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## EFFECTS OF VARIOUS PROTEIN SEED CAKES AS REPLACEMENT FOR FULL FAT SOYBEAN MEAL ON THE HAEMATOLOGICAL CHARACTERISTICS AND SERUM BIOCHEMICAL INDICES OF BROILER CHICKEN

Yusuf, A. A., Agyo, B., Isah, A. and Diftuffe, M.

Department of Agricultural Education,  
Federal College of Education (Tech.), Gombe  
[allhajiabbayusuf@gmail.com](mailto:allhajiabbayusuf@gmail.com) 08063625834

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### ABSTRACT

An 8-week feeding trial was conducted at the Teaching and Research Farm, Federal College of Education (Technical), Gombe to find out alternative non-conventional protein feed sources that could be used to replace full-fat soybean. Three hundred 1-day-old broiler (ROSS) chickens were fed commercial diets for seven days. The birds were afterwards randomly allotted to five dietary treatments with four replicates, 15 birds per replicate. The rations-based diets were full-fat Soybean meal, Soybean cake, Groundnut cake, Sesame seed meal, and Palm kernel cake designated as diets T1, T2, T3, T4, and T5. respectively. The results for blood haematological and serum parameters showed that there was no significant ( $P > 0.05$ ) difference among the treatment means for packed cell volume, red blood cells, white blood cell, haemoglobin, eosinophils, lymphocytes, monocytes, and neutrophils but there was a highly significant ( $P < 0.01$ ) difference in basophils, and a significant ( $P < 0.05$ ) difference was obtained in Mean Corpuscular Volume (MCV). The results for serum biochemical blood indices revealed that there was no significant difference ( $P > 0.05$ ) among the treatment means for total protein, globulin, albumin, total calcium, and ionized calcium but a significant ( $P < 0.05$ ) difference was obtained in the cholesterol where diets T1 and T5 were the highest. Based on the results obtained in this study, it can be concluded that, with the exception of diet T5 (Palm kernel seed cake), all the other seed cakes used can effectively replace full-fat soybean meal without negative effect on blood haematological and serum parameters in broiler chickens.

**Keywords: Protein Seed Cakes, Soya Bean Meal, Broilers, Haematological and Serum**

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### INTRODUCTION

The Nigerian poultry sector is one of the fastest-growing agricultural sectors comprising 169 million birds (Sasu, 2023), yielding 300Mt of meat and 650Mt of eggs annually, ranked fifth in the world comprising 2.6 percent of the world's total population (*Commonwealth Scientific and Industrial Research Organisation (CSIRO), (2020).*). But profitability in any business depends upon the knowledge, use and attitude towards various inputs of quality and quantity parameters (*CSIRO, 2020*). The COVID-19 pandemic which plunged the World into economic hardship and economic recession, coupled with rising insecurity and climate changes led to increasing food prices, loss of livelihoods, hunger and malnutrition in Nigeria (Adesina and Loboguerrero, 2021), thereby necessitating the use of cheaper sources of nutrients to meet the nutritional requirements of poultry.

The major hindrance to commercial poultry production in Nigeria is the unavailability and high cost of feed which arises from the competition between human and animals for the available grains (Ogba *et al.*, 2020). Soya bean has been used as a sole supplementary plant protein and lipid in poultry feed for a long time as well as food industry depends more on soybean as a mainstay for protein (Adli, 2021). In view of the competition between humans and animals for the available conventional legumes like soya beans, efforts are being channeled towards the use of non-conventional feedstuff that are highly nutritious (Arshad *et al.*, 2022). The objective of this study was to determine the effects of non-conventional protein seeds cakes as replacement for full fat soybeans on haematological parameters and serum biochemical indices of broiler chickens.

### MATERIALS AND METHODS

#### Experimental Sites

The study was conducted at Teaching and Research Farm, Federal College of Education (Technical) Gombe, Gombe State. The study area is located within the Northern Guinea Savannah region of North-Eastern geographical zone of Nigeria.

### Experimental Birds and their Management

A total number of 300 1-day-old, broiler (Cobb-500) chicks were purchased from Olam Farm, Chikun hatchery and fed commercial diets for seven days. Thereafter, the birds were randomly allotted to five dietary treatments and four replicates, 15 birds per replicate. The birds were vaccinated following standard procedures and antibiotics, coccidiostats and vitamins were administered when necessary.

