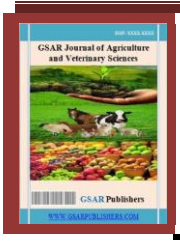

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HAEMATOLOGICAL AND SERUM BIOCHEMICAL PROFILE OF BROILER FED WITH THREE COMMONLY USED COMMERCIAL STARTER FEEDS IN WUKARI, TARABA STATE NIGERIA.

By

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Abstract

The quality of commercial starter feeds is critical for the health and productivity of broiler chickens, yet the consistency of these feeds across different brands in Nigeria remains a concern. This study was conducted to evaluate the haematological and serum biochemical profile of broiler chickens fed three commonly used commercial starter feeds in Wukari, Taraba State, Nigeria. A total of ninety- nine (99) day-old broiler chicks were randomly assigned to three dietary treatments (labelled T1, T2 and T3), each representing one of the three commercial starter feeds, in a completely randomized design. The trial lasted for six weeks, during which feed and water were provided ad libitum. At the end of experiment, blood samples were collected from two birds per treatment for the determination of haematological parameters including packed cell volume (PCV), haemoglobin (Hb), red blood cell count (RBC), white blood cell count (WBC) and differentials, as well as some serum biochemical indices like bilirubin and liver enzymes (AST, ALT, and ALP). Haematological results showed that birds fed T1 and T3 had significantly higher ($P<0.05$) packed cell volume (PCV), haemoglobin (Hb), and red blood cell (RBC) counts compared to T2, indicating better physiological status and oxygen-carrying capacity. White blood cell (WBC) and platelet counts were also higher in T3, suggesting improved immune response. Serum biochemical analysis indicated that T1 supported better liver function, with lower ALT, AST, and bilirubin levels compared to T2 and T3. Overall, the study demonstrates that variations in feed quality significantly influence the health and physiological performance of broiler chickens.

Keywords: *Broiler, Commercial starter feeds, Haematology, Serum biochemistry, Wukari*

INTRODUCTION

The poultry industry occupies a pivotal position in Nigeria's agricultural sector, serving as a major source of animal protein, employment, and livelihood for millions of citizens. Modern poultry production was introduced in Nigeria in the late 1950s when it became evident that the ruminant animal sector could not meet the increasing demand for meat. As of 2022, Nigeria ranked second in terms of poultry population globally, with an estimated total of 249 million birds (Alagawang *et al.*, 2019). Among poultry species, broiler chickens are particularly valued for their rapid growth rate, high feed conversion efficiency, and ability to produce quality meat within a short production cycle, making them an attractive enterprise for both smallholder and commercial farmers (Njoku *et al.*, 2018).

Nutrition is arguably the most critical factor influencing the productivity and health of broiler chickens. For a broiler chicken to reach its maximum genetic potential for meat production, its feed must be nutritionally balanced, as a deficiency in any particular nutrient would hinder economic production. Balanced feed ration is especially crucial because it lays the foundation for skeletal development (Njoku *et al.*, 2018). The quality and composition of feed directly influence organ development, metabolic function, and overall physiological status of the birds. Commercial starter feeds are widely used by poultry farmers in Nigeria due to their convenience and the perception that they are formulated to meet the nutritional requirements of broiler chicks. However, poultry producers have reported reduced performance in terms of body weight gain when using different commercial feeds,

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raising concerns about the consistency and quality of these products (Okeniyi *et al.,* 2019). Previous studies have confirmed that some commercial feeds do not contain the required levels and proportions of nutrients as specified by regulatory standards (Abdullahi *et al.,* 2021).

Haematological and serum biochemical parameters serve as reliable indicators of the physiological and health status of animals. The analysis of normal haematological parameters of chickens is essential in diagnosing various pathological conditions and assessing the overall well-being of birds. Haematological indices such as packed cell volume (PCV), haemoglobin concentration, red blood cell count, and white blood cell differentials provide valuable information about the oxygen-carrying capacity of blood, immune function, and the presence of infections or stress. Similarly, serum biochemical parameters including total protein, albumin, glucose, cholesterol, triglycerides, urea, uric acid, and liver enzymes (aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase) reflect the functional status of vital organs such as the liver, kidneys, and pancreas. These parameters are influenced by dietary composition, nutrient bioavailability, and the metabolic demands of the bird (Ayoola 2020).

