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The Effect of Substituting Soybean with Groundnut Cake on The Physiochemical Characteristics of Novogen Cockerel Humerus and Femur

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ABSTRACT— This study aimed to evaluate the effect of dietary replacement of soybean (SB) with groundnut cake (GNC) on the physiochemical characteristics of Novogen cockerel humerus and femur. A total of 240 one-day-old Novogen Cockerel were used for the experiment, at the end of the brooding period, twenty birds were randomly weighed and slaughtered by severing the jugular vein with sharp knife for humerus and femur morphometric baseline data, and the remaining 220 birds were randomly allocated to four experimental diets (T1=100% SB + 0% GNC, T2= 50% SB + 50% GNG, T3= 25% SB + 75% GNC, T4= 0% SB + 100% GNC) and were fed to an equal number of replicated pens (55 birds per treatment with 11 replicates each) with ad libitum access to fresh water. The means squares show that the treatments were not significantly different for most measured physical and chemical characteristics of humerus and femur. Replicate had no significant effect on any of the humerus characteristics, but differed for some of the femur characteristics, except for the humerus circumference at $P \leq 0.05$. the variations among the treatments were not significant for most humerus characteristics, except for humerus circumference that was significantly different $P<0.05$. There was significant difference $P<0.05$ observed on femur ash weight, femur ash percentage and femur organic matter percentage. Correlation between physical and chemical characteristics of humerus shows a positive correlation but not significant except for humerus organic matter which shows significant positive correlation at $P \leq 0.05$. It was also revealed that correlation between humerus fresh weight and the dry weight shows significance at $P \leq 0.01$. Correlation of humerus moisture with length shows significance at $P \leq 0.01$. Correlation between Physical and Chemical Characteristics of Femur shows that correlation between femur live weight and femur fresh width and length shows significance at $P \leq 0.05$ and $P \leq 0.01$ respectively. Correlation between femur fresh weight and dry weight was significant at $P \leq 0.01$, correlation between ash weight and organic matter weight is negative and significant at $P \leq 0.001$. Finally, the obtained results shows that groundnut cake and soybean meal have similar crude protein content, but soybean meal is of superior quality due to its greater amino acid profile.

KEYWORDS: Physiochemical, Soybean meal, Groundnut cake, Humerus, Femur, Novogen cockerel.

1. INTRODUCTION

Normal bone development in birds is influenced by nutritional factors, genetics, gender, and the absolute growth rate. Skeletal disorders are more pronounced in fast-growing birds and the skeleton not only provides support for the bird but also an important mineral source for metabolic needs. One nutritional aspect that is worthy of attention to the formation of bones is the dietary protein levels. The major protein concentrates used in animal feed formulation are the Oil seed meals, such as soybean meal (SBM) and groundnut cake (GNC). They usually have their crude protein above 40% [1]. Soybean meal is an excellent source of plant protein,

except for its deficiency in methionine and its high cost. Trypsin inhibitors found in soybeans cause the pancreases of chicks to expand [6]. Hence, it is usually subjected to heat treatment prior to use as animal feed in order to destroy the antinutritional factors [4]. However, owing to the near absence of local processing of the little amount of soybean seed generated in the nation and the ensuing rise in ingredient price, the use of SBM in Nigeria has been severely constrained [8].

Groundnut is widely cultivated in Nigeria due to high level of acceptance of its oil among local consumers. Groundnut (*Arachis hypogea*) has agreeable flavour when roasted and its high protein content makes it especially valuable as tissue builder. The digestibility of the protein is very high, with a coefficient of 90% [3]. Hence, GNC is readily available and has a similar crude protein content as SBM, although lacking lysine and methionine and being abundant in vitamin B [7]. By figuring out the ideal amount of GNC that can replace SBM to such a diet would increase the performance of the fed experimental units [5]. The aim of the present study is to assess the effect of varying dietary proportion of groundnut cake meal inclusion levels on the physiochemical characteristics of Novogen cockerel humerus and femur.

