal in the diets of pullet chicks though, cost of 1kg feed consumed/weight gain gave almost equal values (P<0.05) The interactive effects of CPM and CNM on the plasma haematological and serum biochemical

indices (Table 6) of pullet chicks fed the experimental diets revealed significant (P<0.05) differences only in the packed cell volume (%) and total protein (g/dl). The highest packed cell volume (%) of 43.00 was recorded in diet 5 (10%CPM and 0%CNM) and the lowest value of 36.00 was obtained in diet 8 (10%CPM and 30%CNM). Also, the highest total protein (64.67g/dl) was obtained in diet 5 while the lowest (58.00g/dl) was recorded in diet 2. The range of values obtained was within normal limits for avian species (Fraser and Mays, 1986).

Table 7 showed that the significant ( $P < 0.05$ ) effect of CPM inclusion in the diets were masked by the inclusion of CNM in the diets only in protein intake and protein efficiency ratio. These results were contrasted by the significant ( $P < 0.05$ ) effect of CNM inclusion in the diets reflected in the interaction only in the packed cell volume and total protein.

### Conclusion

Conclusively, the supplementation of CPM with CNM enhanced the utilization of the diets by obviating the deleterious effect of CPM sole feeding and then ensured normal response to growth, bird's body temperature and blood constituents.

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