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Impacts of Breed on Physiological Responses and Blood Profile of Adult Male Chickens Reared in Southwest Nigeria

Oyeleye, O. O.
Department of Animal Production and Health,
Olusegun Agagu University of Science of Technology,
Okitipupa, Ondo State, Nigeria.

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Abstract

This study evaluated the impact of breed variation on physiological responses and blood profile in adult male chickens reared under tropical Nigerian conditions. A total of 60 adult male chickens from four breeds (White Yaffa, Noiler, Fulani ecotype and Yoruba ecotype), comprising fifteen birds per breed, were reared. The body weight, physiological, serum biochemical and haematological parameters of the birds were assessed. Data were collected and subjected to one-way analysis of variance (ANOVA) and correlation analysis at $p<0.05$. The findings revealed that the White Yaffa and Noiler breeds demonstrated superior body weight compared to the indigenous Fulani and Yoruba ecotypes. Body and rectal temperatures across breeds fell within the normal physiological range for chickens. Heart rate and respiratory rate varied significantly for White Yaffa. Fulani and Yoruba Ecotypes exhibited higher Aspartate Aminotransferase (AST)- (Fulani: 13.33 U/L; Yoruba: 14.00 U/L vs. Noiler: 7.00 U/L) and Alanine Aminotransferase (ALT) (Fulani: 11.00 U/L vs. Noiler: 5.67 U/L), Noiler showed elevated creatinine (86.73 µmol/L vs. Yoruba ecotype: 67.63 µmol/L), while Yafa displayed the highest globulin (40.33 g/L). Glucose, total protein, and urea remained stable across breeds. Noiler and White Yaffa exhibited higher values of red blood cell, haemoglobin, and packed cell volume. Fulani and Yoruba ecotypes recorded lower erythrocytic indices but higher lymphocyte and neutrophil counts. Strong correlation coefficients were observed between heart and respiratory rates ($r=0.855$), AST and ALT ($r = 0.898$), ditto urea and creatinine ($r = 0.931$). The study concludes that optimal poultry production in tropical environments requires use of both improved and indigenous breeds. These findings provide physiological basis for strategic breed selection in Nigeria's poultry industry.

Introduction

Poultry production plays a vital role in food security and economic development across the globe and remains one of the fastest means of bridging the animal protein supply gap in the developing countries (Erdaw and Beyene, 2022; FAO, 2022). Chicken are the most common and widespread domestic birds globally, and they serve as a vital source of meat and eggs for human consumption. Among poultry species, chickens are especially valued for their relatively short production cycle, rapid growth rate and adaptability to different environmental conditions (Oluyemi and Roberts, 2000; Adomako and Asamoah, 2025).

Breed differences significantly affect performance due to genetic makeup, physiological adaptations and interactions with the environment (Ogbu, 2021). For instance, exotic breeds often show faster growth rates and higher body weights than indigenous breeds, but they may be less tolerant to tropical climatic stress. Conversely, indigenous breeds of chicken such as the Fulani and Yoruba ecotypes in Nigeria often have

Corresponding author: Tel +2348160911765
Email address: olubisi.oluseun@gmail.com, (O.O. Oyeleye)
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lower growth rates but are more resilient to harsh environmental conditions, diseases, and feed scarcity (Alabi *et al.,* 2020). The genetic diversity in body weight, physiological, haematological and serum biochemical parameters presents opportunities for selective breeding and sustainable poultry production strategies in Nigeria.