2. MATERIALS AND METHODS

Experimental location: The experiment was conducted at the Teaching and Research Farm Federal University Oye-Ekiti, Ikole campus. Ekiti state, with the following GPS coordinates; latitude of 7.7982661° N and longitude of 5.514493° E. It has an average annual temperature ranging from 21°C to 28°C with high humidity over 75%. The mean annual total rainfall in the south is about 1800mm while that of the northern part is hardly over 1600mm.

2.1 Management of experimental animals

A total number of one-day-old 240 healthy Novogen Cockerel were purchased from a commercial hatchery. On arrival, the chicks were housed in communal pen bedded with wood shavings and brooded together for two weeks using charcoal pot as heat source and was fed a commercial starter feed from a reputable feed mill (Top Feed) in Ekiti State. At the end of the brooding period, twenty birds were randomly weighed and slaughtered by severing the jugular vein with sharp knife for humerus and femur morphometric baseline data, and the remaining 220 birds were randomly allocated to four experimental diets (T1=100% SB + 0% GNC, T2= 50% SB + 50% GNG, T3= 25% SB + 75% GNC, T4= 0% SB + 100% GNC) as shown in Table 1, and were fed to an equal number of replicated pens (55 birds per treatment with 11 replicates each) with ad libitum access to fresh water. The experiment lasted until 10 weeks of age with strictly observing all requirements for humane treatment of experimental animals.

2.2 Experimental diet

There were four diets. Diets T1, T2, T3 and T4 formulated for the experiment as shown in Table 1.

Table 1: Nutrient composition of formulated feed diet (%)

Ingredient (%)	T1	T2	T3	T4
Maize	55	55	55	55
Groundnut Cake	0	19	28.5	38
Soybean Meal	38	19	9.5	0
Rice Bran	1.45	1.45	1.45	1.45
Fish Meal	2	2	2	2
Bone Meal	2	2	2	2

Monocalcium Phosphate	1	1	1	1
Lysine	0.1	0.1	0.1	0.1
Methionine	0.05	0.05	0.05	0.05
Premix	0.1	0.1	0.1	0.1
Toxin Binder	0.05	0.05	0.05	0.05
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100

T1 is the control diet containing 100% Soya bean meal (SBM) and groundnut cake (GNC) at 0%, T2: SBM at 50% and GNC at 50%. T3 SBM at 25% and GNC at 75% and T4, SBM at 0% and GNC at

2.3 Data Collection

Data were collected for length and width of the humerus and femur; circumference; dry matter, moisture, and organic matter content; humerus and femur minerals (ash content). length, breadth, and circumference were measured using a metric tape. The bones were dried at 65oC for 72 hours in the central laboratory's oven before being weighed on a sensitive scale with a maximum weight of 3100g and a readability of 0.01g. The total mineral was examined by heating the sample to 550oC for 4 hours (AOAC guideline) in a 220v, 4KW muffle furnace in the central laboratory. Organic matter was estimated by subtracting ash from sample weight. The proximate analysis of the formulated diet was analyzed as per A.O.A.C. [2] and the base line data for humerus and femur is also shown in Table 2 and 3 respectively.

Table 3: Femur

Id	L W (g)	F B (g)	B L (cm)	B C (cm)	DB (g)	Sa (g)	Ash (g)	O M (g)
1	125	1	4.1	0.9	0.56	0.48	0.34	0.14
2	118	0.97	4	1	0.58	0.38	0.25	0.13
3	105	0.62	3.8	1	0.48	0.38	0.22	0.16
4	96	0.56	3.7	0.9	0.36	0.23	0.12	0.11
5	99	0.97	3	0.8	0.57	0.34	0.21	0.13
6	112	1	3.7	1.1	0.52	0.31	0.19	0.12
7	120	0.78	3.2	1.3	0.38	0.12	0.07	0.05
8	94	1	4	0.9	0.62	0.33	0.17	0.16
9	109	0.74	3.1	0.8	0.36	0.26	0.13	0.13
10	92	0.66	3	0.9	0.28	0.19	0.1	0.09
11	103	0.8	3	1	0.41	0.27	0.15	0.12
12	115	1.01	4.3	0.8	0.7	0.43	0.25	0.18
13	89	0.96	4.4	0.8	0.67	0.44	0.3	0.14
14	95	0.76	3	0.8	0.32	0.19	0.11	0.08
15	100	1.13	4	1.2	0.7	0.47	0.29	0.18
16	77	0.86	3.5	1.2	0.42	0.24	0.15	0.09
17	71	0.6	3.2	0.8	0.25	0.14	0.07	0.07
18	91	0.93	4	0.8	0.55	0.31	0.16	0.15
19	101	0.98	3.88	1.2	0.62	0.36	0.22	0.14
20	94	1.06	3.9	0.9	0.72	0.42	0.28	0.14

