COMPARATIVE EVALUATION OF BODY WEIGHT AND PHYSIOLOGICAL PARAMETERS OF DIFFERENT BREEDS OF BROILER CHICKEN

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ABSTRACT
This study evaluated body weight and physiological parameters across various broiler chicken breeds with the objective of elucidating differences in health indicators among these breeds. A total number of two hundred (200) broiler chicks (fifty-day-old Cobb broiler chicks, fifty-day-old Ross broiler chicks, fifty-day-old Arbor Acres broiler chicks, and fifty-day-old Marshall broiler chicks) were used for the experiment. The study lasted for ten weeks. The physiological parameters evaluated in the study included body weight, body temperature, rectal temperature, heart rate, and respiratory rate. The study discovered that there were no significant differences across all breeds in body weight. The highest body weight was in the Cobb (1165) while the lowest was in the Marshal (961.70). All physiological parameters were not significant across all breeds. This comparative analysis emphasizes the potential of targeted dietary interventions to enhance broiler performance under various developmental stages.
Keywords: Body weight, Physiological parameters, Breeds, Broiler chicken

INTRODUCTION
Poultry particularly developed for meat production is known as broiler chickens. They may attain market weight in a short amount of time, usually 6 to 8 weeks, and are distinguished by their quick development rate and effective feed conversion. Poultry production provides the opportunity to meet animal protein intake from the livestock industry in Nigeria. It provides ready jobs for a large number of populations (Olaloku, 1999). It is now by far the largest livestock species worldwide, accounting for more than 30% of all animal protein consumption (Permin and Pedersen, 2000). The development of suitable strains of broiler chickens for the tropical environment is a research interest that has engaged the attention of several poultry geneticists and breeders for the past decades (Nargish et al., 2010). Consumer preference for tender and white meat containing low contents of fat and cholesterol seems to act as catalyst engendering increased broiler production not only at festive periods but all year round. Broiler meat is sold whole or cut into parts for individuals and families who cannot afford whole chicken (Olawunmi and Fagbuaro, 2011). The genetic selection of broiler chicken breeds for superior growth rate has arguably been the primary method for increasing productivity (Peter et al., 2010). There is evidence that there are genetic differences in growth rate between strains and changes in weight ranking may be critical in the age range between eight and twelve weeks (Deeb and Lamont, 2000).

Low productivity experienced by broiler meat chicken producers in the tropics may be attributed to a lack of selection of improved poultry breeds. Hitherto, little research work has been carried out on different improved breeds of broiler chickens by local producers, even though they are more numerous. There is a need for research efforts to compare the performance of the various available and popular breeds of broilers to recommend the best to the farmers. Physiological responses in broiler chickens are crucial indicators of their health, welfare, and productivity. Knowing these factors contributes to improving growth performance, optimizing the rearing environment, and guaranteeing the birds' general well-being. This report explores the key physiological parameters of broiler chickens, their significance, and how they impact broiler production. According to Kral and Suchy (2000), these include accurate interpretation of the health status of birds, diagnostic and management purposes, useful in the development of new broiler strains which are genetically resistant to poultry diseases; as well as for genetic improvement of industrial and indigenous poultry. Thus, the objectives of this study are to determine the effect of breed and age on the physiological responses of broilers.

MATERIALS AND METHODS
Study area
The study was conducted at Adeomoh Farm, which is a kilometer to the Teaching and Research Farm of Olusegun Agagu University of Science and Technology, Okitipupa, Ondo State. The climate is

relatively dry, occurring between February and May. Okitipupa lies between latitude $6^0$25 and $6^0$46 N and Longitude $4^0$35 and $4^0$50 E within the tropical rainforest zone of Nigeria. It covers a total land area of 636 sq. km and has an estimated population of 233.565 people. A Udic soil moisture regime and an isohyperthermic soil temperature regime prevail in the area with total rainfall often exceeding 2000mm, while the monthly mean temperature ranges between 27^0C and 28^0C respectively.

Management of experimental birds

A total of 200 day–old Broiler chicks (50 Ross, 50 Cobb, 50 Arborcre, and 50 Marshall) were purchased for this study. The birds were raised in deep litter brooder pens and given a floor space of about 1.45m per bird as suggested by Adejoro, (2002). They were raised for 10 weeks and placed on the same diets as recommended by NRC (1994). All the necessary vaccinations and medication were administered to the birds accordingly.