The Nigerian poultry sector is characterized by the coexistence of exotic commercial breeds (e.g. White Yaffa and Noiler) and indigenous ecotypes (e.g. Fulani and Yoruba). The White Yaffa, a commercial hybrid, is recognized for its impressive meat yield and rapid growth rate under intensive production systems. The Noiler, developed through selective crossbreeding, is a dual-purpose bird known for both meat and egg production, with moderate adaptability to tropical conditions (Garba *et al.,* 2024b). The Fulani ecotype chicken, a hardy indigenous breed found mostly in northern Nigeria, is valued for its resistance to diseases, ability to scavenge, and survival under minimal management. Similarly, the Yoruba ecotype chicken, predominantly found in southwestern Nigeria, is well adapted to local environmental conditions and is appreciated for its cultural significance, brooding ability, and survival under free-range systems (Adebambo and Dessie, 2020)**.**

Understanding how these breeds differ in body weight and physiological parameters is crucial for determining their suitability for various production systems, particularly in tropical environments where heat stress is a major limiting factor in poultry production**.** Heat stress can elevate body temperature and respiratory rate, suppress feed intake, reduce growth performance, and impair reproductive efficiency (Sesay, 2022). Similarly, excessive fluctuations in heart rate and rectal temperature can indicate physiological distress or suboptimal adaptation to the environment.

Serum biochemistry serves as a vital diagnostic tool for assessing poultry health and metabolic status. Parameters such as total protein, glucose, cholesterol, and liver enzymes (e.g. AST, ALT) reflect physiological responses to nutrition, stress, and disease (Oke *et al*., 2021). For instance, elevated serum cholesterol in broilers has been linked to genetic selection for rapid growth (Eldamrawy *et al.,* 2024), while the Nigerian indigenous chicken (NIC) often exhibits lower metabolic rates but higher resilience to parasitic infections (Kpomasse, 2023). Despite these insights, limited studies have systematically compared serum biochemical profiles across breeds reared in Nigeria's tropical environment, where heat stress and feed variability exacerbate metabolic challenges (Ugwuene, 2021).

Haematological parameters serve as essential indicators of the physiological, nutritional, and pathological status of animals, including poultry. These parameters include red blood cell count (RBC), white blood cell count (WBC), haemoglobin concentration (Hb), packed cell volume (PCV), and several indices such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC). The blood indices values provide critical information about the immune status, metabolic functioning, and stress responses in birds, making them indispensable in veterinary diagnostics and health management practices (Ojedapo and Ifanegan, 2021; Olaniyi *et al.,* 2021). However, an often-underestimated dimension of breed differentiation is its impact on haematological parameters. Recent studies indicate that dual-purpose breeds such as Noiler and Yaffa generally exhibit higher growth performance but may differ in their immunological and haematological profiles compared to indigenous breeds (Irivboje *et al.,* 2020). For instance, indigenous chickens (Fulani ecotype and Yoruba ecotype) often show higher WBC and lymphocyte counts, which could be indicative of a more robust innate immune response, potentially conferring greater resistance to endemic pathogens (Sulaiman *et al.,* 2020). These haematological variations can have important implications for breed resilience under field conditions, particularly in low-input or climate-challenged environments. While several studies have compared haematological parameters across chicken genotypes, the majority of these have focused primarily on laying hens or pooled-sex populations, leaving a significant knowledge gap concerning male chickens **(**Omodewu and Tiamiyu, 2021).

Therefore, this study sought to investigate the effects of breed on body weight, key physiological

parameters (body temperature, rectal temperature, heart rate, and respiratory rate), haematological and serum biochemical parameters in adult male chickens, focusing on four breeds: White Yaffa, Noiler, Fulani ecotype, and Yoruba ecotype. By providing scientific evidence on breed-related differences, the study aims to guide poultry farmers, researchers, and policy stakeholders in making informed breed selection and management decisions for enhanced productivity in Nigeria's poultry industry.

Materials and Methods

Experimental Site and Duration

The study was conducted over a period of twelve weeks at the Poultry Research Unit of Olusegun Agagu University of Science and Technology, Okitipupa, Ondo State. Okitipupa lies between latitude $6^0$25 and $6^0$46 and longitude 4 ^{0}35 and $4^0$50 E within the tropical rainforest zone of Nigeria. It covers a total land area of 636sq.km, and has an estimated population of 233.565 people (Toponavi, 2023). The site is situated within a tropical agro-ecological zone, characterized by average daily temperatures ranging from 20°C to 30°C and relative humidity levels of 60–80%. The study was conducted between February and May in the year 2025, during which environmental conditions were closely monitored to ensure consistency (average rainfall ranges between 2000mm to 2500mm annually).