SOURCE: Data obtained from experimental birds. LW (live weight), FB (fresh bone), BL (bone length), BC

(bone circumference), DB (dry bone), Sam (sample), OM (organic matter), g(grams), c(centimeter). The width and tensile strength could not be obtained because of the size of the bones as at that time.

2.4 Statistical Analysis

All data collected were subjected to one-way analysis of variance (ANOVA) using Proc GLM in SAS (Version 9.4) and significant means were separated using the HSD. Pearson's correlation coefficient amongst trait was done using Proc corr. in SAS.

3. RESULT AND DISCUSSION

The proximate analysis showed that treatment 1 had the highest crude protein and metabolizable energy content of 27.13% and 2914kcal/kg respectively followed by treatment 2 which had crude protein of 23.75% and metabolizable energy of 2902.6kcal/kg. Treatment 3 had the least crude protein content of 21% but had metabolizable energy of 2896.9kcal/kg higher than treatment 4. Treatment 4 had metabolizable energy of 2891.2kcal/kg and crude protein of 23.13%. Treatment 3 had the highest mineral percentage of 9.6% followed by treatment 4 which had 8.80%, then treatment 1 which had 7.5% and treatment 2 having the least mineral percentage of 5.0% (Table 4).

Table 4: Proximate analysis of formulated diet

Parameters	T1	T2	T3	T4
Ash (%)	7.5	5	9.6	8.8
CP (%)	27.13	23.75	21	23.13
CF (%)	5.2	5.6	5.4	5.4
EE (%)	6.5	6.3	6.3	6.8
DM (%)	93.14	93.11	93.08	93.2
ME (Kcal)	2914	2902.6	2891.9	2891.2

T1: control diet containing 100% Soya bean meal (SBM) and groundnut cake (GNC) at 0%, T2: SBM at 50% and GNC at 50%, T3 SBM at 25% and GNC at 75% and T4, SBM at 0% and GNC at 100%.

3.1 Mean squares of the physical and chemical characteristics of humerus and femur of cockerel

In this research there are hardly any published paper related to this work, therefore, there is paucity of information due to lack of existing literatures. The means squares show that the treatments were not significantly different for most measured physical and chemical characteristics of humerus and femur, except for humerus circumference, femur circumference, femur ash weight, percentage femur ash weight, and percentage femur organic matter (Tables 5 & 6). Replicate had no significant effect on any of the humerus characteristics, but differed for some of the femur characteristics, including femur circumference, percentage femur sample weight, and femur ash weight. This implies that there was treatment effect on the humerus circumference at $P<0.05$. Replicate had no significant effect on any of the humerus characteristics, but differed for some of the femur characteristics, including femur circumference, percentage femur sample weight, and femur ash weight which showed significant differences at $P<0.05$. this implies that the treatments had no significant effect on the traits measured.