### Treatments and Experimental Diets for Broilers

The study comprises four iso-nitrogenous and iso-caloric dietary treatments in both the starter (23% CP, 3000kcal/kg ME) and finisher rations (20% CP, 3000kcal/kg ME). The test ingredients in the diets were Full Fat Soybean Meal, Soybean Cake, Groundnut Cake, Sesame Seed Meal and Palm Kernel Cake designated as diet T1, T2, T3, T4 and T5, respectively for both the starter, table 1, and the finisher table 2. The birds were fed *ad-libitum* the starter experimental diet from 2<sup>nd</sup> - 4<sup>th</sup> week, while the finisher diet was fed from 5<sup>th</sup> – 8<sup>th</sup> week

**Table 1. Dietary Composition (%) and Calculated Analysis of Broiler Starter Diets (2-4 weeks)**

Diets	Levels of Inclusion in Percentages of Feed Ingredients				
	T1	T2	T3	T4	T5
Maize	42.92	49.50	50.38	47.57	36.24
FFSB	38.38	-	-	-	-
SBC	-	31.80	-	-	-
GNC	-	-	30.92	-	-
SSC	-	-	-	33.73	-
PKC	-	-	-	-	30.00
Rice Bran	10.00	10.00	10.00	10.00	10.00
Fish Meal	5.00	5.00	5.00	5.00	5.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Palm Oil	0.029	0.025	0.017	1.17	2.60
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
CP (%)	23.00	23.00	23.00	23.00	23.00
ME (kcal/kg)	3000.00	3000.00	3000.00	3000.00	3000.00

FFSB=Full fat soyabean, SBC= Soybean cake, GNC= Groundnut cake, SSC= Sesame seed cake, PKC= Palm kernel cake.

### Evaluation of Blood Sample

Blood samples were collected at the age of eight weeks from two birds per replicate making a total of eight birds per treatment by inserting a new sterile needle into the wing vein of the birds and extracting 2mls of blood which were placed inside vacutainer tubes containing Ethylene Diamine Tetra Acetic Acid (EDTA). The blood samples were gently shaken to mix with EDTA in order to prevent coagulation. The samples were then analyzed for Red Blood Cell (RBC), White Blood Cell (WBC), Packed Cell Volume (PCV), Haemoglobin (Hb), Neutrophil, Lymphocytes, Monocytes, Erosinophyl and platelets.

### Total Protein, Albumin, Globulin and Cholesterol

Blood serum was obtained by coagulating the blood, the serum parameters which were analyzed are; Total Protein, Albumin, Globulin and Cholesterol.

### Statistical Analysis

All records collected will be stored and managed using the Microsoft Excel (2016). Information obtained will be subjected to a one-way analysis of variance (ANOVA) using Statistical Analysis System (2009). Differences between the mean values will be compared at ( $P < 0.05$ ) using Fisher's Least Significant Difference (LSD).

**Table 2. Dietary Composition (%) and Calculated Analysis of Broiler Starter Diets (5-8 weeks)**

Diets	Levels of Inclusion in Percentages of Feed Ingredients				
	T1	T2	T3	T4	T5
Maize	49.68	55.10	55.83	53.51	32.06
FFSB	31.62	-	-	-	-
SBC	-	26.20	-	-	-
GNC	-	-	25.47	-	-
SSC	-	-	-	27.79	-
PKC	-	-	-	-	35.00
Rice Bran	12.00	12.00	12.00	12.00	12.00
Fish Meal	3.00	3.00	3.00	3.00	14.24
Bone Meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Common Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Palm Oil	0.025	0.021	0.014	0.54	0.985
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
CP (%)	20.00	20.00	20.00	20.00	20.00
ME (kcal/kg)	3000.00	3000.00	3000.00	3000.00	3000.00

## RESULTS AND DISCUSSION

### Blood parameters Characteristics of Broilers Fed with Various Protein seeds cakes Sources

The results for Blood parameters is shown in table 3, the results revealed that there was no significant ( $P > 0.05$ ) difference among the treatment means for packed cell volume, red blood cell, white blood cell, haemoglobin, Eosinophils, Lymphocytes, Monocytes, and Neutrophils but there was a highly significant ( $P < 0.01$ ) difference in Basophils, and a significant ( $P < 0.05$ ) difference was obtained in Mean Corpuscular Volume (MCV) in both parameters diets 3 and 2 had the highest follows by diet 1 while diets 4 and 5 were similar and the least.

The results for Serum biochemical blood indices is shown in table 4. The result revealed that, there was no significant difference ( $P > 0.05$ ) among the treatment means for total protein, globulin, albumin, total calcium and ionized calcium but a significant ( $P < 0.05$ ) difference was obtained in the cholesterol where diets 1 and 5 were the highest which were also similar to diets 3 and 4 while the least was obtained in diet 2