Experimental Animals and Management

A total of 60 mature male chickens, comprising four breeds Noiler, Yaffa, Fulani ecotype, and Yoruba ecotype was used in the experiment with 5 birds per breed and replicated three times. The 28th week old birds were randomly allocated to pens in a completely randomized design. Vaccination schedule and other management practices were strictly adhered to. The birds were fed with grower mash of 17% crude protein, water from the borehole and other necessary medications were administered (Table 1).

Table 1: Nutrient analysis of the commercial grower feed

Nutrients	Quantity (%)
Moisture	8.68
Ash	2.28
Protein	17.02
Fat	8.81
Fibre	6.71
Carbohydrate	56.50
Energy content	2750kcal/kg

Data collection and procedures

At the end of two weeks acclimatization in the battery cage system, body weight was measured weekly using a digital top-loading balance with 0.01g sensitivity (GROMY RS232, CHINA). Weighing was done early in the morning before feeding to avoid the confounding effects of gut fill. Physiological parameters such as body temperature and rectal temperature were measured using a digital clinical thermometer (INDIAMART C201, INDIA). Heart rate was determined using a digital stethoscope (HACKSTER G11, JAPAN) placed at the left thoracic cavity, and respiratory rate was determined by direct observation of abdominal movements (flank rise and fall). Counts were taken over 30 seconds and multiplied by two to give breaths per minute using a digital stethoscope. Five randomly selected birds from each breed group (n=5 per group; total n=20) were humanely restrained for blood sample collection. Approximately 3–5 mL of blood was drawn from the wing vein using sterile 21-gauge needles and syringes. Blood for haematological analysis was immediately transferred into sterile EDTA anticoagulant tubes and kept at 4°C until analysis, which was performed within two hours of collection to prevent cell degradation. Haematological parameters were analysed using standard laboratory procedures as described by Daramola *et al.* (2020) and Yakubu *et al.* (2022). The blood serum biochemical parameters were analysed using the methods described by Smith *et al.* (2023).

Statistical analysis

Data collected were subjected to Analysis of Variance (ANOVA) using the general linear model procedure of SAS 9.2. (2020). Means were separated using Duncan Multiple Range Test at 5% level of

significance. The statistical model employed was: $Y_{ij} = \mu + B_i + \varepsilon_{ij}$, where: Y_{ij} = observed value of the dependent variable, μ = overall mean; B_i = effect of the i-th breed (White Yaffa, Noiler, Fulani, Yoruba); ε_{ij} = random error. Pearson correlation was used to determine the phenotypic correlation among the parameters.

Results

Effect of breed on body weight and physiological parameters

Table 2 shows the effect of breed on body weight and physiological parameters. White Yaffa and Noiler breeds exhibited significantly higher body weights (2.73kg and 2.20 kg) compared to the Fulani and Yoruba ecotype breeds (1.87kg and 1.50kg). Mean body and rectal temperatures remained within the normal physiological range for chickens (between 40.2°C and 41.2°C). Variations were observed across breeds, with the White Yaffa displaying relatively the lowest heart rates ($p< 0.05$) compared to the Fulani and Noiler. The White Yaffa had the lowest respiratory rates compared to others under the same conditions.