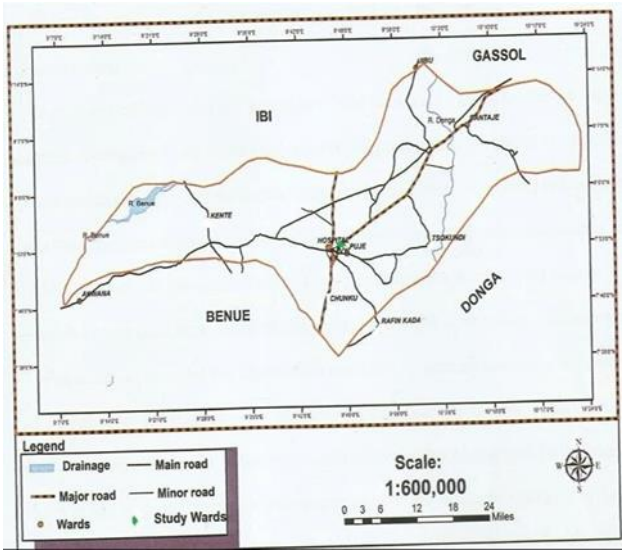
Despite the widespread use of commercial starter feeds in Wukari, Taraba State, and the surrounding areas, there is a paucity of information on the haematological and serum biochemical profiles of broiler chickens fed these commercially available feeds. This knowledge gap is significant because blood parameters can serve as early warning signals of nutritional inadequacies or the presence of anti-nutritional factors in feed. Furthermore, the variability in the quality of commercial feeds from different manufacturers necessitates an empirical evaluation of their effects on the physiological status of birds. This study was therefore designed to evaluate the haematological and serum biochemical profile of broiler chickens fed three commonly used commercial starter feeds in Wukari, with the aim of providing scientific evidence to guide poultry farmers in their feed selection decisions and to contribute to the broader understanding of feed quality assessment through blood parameter monitoring.

MATERIALS AND METHODS

Experimental Location

The experiment was conducted at the poultry house of Federal University Wukari Teaching and Research Farm, Wukari Local Government Area of Taraba State, Nigeria. Wukari is located within the Guinea Savannah ecological zone and is characterized by a tropical climate with distinct wet and dry seasons, it is located at longitude (9°47'0" E) and latitude (7°51'0" N). The area experiences moderate rainfall and average temperatures suitable for poultry production.

Figure 1- Map of Wukari showing its neighbouring towns.
Source- Ejike et al., 2020



Experimental diet

Three different commercial feed samples designated as broiler starter feed was purchased from a poultry feed stores in Wukari, Taraba State. The Poultry feed samples was designated (labelled) as T1, T2 and T3. Each sample was properly labelled and stored prior to proximate analysis and feeding trial.

Feeding of birds

Ninety-nine (99) day old broiler chicks (Arbo acre breed) were purchased from Fidan hatchery in Ibadan, Oyo State. The birds were housed in the poultry house, Teaching and Research Farm Federal University Wukari. The birds were randomly allocated to three groups according to the three different feeds. Prior to the arrival of the chicks, all necessary sanitary measures were carried out; this includes: Thorough washing and disinfection of poultry house. Application of fresh sawdust, provision/checking of lightening, heating and feeding equipment. All treatment and vaccination schedules, as well as all necessary husbandry practices were duly observed throughout the experimental period. Initial weights of the birds were measured daily and thereafter.

Experimental Design

The experiment was arranged in a Completely Randomized Design (CRD) with three treatment groups and two replicate per treatment. Each treatment group was assigned one of the three starter feeds throughout the experimental period.