**Table 3. Blood Parameters of Broiler Fed with various Protein Seed Cakes Sources**

Parameters	Broilers Fed with Supplemented Natural Growth Promoters					
	T1	T2	T3	T4	T5	SEM
Packed cell volume (%)	26.20	30.55	28.00	24.70	27.90	2.43 <sup>NS</sup>
Red blood cell (106/L)	2.25	2.59	2.28	2.15	2.49	0.17 <sup>NS</sup>
White blood cell (103/L)	157.75	143.69	135.54	118.68	135.36	18.82 <sup>NS</sup>
Hb (g/d/L)	6.10	7.15	6.55	5.10	6.55	0.63 <sup>NS</sup>
MCV ( <i>f</i> )	116.40ab	117.97ab	122.95a	115.05b	111.45b	2.96*
Eosinophils	0.00	0.00	0.00	0.05	0.05	0.03 <sup>NS</sup>
Lymphocytes	79.45	86.90	79.00	69.75	74.55	6.83 <sup>NS</sup>
Monocytes	0.65	0.45	0.35	0.40	0.20	0.15 <sup>NS</sup>
Neutrophils	14.10	12.50	12.85	25.30	21.60	7.29 <sup>NS</sup>
Besophils	5.80bc	10.15a	7.80ab	4.50c	3.52c	1.13***

<sup>abc</sup> Means bearing different superscripts within the same row differ significantly, \* = ( $p < 0.05$ ), \*\* = ( $p < 0.01$ ), \*\*\* = ( $p < 0.001$ ), NS = not significant and SEM = standard Error of the mean. MCV = mean corpuscular volume

**Table 4. Serum Biochemical Indices of Broiler Chickens as Influenced by Feeding Various Protein Seed Cake Sources**

Parameters	T1	T2	T3	T4	T5	SEM
Total Protein (g/L)	27.00	27.00	24.00	21.50	25.5	0.17 <sup>NS</sup>
Albumin (g/dL)	10.00	13.50	9.00	8.50	10.0	0.21 <sup>NS</sup>
Globulin (g/dL)	17.00	13.50	15.00	13.00	15.5	0.20 <sup>NS</sup>
Total Calcium	2.55	3.15	2.50	3.04	2.64	0.57 <sup>NS</sup>
Ionized Calcium	1.31	1.62	1.29	1.56	1.36	0.29 <sup>NS</sup>
Cholesterol (mmol/L)	2.40a	1.45b	1.85ab	2.05ab	2.45a	0.31*

Haematological indices are a reflection of the effects of dietary treatments on the animal in terms of the type, quality and amounts of the feed ingested and available for the animal to meet its physiological, biochemical and metabolic necessities (Buta *et al.*, 2019). The PCV value obtained showed that birds in all treatments were in the normal range of 22-33% according to (Banerjee, 2009). George, (2020), stated that since PCV is responsible for transporting absorbed nutrients, and oxygen, an increased level could lead to better transportation and thus resulting in an increased primary and secondary polycythemia.

The value observed for both WBC ( $11.87-15.78 \times 10^6/L$ ) and RBC ( $2.15-2.59 \times 10^6/L$ ) were in normal range  $9-34 \times 10^6/L$  and  $2-4 \times 10^6/L$ , respectively according to the findings of Banerjee (2009). Since the WBC values lies between the normal range of clinical birds, this informs that the birds are capable of generating antibodies in the process of phagocytosis and have high degree of resistance to diseases and enhance adaptability to local environmental and disease prevalent conditions (Animashahun and Omoikhoje, 2014). The values obtained in this study are indication that there was, no microbial infections or presence of foreign bodies, antigens or parasites in the circulatory system of the experimental animals (Ahamafulé *et al.*, 2008).

The haemoglobin count observed in this study ranges from (5.1-7.15g/dL) where only diet T2 fall within the normal range (7-13g/dL) recommended for healthy broiler chickens indicating that the birds had sufficient blood pigment for proper transportation of oxygen (Buta *et al.*, 2019).

Serum biochemistry is usually used for detection of organ diseases in domestic mammals and the amount of available protein in the diets (Iyayi and Tewe, 1998). It has been reported that serum biochemical constituents are positively correlated with the quality of the diet (Adeyemi, *et al.*, 2000). The Cholesterol values observed ranges between 1.45-2.45mmol/L and within the range of 1.86-3.37mmol/L in broilers reported by (Ross *et al.*, 1978). The highest cholesterol in diets T1 and T5 may be as a results of high residual oils in those feeds while the lower value in cholesterol indicates in diets T2, T3 and T4 can be due to effective utilization of different meals and this concurred with the result of (Osho *et al.*, 2016) in broiler chickens. The results for the blood parameters as well as the serum biochemical indices indicates that the various protein seed cakes have no detrimental effects on the birds

## CONCLUSION

From the results obtained in this study, it was concluded that with the exception of Palm kernel seed cake, all the other seed cakes used (Soybean cake, Groundnut cake, Sesame seed cake) can effectively replace full fat soybean meal for effective blood haematological and serum parameters without any detrimental effects in broiler chickens.

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