Table 2: Breed effects on body weight and physiological responses in adult male chicken

Parameters	Breeds of chicken				Overall mean
	Noiler	Fulani Ecotype	White Yaffa	Yoruba Ecotype	
Bd wt. (Kg)	$2.20^{a} \pm 0.06$	$1.87^{b} \pm 0.23$	$2.73^{a} \pm 0.03$	$1.50^{b} \pm 0.17$	2.08 ± 0.14
Bd temp. (°C)	40.40 ± 0.06	40.73 ± 0.03	39.93±0.23	40.13±0.19	40.29 ± 0.12
Rc temp. (°C)	40.97 ± 0.23	41.07 ± 0.30	40.80±0.10	41.33±0.12	41.04 ± 0.10
Ht bt (beat/min.)	182.33^{a}±1.20	176.33^{a}±2.33	154.33^{b}±2.19	176.67^{a}±4.81	172.42± 3.47
Rs rate (breath/min)	$74.67^{a} \pm 0.33$	$74.50^{a} \pm 2.89$	$67.67^{b} \pm 1.45$	$75.67^{a} \pm 0.33$	73.13 ± 1.02

Means with the same superscripts are not significantly different ($p<0.05$).
Bd wt. = Body weight; Bd temp. = Body temperature; Ht. bt. = Heart beat; Rs rate = Respiratory rate.

Effect of breed on serum biochemical parameters:

Table 3 demonstrates significant breed differences in serum biochemical parameters. Globulin levels were significantly highest in White Yafa chickens (40.33 ± 1.20 g/L) and significantly lowest in Yoruba chickens (34.33 ± 2.33 g/L). The albumin/globulin ratio was significantly elevated in Noiler (1.13 ± 0.03) compared to White Yafa (1.00 ± 0.05). Indigenous breeds showed markedly significantly higher enzyme activities: Fulani chickens exhibited the significantly highest ALT (11.00 ± 0.58 U/L), while Local chickens showed the significantly highest AST (14.00 ± 1.15 U/L). Alkaline phosphatase was significantly elevated in Local (19.77 ± 0.79 U/L) and White Yafa (19.23 ± 1.70 U/L) breeds. Creatinine concentration was significantly highest in Noiler chickens (86.73 ± 2.94 µmol/L) and lowest in Local chickens (67.63 ± 3.15 µmol/L). Sodium levels were significantly reduced in Local chickens (1.33 ± 0.03 mmol/L) compared to other breeds. Total protein, albumin, glucose, chloride, urea, and potassium showed no statistically significant differences across all breeds.

Effect of breed on haematological parameters:

The effect of breed on haematological parameters is shown in Table 4. Significant differences ($P < 0.05$) were observed for most parameters except Hb, MCHC, and eosinophils. Noiler chickens exhibited markedly higher RBC counts (40.73 $\times 10^{6}$/µL). For packed cell volume (PCV) across the chicken breeds was relatively comparable, and found to be in the normal range. Platelet counts were significantly higher in Fulani (33.07 $\times 10^{3}$/µL) compared to Yoruba (30.33 $\times 10^{3}$/µL). Neutrophil proportions were significantly lowest in Fulani (61.33%) but highest in Yoruba (70.33%)

Table 3: Breed effect on serum biochemical parameters

Variables	Noiler	Fulani Eco type	White Yaffa	Local (Yoruba eco type)
TP (g/L)	75.00±0.58	75.33±0.33	79.00±0.58	73.33±3.84
Alb (g/L)	39.00±0.58	37.00±0.58	38.33±1.86	41.00±1.15
Glob (g/L)	35.00^{b}±0.57	36.33^{ab}±0.33	40.33^{a}±1.20	34.33^{b}±2.33
Al/Glob	1.133^{ab}±0.03	1.000^{a}±0.00	1.000^{b}±0.05	1.200^{a}±0.57
Ast (µ/L)	7.0000^{c}±0.04	13.33^{ab}±0.03	12.00^{b}±0.12	14.00^{a}±0.42
Alt (µ/L)	5.67^{c}±0.33	11.00^{a}±0.58	9.00^{b}±0.58	10.00^{ab}±0.58
Alp (µ/L)	15.267^{b}±0.64	17.00^{ab}±0.58	19.23^{a}±1.70	19.767^{a}±0.79
Glu (µmol/L)	5.866±0.24	5.733±0.38	5.000±0.06	5.500±0.21
Chlorid.(µmol/L)	5.833±0.88	5.500±0.06	5.933±0.88	5.166±0.17
Urea.(µmol/L)	5.900±0.26	3.400±0.15	4.366±0.47	3.533±0.32
Creatine(µmol/L)	86.733^{a}±2.94	70.800^{bc}±0.76	77.867^{ab}±4.01	67.633^{c}±3.15
Sodium (g/L)	1.600^{a}±0.057	1.600^{a}±0.06	1.700^{a}±0.06	1.333^{b}±0.03
Potasium (g/L)	3.500±0.10	3.400±0.06	3.466±0.15	3.400±0.06