Table 5: Mean squares from ANOVA of the physical and chemical characteristics of humerus of cockerel

HF WT	HF %	HD WT	HD %	HM WT	HM %	HL	HW	HC	HSWT	HS %	HA WT	HA %	HOM WT	HOM%
0.72	0.02	0.1	72.22	1.04	72.24	0.12	0.03	0.07*	0.06	81.08	0.02	37.68	0.06	37.68
4.01	0.04	0.55	35.83	2.29	35.83	0.055	0.01	0.04	0.16	193.27	0.07	54.65	0.07	54.65
3.13	0.09	0.45	79.4	2.76	79.4	0.068	0.01	0.02	0.21	192.46	0.08	55.86	0.083	55.86

*, ** significance at 0.05 and 0.01 levels of Probability respectively

LWT: live weight, HFWT: Humerus fresh weight, HF%: humerus fresh percentage, HD WT: humerus dry weight, HD %: humerus dry percentage, HM WT: humerus moisture weight, HM%: humerus moisture percentage, HL: humerus length, HW: humerus width, HC: humerus circumference, HS WT: humerus sample weight, HS %: humerus sample percentage, HA WT: humerus ash weight, HA%: humerus ash percentage, HOM WT: humerus organic matter weight and HOM % humerus organic matter percentage.

Table 6: Mean squares from ANOVA of the physical and chemical characteristics of femur of cockerel

E	LWT(g)	FF WT(g)	FF %	FD WT	FD %	FM WT	FM %	FL	FW	FC	FS WT	FS %	FA WT	FA %	FOM WT	F
MENT	3403.22	1.59	0.09	0.17	26.35	2.06	26.35	0.064	0.01	0.04	0.19	77.79	0.15*	119.95*	0.1	1
ATE	5201.67	2.53	0.06	0.69	21.49	1.41	21.49	0.19	0.01	0.08*	0.83	296.69*	0.15*	40.1	0.33	
	8934.17	3.87	0.14	0.86	32.51	2.57	32.51	0.15	0.01	0.03	0.33	90.94	0.05	33.82	0.18	

*, ** significance at 0.05 and 0.01 levels of Probability respectively

LWT: live weight, FF WT: femur fresh weight, FF%: femur fresh percentage, FD WT: femur dry weight, FD %: femur dry percentage, FM WT: femur moisture weight, FM%: femur moisture percentage, FL: femur length, FW: femur width, FC: femur circumference, FS WT: femur sample weight, FS %: femur sample percentage, FA WT: femur ash weight, FA%: femur ash percentage, FOM WT: femur organic matter weight, and FOM %: femur organic matter percentage.

3.2 The mean effect of diets on the physical and chemical characteristics of the humerus and femur of the experimental cockerel

Generally, the variations among the treatments were not significant for most humerus characteristics, T_3(25% SBM + 75% GNC) had the highest (2.12g) mean effect on humerus circumference (HC), followed by T_4(0% SBM + 100% GNC) (2.11g), while T_1(100% SBM + 0% GNC) had the least (1.93g) effect on HC (Table 7). On the other hand, T_2 (50% SBM + 50% GNC) had the highest (1.28) effects on femur ash weight, and percentage femur ash weight (45.41) (Table 8), whereas T_4 (0% SBM + 100% GNC) had the least effects on the two characteristics. However, T_4 had the most significant effect on percentage organic matter (Table 8). while other traits had no significant treatment effect although the performances of each trait differ between the treatments.

Table 7: The mean effect of four treatments on the physical and chemical characteristics of the humerus of the experimental cockerel

Parameter	T_1	T_2	T_3	T_4	HSD	CV%
LIVE WGT(g)	613.14	623.45	563.37	589.6	114.53	15.68
FRESH HUMERUS WGT(g)	9.83	9.58	9.34	9.22	2.14	18.63
FRESH HUMERUS %	1.62	1.53	1.62	1.58	0.36	18.56
HUMERUS DRY WGT(g)	3.65	3.94	3.55	3.81	0.38	17.94
HUMERUS DRY %	37.56	42.59	38.51	42.7	10.8	22

