

## *Original Research Paper*

# **Blood Indices of Broiler Finisher Birds Fed Varying Dietary Levels of Crayfish Waste Meal**

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Received 2 November 2019; Accepted 14 December 2019; Published 21 December 2019

**ABSTRACT:** A study was carried out using 300 unsexed four weeks old Cobb breed of broiler finisher birds to evaluate their blood indices when fed 0%, 1%, 2%, 3% and 4% dietary inclusion levels of crayfish waste meal. The birds were randomly allotted to five treatment groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> representing 0%, 1%, 2%, 3% and 4% dietary inclusion levels of crayfish waste meal respectively in a completely randomized design. Feed and water were supplied ad libitum. On the 54<sup>th</sup> day of age, 5 birds were randomly selected from each replicate, starved of feed but not water for 12hrs. 10ml of blood sample was drawn from each of the birds through the wing vein – with 5mls of it put into bottles containing anti-coagulant (Ethylene Diamine, Tetra Acetic acid) and used to access haematological indices while the other 5ml was put into sterile bottles to coagulate for the assessment of serum biochemical indices. All the blood indices investigated in this study did not differ significantly ( $p < 0.05$ ) among treatment means and did not follow any particular trend. All the values obtained fell within normal range for normal healthy chicken. Results suggest that crayfish waste meal protein possessed similar nutritional qualities as 100% fishmeal and can adequately replace fishmeal in the diets of broiler finisher birds.

**Keywords:** Blood indices, broiler finisher birds, crayfish waste meal

## **INTRODUCTION**

Nutrient content of diets effect the blood profile of healthy birds (Kurtoglu *et al.*, 2005; Obih, 2018). Blood indices are good indicators of the physiological status of animals (Khan and Zafar, 2005, Merck, 2012). Blood acts as a pathological reflector of the status of exposed animals to toxicants and other similar conditions (Olafedehan *et al.*, 2010). Animals with good blood composition are likely to show good performance (Isaac *et al.*, 2013). Blood assay provides the opportunity to investigate the presence of several metabolites and other constituents in the body of the animal and plays a vital role in understanding the physiological, nutritional and pathological status of the animal (Doyle 2006). Afolabi *et al.* (2010) stated that stress conditions due to environment, nutrition and/or pathological factors can be determined by the blood profile. Blood analysis serves as a vital tool in detecting

any deviation from normal in the animal with regard to blood components, blood forming organs and very vital organs of the body. This study was embarked upon to determine the blood indices of broiler finisher birds fed varying levels of crayfish waste meal as replacement for the conventional fish meal.

## **MATERIALS AND METHODS**

### **Experimental site**

This study was conducted at the poultry unit of the Imo State University Research and Production Farm, Owerri, Nigeria situated on longitudes 7<sup>0</sup>, 01<sup>1</sup>, 06<sup>11</sup>E and 7<sup>0</sup>, 03<sup>1</sup> 06<sup>11</sup> E and latitudes 5<sup>0</sup>, 28<sup>1</sup>, 24<sup>1</sup> 1<sup>1</sup>N and 5<sup>0</sup>, 30<sup>1</sup>, 00N (Imo State ministry of Lands and Survey Atlas, 2003).

**Table 1:** Ingredients and Nutrients Composition of Experimental Diets.

Ingredients	% Inclusion Levels				
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)
Fishmeal (Fm)	4	3	2	1	0
Crayfish waste meal (CWM)	0	1	2	3	4
Whole maize	50	50	50	50	50
Soybean meal	8	8	8	8	8
Groundnut cake	15	15	15	15	15
Palm kernel cake	12.00	11.20	10.40	9.60	8.12
Wheat offal	6.20	7.00	7.80	8.60	10.08
Bone meal	4.00	4.00	4.00	4.00	4.00
Common salt	0.30	0.30	0.30	0.30	0.30
Vit./min.premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrient Composition of the experimental diets.					
% crude protein	21.28	21.26	21.24	21.23	21.21
% crude fiber	3.34	3.46	3.58	3.70	3.82
Ether extract %	3.38	3.87	3.92	3.98	4.12
Metabolizable energy (Kcal/kg)	2833.84	2839.78	2839.72	2860.66	2868.66

### Preparation of experimental diets

Crayfish waste was procured from crayfish vendors and subjected to crushing in a mill. Sample of the milled crayfish waste meal (Table 1) was subjected to proximate analysis at Precision Analytical Research Laboratory, Ibadan in line with standard methods (AOAC, 2010). Other feed ingredients were procured from reputable vendors (crushed where necessary) and mixed according to the formulae in (Table 1).