Means with the same superscripts are not significantly different at $p<0.05$. TP - Total Protein; ALB - Albumin; GLOB - Globulin; AL/GLOB - Albumin/Globulin Ratio; AST- Asparate Amino Transferase; ALT - Alanine Amino Transferase; ALP - Alkaline Phosphate; GLU - Glucose; CHOLRD - Chloride ion**.**

Table 4: Breed effect on haematological parameters

Parameters	Fulani	Yoruba ecotype	Noiler	White Yaffa
PCV (%)	$46.00^{a} \pm 0.58$	$48.00^{ab} \pm 0.58$	$49.00^{a} \pm 0.58$	$48.33^{ab} \pm 1.20$
HB (g/L)	15.67 ± 0.33	15.57 ± 0.30	15.77 ± 0.40	16.00 ± 0.40
RBC ($\times 10^{12}$/L)	$4.30^{b} \pm 0.15$	$4.23^{b} \pm 0.12$	$40.73^{a} \pm 0.14$	$4.53^{b} \pm 0.09$
WBC ($\times 10^{9}$/L)	$12.53^{a} \pm 0.29$	$12.90^{a} \pm 0.44$	$13.17^{a} \pm 0.22$	$12.93^{b} \pm 0.07$
Platelet ($\times 10^{12}$/L)	$33.07^{a} \pm 0.58$	$30.33^{b} \pm 0.41$	$31.17^{b} \pm 0.27$	$31.37^{b} \pm 0.41$
MCV (fL)	$103.43^{b} \pm 0.81$	$110.13^{a} \pm 1.67$	$104.20^{b} \pm 0.72$	$104.23^{b} \pm 1.21$
MCH (pg)	$34.67^{b} \pm 0.33$	$37.00^{a} \pm 0.64$	$34.40^{b} \pm 0.74$	$35.17^{ab} \pm 0.60$
MCHC (g/L)	33.43 ± 0.30	33.57 ± 0.22	33.63 ± 0.38	33.63 ± 0.19
Neut. ($\times 10^{9}$/L)	$61.33^{c} \pm 0.88$	$70.33^{a} \pm 0.88$	$69.00^{a} \pm 0.58$	$66.33^{b} \pm 0.88$
Lymph. ($\times 10^{9}$/L)	$34.67^{a} \pm 0.33$	$29.00^{c} \pm 0.38$	$30.33^{bc} \pm 0.33$	$32.33^{b} \pm 1.20$
Mono. ($\times 10^{9}$/L)	$2.67^{a} \pm 0.33$	$0.00^{b} \pm 0.00$	$0.33^{a} \pm 0.33$	$2.00^{b} \pm 0.00$
Eosin. ($\times 10^{9}$/L)	$0.67^{a} \pm 0.33$	$0.67^{a} \pm 0.33$	$0.00^{a} \pm 0.00$	$0.00^{a} \pm 0.00$

Means with the same superscripts are not significantly different at $p<0.05$.MCH: Mean Corpuscular Volume; MCH: Mean Corpuscular Haemoglobin; MCHC: Mean Corpuscular Haemoglobin Concentration; PCV: Packed Cell Volume; HB: Haemoglobin; RBC: Red Blood Cell; WBC: White Blood Cell.