Management of the birds

The birds were brooded and managed under standard poultry management practices. Clean wood shavings were used as litter material. Feed and clean drinking water were provided ad libitum throughout the experiment period which was for six weeks.

Proximate analysis

Proximate analysis of the feed was carried out on dried feed sample. Five grams (5g) of each of the feed samples were sent to Central Laboratory Federal University Wukari for the

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proximate composition. The following parameters were determined: Moisture content, ash content, Lipid and crude Fibre.

Determination of serum biochemical parameters

After a period of 6 weeks, two (2) birds were randomly selected from each group, giving a total of six (6) birds per treatment and blood samples were collected. Bleeding was done from the punctured wing vein with a scalpel vein needle set. The blood sample (5ml) was collected from each bird and were divided into bottles: EDTA for haematological analysis and plain bottles for serum biochemical analysis. Samples in the plain bottle were allowed to clot to obtain serum in medical laboratory of Federal University Wukari Teaching Hospital

Haematological analysis

Packed cell volume (PCV), Haemoglobin concentration (HB), Red blood cell count (RBC), White Blood Cell count (WBC), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were determined using commercial diagnostic kits.

Serum Biochemical Analysis

Serum samples were analysed for the following biochemical parameters using standard laboratory procedures and commercial diagnostic kits: Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), Total Bilirubin (TB), Conjugated Bilirubin (CB).

Statistical Analysis

Data obtained from proximate analysis, haematology and serum biochemistry were imputed into the computer, and statistical analysis is performed using the Statistical Package for Social Sciences (SPSS) software. One-way analysis of variance (ANOVA) is utilized while comparing the degree of significance of different parameters.

RESULT

Table 1: Proximate Analysis of Three Different Commercial Starter Feeds in Wukari, Taraba State Nigeria

Variable	T1	T2	T3	SEM	p-value
Moisture content %	7.27[b]	7.00[c]	7.96[a]	0.28439	0.7195
Ash content %	4.8700[c]	5.7344[a]	5.7300[b]	0.28740	0.0042
Crude fibre %	12.2476[c]	14.5030[a]	13.7831[b]	0.66512	0.0001
Crude lipid %	6.9743[c]	10.3730[b]	12.0276[a]	1.48744	0.0000

Values are expressed as mean

Table 2: Haematological Parameters of Broiler Chickens Fed Different Commercial Starter Feeds labelled T1, T2 and T3

	TREATMENTS				
Parameter	T1	T2	T3	SEM	p-value
PCV (%)	0.26[c]	0.58[a]	0.27[c]	0.12	0.180
Hb (g/dl)	11.85[b]	7.60[c]	12.00[a]	1.80	0.020
RBC	2.50[a]	1.50[c]	2.30[b]	0.40	0.010
MCV	115.70[b]	130.65[a]	115.10[c]	2.20	0.045
MCH	53.85[b]	59.30[a]	52.85[c]	2.10	0.110
MCHC	46.60[a]	45.25[c]	45.70[b]	1.00	0.040
WBC	103.65[b]	64.65[c]	119.10[a]	18.50	0.070
Platelets	24.75[b]	16.50[c]	42.00[a]	12.00	0.390

Values are expressed as mean

Table 3: Serum Biochemical Parameters of Broiler Chickens Fed Different Commercial Feeds labelled T1, T2 and T3

	TREATMENTS				
Parameter	T1	T2	T3	SEM	p-value
ALP	14.50[b]	7.00[c]	16.50[a]	6.00	0.013
ALT	4.50[c]	7.50[a]	7.00[b]	1.20	0.248
AST	272.00[c]	286.00[b]	307.50[a]	15.50	0.017
Bil. Total	0.75[c]	1.95[b]	2.90[a]	0.80	0.086
Bil. Conjugate	0.10[c]	1.00[b]	1.80[a]	0.60	0.079

Values are expressed as mean

DISCUSSION

Results from Table 1 (Proximate composition) showed that feed labelled T3 has the highest moisture and crude lipid contents, while T2 has the highest crude fibre content.