HUMERUS MOISTURE WGT(g)	6.18	5.64	5.79	5.41	2.01	28.9
HUMERUS MOISTURE %	62.44	57.41	61.49	57.3	10.8	14.94
HUMERUS LENGTH (cm)	5.94	6.18	5.98	6.1	0.32	4.3
HUMERUS WIDTH (cm)	0.58	0.59	0.6	0.59	0.12	17.11
HUMERUS CIRCUMFERENCE (cm)	1.93^{b}	2.04^{ab}	2.12^{a}	2.11^{a}	0.15	6.22
HUMERUS SAMPLE WGT (g)	2.23	2.2	2.06	2.11	0.56	21.56
HUMERUS SAMPLE %	62.56	57.11	58.51	56.07	16.81	23.7
HUMERUS ASH WGT (g)	0.99	1.07	0.97	1.05	0.35	28.07
HUMERUS ASH %	44.8	48.22	47.71	49.36	9.06	15.73
HUMERUS ORGANIC MATTER WGT(g)	1.24	1.13	1.09	1.07	0.35	25.53
HUMERUS ORGANIC MATTER %	55.2	51.78	52.29	50.64	9.06	14.24

+means with the same superscript on the same row are not significantly different at P<0.05, HSD: Tukey Honest Significant difference, CV: coefficient of variation, T1 is the control diet containing 100% Soya bean meal (SBM) and groundnut cake (GNC) at 0%, T2: SBM at 50% and GNC at 50%. T3 SBM at 25% and GNC at 75% and T4, SBM at 0% and GNC at 100%.

Table 8: The mean effect of four treatments on the physical and chemical characteristics of the femur of cockerel

Parameter	**T_1**	**T_2**	**T_3**	**T_4**	**HSD**	**CV%.**
LIVE WGT (g)	613.14	623.45	563.37	589.6	114.53	15.68
FRESH FEMUR WGT(g)	13.35	13.61	13.6	12.76	2.38	14.76
FRESH FEMUR %	2.21	2.2	2.38	2.18	0.45	16.65
FEMUR DRY WGT (g)	4.73	5	4.9	5.02	1.12	18.82
FEMUR DRY %	35.93	36.66	36.17	39.44	6.91	15.39
FEMUR MOISTURE WGT(g)	8.61	8.61	8.71	7.74	1.94	19.04
FEMUR MOISTURE %	64.07	63.34	63.83	60.56	6.9	9.06
FEMUR LENGTH (cm)	6.5	6.55	6.39	6.39	0.47	5.95
FEMUR WIDTH (cm)	0.65	0.59	0.59	0.62	0.11	15.48
FEMUR CIRCUMFERENCE (cm)	2.17	2.24	2.21	2.31	0.19	7.084
FEMUR SAMPLE WGT(g)	2.63	2.83	2.87	2.61	0.69	20.91
FEMUR SAMPLE %	54.77	58.08	58.97	53.02	11.56	16.97
FEMUR ASH WGT (g)	1.17^{ab}	1.28^{a}	1.18^{ab}	0.98^{b}	0.27	19.49
FEMUR ASH %	45.10^{a}	45.41^{a}	41.67^{ab}	38.02^{b}	7.05	13.67
FEMUR ORGANIC MATTER WGT (g)	1.45	1.56	1.69	1.63	0.51	26.47
FEMUR ORGANIC MATTER %	54.90^{b}	54.59^{b}	58.34^{ab}	61.98^{a}	7.05	10.12

+means with the same superscript on the same row are not significantly different at P<0.05, HSD Tukey Honest Significant difference, CV; coefficient of variation, T_1 is the control diet containing 100% soybean meal (SBM) and groundnut cake (GNC) at 0%, T_2 SBM at 50% and GNC at 50%. T_3 SBM at 25% and GNC at 75% and T_4, SBM at 0% and GNC at 100%

3.3 Pearson's correlation coefficient for physical and chemical characteristics of humerus of cockerel

Table 9 shows the correlation between physical and chemical characteristics of humerus of cockerel. The correlation between live weight of birds and the relative weight of moisture, length, width and organic matter is positive but not significant except for humerus organic matter which shows significant positive correlation at $P \leq 0.05$, while correlation with other measured traits is negative with no significance except for humerus relative fresh weight and ash weight which is negatively correlated and significant at $P \leq 0.05$. It was also revealed that correlation between humerus fresh weight and the dry weight, length, width, sample weight and organic matter weight is negative but not significant except for dry weight which shows significance at $P \leq 0.01$while correlation between moisture content, circumference and ash relative weight is positive and not significant except for moisture relative weight which shows significance at $P \leq 0.001$. Correlation between humerus dry weight and moisture weight, width, sample weight and ash weight also show negative and not significant except for moisture relative weight which is significant at $P \leq 0.001$ while correlation with other measured traits is positive with no significance but differed for humerus length which is also positive but significant at $P \leq 0.01$.