Correlation among physiological responses in adult male chickens

There was no significant correlation between body temperature and rectal temperature, rectal temperature and heartbeat, rectal temperature and respiratory rate. However, body temperature and heartbeat, as well as heartbeat and respiratory rate were positively and strongly correlated (Table 5).

Table 5: Correlation among physiological responses in adult male chicken.

	Body temperature	Rectal temperature	Heart beat	Respiratory rate
Body temperature	1.000			
Rectal temperature	0.104^{ns}	1.000		
Heart beat	0.736^{**}	0.284^{ns}	1.000	
Respiratory rate	0.577^{*}	0.462^{ns}	0.855^{**}	1.000

Correlations among the serum biochemical parameters

Table 6 shows phenotypic correlations between serum biochemical parameters. Strong positive correlations were observed between aspartate aminotransferase and alanine aminotransferase (r = 0.898), urea and creatinine (r = 0.931), globulin and total protein (r = 0.772). Strong negative correlations existed between albumin/globulin ratio and globulin (r = -0.829), urea and aspartate aminotransferase (r = -0.937), and urea and alanine aminotransferase (r = -0.918).

A moderate positive correlation was also observed between sodium and globulin (r = 0.650). Glucose showed no significant correlations with other parameters, with correlation coefficients (r) ranging from 0.376 (globulin) to -0.011 (chloride). Potassium exhibited a weak correlation with other serum biochemical parameters, and the strongest being creatinine (r = 0.662).

Table 6: Phenotypic correlation among serum biochemistry in male chickens

	Total protein	Albumin	Globulin	Al/Glo	AST	ALT	ALP	Glucose	Chloride	Urea	Creatinine	Na	K
Total protein													
Albumin	0.124^{ns}												
Globulin	0.772**	-0.214^{ns}											
Al/Glo	-0.599*	0.558*	-0.829***										
AST	-0.149^{ns}	-0.037^{ns}	0.063^{ns}	-0.077^{ns}									
ALT	-0.138^{ns}	-0.251^{ns}	0.109^{ns}	-0.261*	0.898***								
ALP	-0.061^{ns}	0.451^{ns}	-0.123^{ns}	0.354*	0.592***	0.356*							
Glucose	-0.376*	-0.066^{ns}	-0.538**	0.265**	-0.282*	-0.134^{ns}	-0.439*						
Chloride	0.307*	-0.279*	0.225*	-0.181*	-0.569***	-0.494*	-0.131^{ns}	-0.011^{ns}					
Urea	0.241	0.026*	0.020^{ns}	0.121^{ns}	-0.937***	-0.918***	-0.387*	0.155^{ns}	0.527**				
Creatinine	-0.036^{ns}	0.059^{ns}	0.179*	-0.068^{ns}	-0.850***	-0.844***	-0.398*	-0.036^{ns}	0.549**	0.931***			
Na	-0.141^{ns}	-0.608**	0.650**	-0.695**	-0.360*	-0.135^{ns}	-0.465*	-0.141^{ns}	0.690**	0.279*	0.440*		
K	-0.086^{ns}	0.233*	0.028^{ns}	0.099^{ns}	-0.364*	-0.340*	0.095^{ns}	-0.086^{ns}	0.198*	0.575**	0.662**	0.152^{ns}	

AL/GL- Albumin/Globulin Ratio; AST- Asparate Amino Transferase; ALT- Alamine Amino Transferase; ALP - Alkaline Phosphate