Results from Table 2 (haematology) showed that the packed cell volume (PCV), haemoglobin (Hb), and red blood cell (RBC) values were significantly higher ($P<0.05$) in birds fed T1 and T3 compared to T2 This suggests better oxygen-carrying capacity and overall blood quality in T1 and T3, whereas the lower values observed in T2 may indicate reduced erythropoietic activity or possible nutritional inadequacy. This trend aligns with findings by Saidu *et al.*, (2025) who reported that adequate nutrient composition in broiler diets enhances haematological indices. Mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) were highest in T2, indicating larger red blood cells with higher haemoglobin content per cell. Mean corpuscular haemoglobin concentration (MCHC) remained relatively similar across treatments, indicating stable haemoglobin concentration within red cells regardless of diet.

White blood cell (WBC) counts were highest in T3, followed by T1, and lowest in T2. This implies a stronger immune

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response and better disease resistance in birds fed T3 and T1, while birds on T2 may have had compromised immunity. Platelet counts followed a similar pattern, with T3 recording the highest value, which is indicative of better clotting ability and overall physiological stability. These observations are consistent with reports by Abdulmaid *et al.,* (2024) who noted that improved diet quality enhances immune function and blood integrity in broiler chickens. The results indicate that T1 and T3 supported better haematological health of broiler chickens compared to T2, likely due to differences in nutrient composition and bioavailability of essential dietary components.

Results from Table 3 (Serum Biochemistry) show that Alkaline phosphatase (ALP) values were significantly ($P<0.05$) higher in T3 and T1 compared to T2. Since ALP is associated with metabolic activity and bone development, the higher values in T1 and T3 suggest better physiological activity and nutrient utilization, while the lower value in T2 may reflect reduced metabolic efficiency. Similar observations have been reported in broiler nutrition studies where adequate dietary nutrients support enzyme activity and growth processes (Zanding *et al.,* 2025).

Alanine aminotransferase (ALT) and aspartate aminotransferase (AST), which are key indicators of liver integrity, were elevated in T2 and T3 compared to T1. The relatively lower ALT value in T1 suggests better liver stability, whereas the higher enzyme levels in T2 and T3 may indicate mild hepatic stress or increased metabolic load. However, the values are not excessively high, suggesting no severe liver damage.

Total bilirubin and conjugated bilirubin were lowest in T1 and significantly ($P<0.05$) higher in T2 and T3. Elevated bilirubin levels are often associated with increased breakdown of red blood cells or impaired liver function (Opoola *et al.,* 2024). Therefore, the higher values observed in T2 and especially T3 may suggest increased metabolic burden or reduced efficiency in bilirubin clearance. The results suggest that T1 supported better liver function and metabolic stability, while T2 and T3 showed signs of relatively higher metabolic stress, as reflected in elevated liver enzymes and bilirubin levels. These variations are likely linked to differences in nutrient composition and quality of the commercial feeds

CONCLUSION

Based on the findings of this study, it can be concluded that there are significant variations in the nutritional composition of commercial broiler starter feeds available in Wukari, Taraba State Nigeria and the variations reflected in the haematological and serum biochemical parameters that were evaluated. The study highlights the importance of feed quality in broiler production, as poor-quality feeds can negatively affect growth, health, and overall productivity. Therefore, ensuring proper feed formulation and quality control is essential for optimal poultry production.

RECOMMENDATIONS

Based on the results of this study, the following recommendations are made:

Poultry farmers should carefully select commercial feeds based on proven nutritional quality rather than relying solely on brand popularity. Regulatory bodies should strengthen monitoring and evaluation of commercial feeds to ensure compliance with nutritional specifications. Routine proximate analysis of feeds should be encouraged to verify nutrient composition and detect inconsistencies. Further research should be conducted on a larger scale and include growth performance parameters such as weight gain and feed conversion ratio. Farmers should be educated through extension services on the importance of feed quality and its impact on broiler health and productivity.

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CONFLICT OF INTEREST

None

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