### Procurement and rearing of experimental birds

A total of 300 unsexed four weeks old Cobb breed of broiler birds were used for this study. The birds were reared on deep litter in a Standard tropical poultry building. The 300 birds were randomly divided into five treatment groups of 60 birds each and each treatment group was further replicated three times. The birds were housed in 15 pens (each capable of accommodating 20 finished broiler birds).

### Experimental design, data collection and data analysis

The experimental design was completely randomized design (CRD). Each of the fifteen replicates had 20 birds totaling 60 birds per treatment group represented as T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> with crayfish waste meal inclusion levels of 0%, 1%, 2%, 3% and 4% respectively. Two days to the termination of the study, five birds were randomly

selected from each replicate, starved of food but not water for 12 hours. 10ml of blood sample was drawn from each bird through the wing vein with a sterile syringe/needle 5ml of the blood sample was quickly discharged into sample bottles containing anticoagulant, ethylene diamine tetra-acetic Acid (EDTH) and was used to assess haematological indices – Haemoglobin, (Hb), White Blood Cell (WBC), counts, Packed Cell Volume (PCV), Mean Corpuscular Haemoglobin Concentration (MCHC), Mean Cellular Haemoglobin (MCH), Mean Corpuscular Volume (MCV), blood clotting time and red blood cells (RBC) count. While the other 5ml were put into sterile bottles without anticoagulant and was used for the determination of serum biochemical parameters – total serum protein, serum albumin, cholesterol, creatinine and urea, as well as serum electrolytes and serum enzymes. With the exception of erythrocyte sedimentation rate, haematological parameters were determined with Sysmex Auto Analyzer while serum biochemical indices were determined with Vistros Die II Autoanalyzer.

All data collected were subjected to analysis of variance (Steel and Torrie, 1980), while difference between treatment means were separated using Duncans multiple range test as outlined by Onuh and Igwemma (2003).

### RESULTS AND DISCUSSION

Proximate composition of crayfish waste meal and fish meal are shown in (Table 2). Results of the blood indices

**Table 2:** Proximate composition of crayfish waste meal and fishmeal

Nutrients	Fishmeal	Crayfish Waste Meal
Dry matter %	94.06	86.17
Crude protein %	55.93	38.82
Crude fibre %	1.84	1.77
Ether Extract %	5.11	7.89
Ash %	15.38	10.66
Nitrogen free extract	15.00	23.83
Moisture	5.94	13.83

**Source:** Precision research laboratory – field study

**Table 3:** Haematological parameters of broiler finisher birds fed varying levels of crayfish waste meal (CWM).

Parameters	% Inclusion Levels					SEM
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)	
Hb (g/dL)	12.83	13.03	12.60	12.40	12.63	0.21
PCV (%)	39.33	40.67	36.67	37.00	36.67	1.87
RBC (x10 <sup>12</sup> L)	12.77	13.17	12.43	12.20	12.40	0.32
MCV (fL)	30.77	30.87	29.50	30.27	29.57	0.76
MCH (Pg)	9.90	9.87	10.13	10.17	10.20	0.11
MCHC (Pg)	32.63	32.10	34.50	33.80	34.50	1.06
ESR (mm <sup>3</sup> /1 <sup>st</sup> hour)	43.33	46.67	46.67	43.33	46.67	6.67

**SEM:** Standard Error of Mean

**Table 4:** WBC and its differentials values of broiler finisher birds fed varying levels of crayfish waste meal (CWM).

Parameters	% Inclusion Levels					SEM
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)	
WBC (x10 <sup>9</sup> L)	11.70	11.73	11.43	11.47	11.47	0.15
Lymphocytes (%)	42.00	43.67	43.67	44.67	44.65	0.79
Heterophils (%)	55.00	53.33	53.00	51.67	52.62	1.00
Eosinophils (%)	1.33	1.67	1.67	1.67	1.33	0.33
Mesophils (%)	1.67	1.33	1.67	2.00	1.33	0.30
Basophil (%)	0.00	0.00	0.00	0.00	0.00	0.00

SEM: Standard Error of Mean.