Table 7: Correlation Among Haematological Parameters

	PCV	HB	RBC	WBC	Platelet	MCV	MCH	MCHC	Neut	Lymph	Mono	Eosin
PCV												
HB	0.388^{ns}											
RBC	0.428^{ns}	0.022^{ns}										
WBC	0.534^{ns}	0.047^{ns}	0.356^{ns}									
PLATELET	-0.329^{ns}	0.019^{ns}	-0.161^{ns}	-0.372^{ns}								
MCV	0.351^{ns}	0.094^{ns}	-0.240^{ns}	0.368^{ns}	-0.492^{ns}							
MCH	0.221^{ns}	0.289^{ns}	-0.399^{ns}	0.225^{ns}	-0.331^{ns}	0.899***						
MCHC	0.161^{ns}	-0.288^{ns}	0.086^{ns}	-0.295^{ns}	-0.149^{ns}	-0.147^{ns}	-0.234^{ns}					
NEUT	0.635*	0.161^{ns}	0.359^{ns}	0.389^{ns}	-0.877***	0.577*	0.416^{ns}	-0.051^{ns}				
LYMPH	-0.535^{ns}	-0.182^{ns}	-0.305^{ns}	-0.204^{ns}	0.761**	-0.622*	-0.439^{ns}	-0.058^{ns}	-0.926***			
MONO	-0.433^{ns}	-0.034^{ns}	-0.451^{ns}	-0.301^{ns}	0.691*	-0.596*	-0.468^{ns}	-0.070^{ns}	-0.853***	0.887***		
EOSIN	-0.375^{ns}	-0.332^{ns}	-0.416^{ns}	-0.127^{ns}	0.405^{ns}	0.386^{ns}	0.397^{ns}	0.145^{ns}	-0.341^{ns}	0.125^{ns}	0.000^{ns}	

Key: PCV = Packed Cell Volume; HB = Haemoglobin; RBC = Red Blood Cell; WBC = White Blood Cell; MCV = Mean Corpuscular Volume; MCHC: Mean Corpuscular Haemoglobin Concentration; MCH: Mean Corpuscular Haemoglobin; NEUT.: Neutrophils; LYMPH: Lymphocytes; MONO: Monocytes; EOSIN: Eosinophils.

Discussion

White Yaffa and Noiler breeds exhibited significantly higher body weights compared to the Fulani and Yoruba ecotype breeds. This confirms that improved or exotic-type breeds tend to possess superior growth performance (Garba *et al.*, 2024a). While mean body and rectal temperatures remained within the normal physiological range for chickens (between 40.6°C and 41.7°C for body temperature while normal rectal temperatures are between 40^0C and 42^0C). All breeds showed stable rectal temperatures, suggesting a better tolerance to thermal stress. Variations were observed across breeds in heart rates with the White Yaffa displaying relatively lowest heart rates. Lower heart rates under tropical stress conditions may indicate superior adaptability and cardiovascular stability (Ghaziantafrishi, 2024). The White Yaffa had lowest respiratory rates under the same conditions compared to other three breeds suggesting their ability to cope better with heat stress. Since panting is a primary thermoregulatory mechanism in poultry, reduced respiratory rates in this breed imply lower susceptibility to heat stress**.** This reflects the genetic trade-off between productivity and resilience that characterizes poultry production in the tropics.

The significantly higher globulin levels in Yaffa chickens (40.3 g/L) compared to Noiler (35.0 g/L) and Yoruba ecotype (34.3 g/L) indicate superior disease resistance. Yaffa is ideal for disease-prone regions, farmers can reduce mortality rates by 15–20% by choosing this breed where outbreaks of Newcastle disease or avian influenza are common (Yakubu *et al.*, 2022). Conversely, Noiler's elevated creatinine (86.7 µmol/L vs. 67.6 µmol/L in Yoruba ecotype chicken) confirms its genetic advantage for rapid muscle growth. This translates to faster market readiness; farmers can achieve slaughter weights in 10–12 weeks with quality feed, increasing profitability by 25% compared to indigenous breeds (Adebayo *et al*., 2021). Fulani ecotype showed higher liver enzymes (AST and ALT) than that of Noilers'. This signals their adaptation to scavenging but also reveals vulnerability to parasites and toxins. As Yakubu *et al*. (2022) noted, the Fulani and Yoruba ecotype breeds forage on varied diets (insects, plants), increasing exposure to pathogens. Crucially, the lack of breed differences in glucose, total protein, and urea means farmers can use the same energy-rich feeds (e.g., maize-soy blends) across all breeds without compromising metabolic health, simplifying feed procurement and cutting costs (Eldamrawy, *et al.,* 2024; Garba *et al.* 2024).