Correlation of humerus moisture with length, circumference and organic matter is negative and with no significance except for length which shows significance at $P \leq 0.01$ while Correlation between physical and chemical characteristics of humerus shows that correlation between live weight of birds and the relative weight of moisture, length, width and organic matter is positive but not significant except for humerus organic matter which shows significant positive correlation at $P \leq 0.05$, while correlation with other measured traits are negative with no significance except for humerus relative fresh weight and ash weight which is negatively correlated and significant at $P \leq 0.05$. It was also revealed that correlation between humerus fresh weight and the dry weight, length, width, sample weight and organic matter weight is negative but not significant except for dry weight which shows significance at $P \leq 0.01$while correlation between moisture content, circumference and ash relative weight is positive and not significant except for moisture relative weight which shows significance at $P \leq 0.001$. Correlation between humerus dry weight and moisture weight, width, sample weight and ash weight also show negative and not significant except for moisture relative weight which is significant at $P \leq 0.001$ while correlation with other measured traits is positive with no significance but differed for humerus length which is also positive but significant at $P \leq 0.01$.

Table 9: Pearson's correlation coefficient for physical and chemical characteristics of humerus of cockerel

	Lwt	**HFwt**	**HDwt**	**HMC**	**HL**	**HW**	**HC**	**HSwt**	**HA wt**
HFwt	0.48***								
HDwt	0.37*	0.39**							
HMC	0.37*	0.92***	0.01						
HL	0.28	0.13	0.61***	-0.12					
HW	0.17	0.05	-0.06	0.08	0.21				
HC	-0.13	-0.07	-0.06	-0.05	0.23	0.31*			
HSwt	0.28	0.08	0.33*	-0.05	0.10	0.11	-0.15		
HA *wt*	0.03	-0.01	0.09	-0.05	0.13	0.15	-0.08	0.79**	
HOM *wt*	0.41**	0.14	0.43**	-0.03	0.34*	0.02	-0.16	0.80***	0.27

*, **, *** significance at 0.05, 0.01 and 0.001 levels of probability respectively.

Lwt: live weight, HFwt: humerus fresh weight, HDwt: humerus dry weight, HMC: humerus moisture weight, HL: humerus length, HW: humerus width, HC: humerus circumference, HSwt: humerus sample weight, HA wt: humerus ash weight and HOM wt: humerus organic matter weight.

3.4 Pearson's correlation coefficient for physical and chemical characteristics of femur of cockerel

Table shows the correlation between Physical and Chemical Characteristics of Femur. The correlation between femur live weight and all the measured traits are positive and with no significance except for femur fresh width and length which shows significance at $P \leq 0.05$ and $P \leq 0.01$ respectively and also femur fresh weight, moisture weight, sample weight and organic matter which are negatively correlated and with no significance except for femur fresh weight which shows significance at $P \leq 0.01$.

Correlation between femur fresh weight and the measured traits are negative and with no significance except for dry weight which shows significance at $P \leq 0.01$ and moisture, length and organic matter which is positive and with no significance and also differed for moisture which is positive but shows significance at $P \leq 0.01$. Correlation between femur dry weight and the measured traits are negative and with no significance except for moisture which shows significance at $P \leq 0.001$ and width, length and organic matter which shows positive correlation but with no significance with exception of femur width which is positive and significant at $P \leq 0.01$. Correlation between moisture weights and the measured circumference, sample weight and ash weight are positive and while the length, width and organic matter shows negative correlation with no significance with the exception of femur width which is negative but significant at $P \leq 0.01$. Correlation between femur length and width, circumference and organic matter are positive with no significance except for width which shows significance at $P \leq 0.001$ while correlation between length with sample weight and ash weight is negative but not significant. Correlation between femur width and circumference, sample weight and ash weight are negative and with no significance while its correlation with organic weight is positive but also with no significance. Correlation between femur circumference and sample weight, organic weight is negative and with no significance while its correlation with ash weight is positive but with no significance. Correlation between sample weight and ash weight is positive with no significance while its correlation with organic weight is negative and not significant. Correlation between ash weight and organic matter weight is negative and significant at $P \leq 0.001$.