**Table 5:** Serum Biochemical Indices of Broiler Finisher Birds Fed Varying Levels of Crayfish Waste Meal (CWM).

Parameters	% Inclusion Levels					SEM
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)	
Urea (Mmol/L)	6.83	7.50	6.00	6.17	6.17	0.27
Creatinine (Mmol/L)	66.33	67.00	59.67	59.33	60.00	2.88
Cholesterol (Mmol/L)	7.23	7.83	7.43	7.53	7.30	0.32
Total protein (g/dL)	65.67	65.67	70.67	56.00	63.00	3.65
Globulin (g/dL)	43.33	47.33	44.30	39.67	38.33	3.82
Albumin (g/dL)	22.33	23.33	22.00	23.33	20.67	1.01

SEM: Standard Error of Mean.

**Table 6:** Serum Electrolyte Values of Broiler Finisher Birds Fed Varying Levels of Crayfish Waste Meal (CWM).

Parameters	% Inclusion Levels					SEM
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)	
Na <sup>+</sup> (Mmol/L)	41.67	42.00	40.67	40.67	40.34	0.90
K <sup>+</sup> (Mmol/L)	1.00	1.30	1.03	1.03	1.23	0.06
HCO <sub>3</sub> <sup>-</sup> (Mmol/L)	11.06	11.17	10.80	10.57	11.00	0.24
CL <sup>-</sup> (Mmol/L)	21.67	23.00	22.53	22.67	22.33	0.83

SEM: Standard Error of Mean.

**Table 7:** Serum Liver Enzyme Values of Broiler Finisher Birds Fed Varying Levels of Crayfish Waste Meal (CWM)

Parameters	% Inclusion Levels					SEM
	T <sub>1</sub> (0%)	T <sub>2</sub> (1%)	T <sub>3</sub> (2%)	T <sub>4</sub> (3%)	T <sub>5</sub> (4%)	
ALT (iμ/L)	6.70	6.57	6.70	6.73	6.87	0.21
AST (iμ/L)	11.23	11.30	11.47	11.27	11.73	0.10
ALP (iμ/L)	1.30	1.40	1.20	1.10	1.13	0.05

SEM: Standard Error of Mean.

of broiler finisher birds fed varying levels of crayfish waste meal (CWM) are shown in (Tables 2, 3, 4, 5 and 6). All the blood indices investigated in this study did not differ significantly ( $p>0.05$ ) among treatment means and did not follow any particular trend. Results also showed that all the values obtained fell within normal range for normal chicken as reported by (Merck 2012; Doyle, 2006; Sokumbi and Egbunike, 2002; RAR, 2009; Ozkan *et al.*, 2012). It appears from the values obtained for blood indices in this study that crayfish waste meal protein was as good as that of fishmeal and possessed similar nutritional qualities as 100% fish meal in diets and therefore confirmed the nutritional adequacy of crayfish waste meal to replace fishmeal (Maikamo, 2014). Meyers, (1986) had reported that crayfish waste meal has a comparable amino acid profile with fish meal and results obtained here signify the extent of feed and protein utilization in all the diets. Chineke *et al.*, (2006) reported that packed cell volume, haemoglobin and MCH are major indices for evaluating circulatory erythrocytes and are significant in the diagnosis of anaemia. ESR values from this study fell within range for normal chicken and as such CWM did not impact negatively on the broiler finisher birds (Obikaonu *et al.*, 2011).

Values for WBC and WBC differentials suggest that CWM supported the ability of the birds to fight infections and defend their bodies against invasions by microorganism and other foreign bodies (Soetan *et al.*, 2013). Abnormal serum biochemical indices results suggest organ diseases in domestic animals (Malik *et al.*, 2012) and serum biochemical constituents correlate positively with the quality of the diet (Adeyemi *et al.*, 2000), an indication that CWM did not interfere with the quality of the diets.

## Conclusion

Crayfish waste meal diets did not impact negatively on blood indices of broiler finisher birds. It supported normal blood parameter values and therefore could be used to replace fishmeal hundred percent.

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