The comparative haematological indices revealed differences across Noiler, White Yaffa, Yoruba, and Fulani ecotypes, underscoring the role of genetics in shaping physiological and immunological performance. The Noiler chickens maintained higher RBC counts and PCV values, suggesting superior oxygen transport and metabolic efficiency, which may explain their faster growth rates compared to indigenous breeds. These results align with findings by Irivboje *et al.* (2020), who reported that genotypes significantly affect some haematological parameters in Nigerian poultry strains (Anizoba *et al.,* 2024). This also aligns with Nwaigwe *et al.* (2020), who emphasized that improved hybrids are selectively bred for traits enhancing productivity and performance under intensive management systems.

The White Yaffa breed, however, displayed a more balanced haematological profile, combining relatively high erythrocytic indices with favourable immune markers. This suggests that the Yaffa may serve as a middle ground between purely commercial breeds like the Noiler and indigenous ecotypes (Yoruba and Fulani). Its dual-purpose breeding orientation explains why it is increasingly adopted by farmers seeking both egg and meat output without compromising adaptability. Previous studies have suggested that Yaffa chickens demonstrate resilience in semi-intensive systems, maintaining consistent performance across varying environmental conditions (Daramola *et al.,* 2020; Kpomasse *et al.,* 2023). In contrast, Yoruba and Fulani ecotypes demonstrated immunological superiority, with higher lymphocyte and platelet counts, respectively. These traits indicate enhanced disease resistance and immune adaptability, a characteristic advantage of indigenous poultry populations (Irivboje *et al.,* 2020). The Yoruba ecotype's higher neutrophil values also point to robust innate immune defense, while the Fulani's higher platelet counts may offer better protection against injury and infections (Kpomasse *et al.,* 2023). Strong correlation coefficients were observed between Heart

rate and Respiratory rate(r=0.855), AST and ALT (r = 0.898) and urea and creatinine (r = 0.931). Indigenous breeds (Fulani, Local Yoruba) exhibited elevated liver enzymes (AST, ALT), confirming their physiological adaptation to scavenging-based stressors like heat and parasites but indicating higher hepatic workload. Hybrid breeds displayed distinct advantages: Yafa's superior globulin levels highlighted enhanced disease resistance, while Noiler's elevated creatinine affirmed its genetic selection for rapid muscle development. Parameters like glucose, total protein, and urea showed no breed differences under uniform nutrition, emphasizing that dietary management can standardize core metabolic functions across genetic lines.

Conclusion and Recommendations

From the findings, it can be concluded that breed has a significant influence on both body weight and physiological parameters of chickens under tropical conditions. Genetic breed differences alter serum biochemical profiles in male chickens under Nigerian tropical conditions. Noiler chicken exhibited superior erythrocytic profiles that favour growth performance, while White Yaffa emerged as a balanced dual-purpose breed, offering both productive efficiency and moderate resilience. In contrast, Yoruba and Fulani ecotypes demonstrated immunological advantages, highlighting their adaptability to challenging environments and disease pressures.

The findings emphasize that optimal poultry production in tropical environments requires strategic use of both improved and indigenous breeds. Cross-breeding, conservation, and context-specific selection will be essential in building poultry systems that balance productivity, resilience and sustainability. In the context of climate change, where rising ambient temperatures threaten poultry survival, the adaptability traits of indigenous ecotypes cannot be overlooked. Incorporating such ecotypes into breeding programs could ensure sustainable poultry production that is both productive and climate-resilient.

Conflict of Interest

The authors declared no conflicts of interest concerning the research, authorship and publication of this article.

Ethical Compliance

The authors have followed ethical standards in conducting the research and preparing the manuscript.

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