Table 10: Pearson's correlation co-efficient for femur's physical and chemical characteristics of cockerel

	Lwt	**FFwt**	**FDwt**	**FMC**	**FL**	**FW**	**FC**	**FSwt**	**FA wt**
FFwt	0.43**								
FD wt	0.54***	0.58***							
FMC	0.21	0.89***	0.13						
FL	0.41**	0.45**	0.59***	0.2					
FW	0.31*	-0.01	0.29	-0.17	0.52***				
FC	0.09	0.01***	-0.07	0.04	0.01	-0.06			
FSwt	0.31*	0.29	0.51***	0.06	0.46**	0.22	-0.12		
FA wt	0.32*	0.1	0.26	-0.03	0.28	0.03	-0.06	0.79***	
FOM wt	0.24	0.35*	0.56**	0.1	0.48***	0.3	-0.14	0.93***	0.51***

*, **, *** significance at 0.05, 0.01 and 0.001 levels of probability respectively.
Lwt: live weight, FFwt: femur fresh weight, FDwt: femur dry weight, FMC: femur moisture weight, FL: femur length, FW: femur width, FC: femur circumference, FSwt: femur sample weight, FA wt: femur ash weight and FOM wt: femur organic matter weight.

4. CONCLUSION

It was concluded that although groundnut cake and soybean meal have similar crude protein content, soybean meal is of superior quality due to its greater amino acid profile and as such it should be recommended for farmers.

5. ACKNOWLEDGMENT

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6. REFERENCES

[1] Adeniji, A. A. (2008) Replacement Value of Soybean Meal with Groundnut Cake with or Without Fishmeal Supplementation in Diets of Pullet Chicks. Journal of Applied Sciences Research, 4(10), 1249-1252.

[2] A.O.A.C. (1984) Official Methods of Analysis. 14th Edition, Association of Official Analytical Chemists, Washington DC.

[3] Dimitrios, L., Vincenzo, F., Edoardo, C. (2016) Flavor of roasted peanuts (Arachis hypogaea) — Part II: Correlation of volatile compounds to sensory characteristics. Food Research International, pp. 89. 10.1016/j.foodres.2016.08.017.

[4] Ewan, R.C. (1985) World soyabean Research Conference II. Edition by R. Shibles. West View Press.

[5] Ghadge, V.N., Patil, B. (2009) Effect of Replacing Groundnut cake by soybean meal on Performance of Broilers. Veterinary World, 2. 10.5455/vetworld.2009.183-184.

[6] Hoffmann, D., Thurner, S., Ankerst, D., Damme, K., Windisch, W., Brugger, D. (2019) Chickens' growth performance and pancreas development exposed to soy cake varying in trypsin inhibitor activity, heat-degraded lysine concentration, and protein solubility in potassium hydroxide, Poultry Science, 98(6), 2489-2499.

[7] Mukherjee, R., Chakraborty, R., Dutta, A. (2016) Role of Fermentation in Improving Nutritional Quality of Soybean Meal - A Review. Asian-Australas Journal of Animal Science, 29(11),1523-1529. Epub 2015 Dec 1. PMID: 26954129; PMCID: PMC5088370. DOI: https://doi.org/10.5713/ajas.15.0627.

[8] Osho, S.M., Akinleye, S.O., Akanni, K.A., (2009) Determinants of soybean production in south western Nigeria. Journal of life and physical science, 4(2)113.