Experimental design

A total number of two hundred (200) fifty-day-old Cobb broiler chicks, fifty-day-old Ross broiler chicks, fifty-day-old Arborcre broiler chicks, and fifty-day-old Marshall broiler chicks were used for the experiment. The birds were randomly allotted to two different groups, male (40) and female (20) . The study lasted for ten weeks. The dimensions of each pen were 2.01 x 1.00 m and was constructed in a way as to permit straight-through ventilation. The birds were fed commercial broiler feed ration (2900 kcal/kgME and 20.00% Crude protein). Fresh feed and clean water were supplied ad-libitum. The feeders and drinkers were served proportionately depending on number of birds per group. The vaccination schedule and other management practices were strictly adhered to.

Physiological data collection

The materials used were stethoscope, top loading weighing balance, clinical thermometer, cotton wool and stop watch. Data on physiological parameters were collected at 2,4,6,8 and 10 weeks.

Body Weight: Body weight was measured in grams using Scout II electronic sensitive scale and top loading mettle Balance.

Body Temperature: this was measured using a digital clinical thermometer inserted under the wings of the broiler and was left until a constant reading follow with a beeping tone.

Rectal Temperature: This was measured using a digital thermometer inserted 3cm into the rectum and left until a constant reading followed by a repeated beeping tone was reached. The thermometer was wiped using a clean cotton wool with methylated alcohol between subsequent measurement in order to prevent possible cross infections among breeds

Respiratory Rate: This was measured with the aid of a stethoscope and a stop watch (century clock timer) by counting the number of beats in 15s and multiplying by four. The stethoscope was placed on the left side of the breast of an inverted bird after the feather was separated in order to expose as much skin as possible.

Heart Beat Rate: To avoid tension, which might alter the heart rate. Hold the chicken gently; if possible, get someone to help you. The chicken may be safely held by one person, who can support its body without putting too much pressure on its chest. Position the Stethoscope below the wing and near the chicken's chest, place the flat, round diaphragm of the stethoscope on its left side. The location of the heart is here. After positioning the stethoscope, pay close attention to the heartbeat. There ought to be a steady "lub-dub" sound audible, which is the heartbeat. This was measured with the aid of a stethoscope and a stopwatch (century clock timer) by counting the number of beats in 15s and multiplying by four.

Statistical data collection

Data collected were subjected to a two-way analysis of variance (ANOVA) using (SAS, 2004) and the means were separated using the Duncan Multiple Range Test. Pearson correlation was used to determine the relationship among the traits.

The model used was as follow: $Yij = \mu + \alpha i + Aij + \epsilon ij$

Where: μ = overall mean αi = Effect of breed, Aij += effect of age ϵi = random er

RESULTS

Table 1 shows the summary statistics of body weight and physiological parameters in broilers. The highest coefficients were observed in respiratory rate (108.51) and rectal temperature (1.59) was the lowest**. Table 2** shows the effect of breed on the body weight and physiological parameters of different

broiler breeds. It was observed that there were no significant differences across all parameters. The highest body weight was in the Cobb (1165) while the lowest was in the Marshal (961.70).

Table 1: Descriptive statistical of body weight and physical parameters of broiler chicken

Parameter	Mean	Standard Deviation	N	Minimum	Maximum	Coeficient of variation
BW	1074.41	659.99	88	229	2341	61.31
BT	40.34	2.05	88	34	49	5.08
RT	41.24	0.65	88	39	42.5	1.59
HB	128.15	74.14	88	52	408	57.85
RR	20.13	22.04	88	12	222	108.51

RR – Respiratory rate; HB – Heart Beat; BW – Body Weight; BT – Body Temperature; RT – Rectal Temperature.

TABLE 2: Effect of breed on body weight and physiological parameters

PARAMETERS	COBB	ROSS	ABO	MAR	OVERALL
Body weight	1165.00a±135.33	1122.50a±155.23	1056.40a±125.12	961.70a±151.14	1076.41±70.36
Body temp	40.71a± 0.33	40.53a± 0.48	40.14a±0.34	39.98a± 0.56	40.34±0.22
Rectal temp	41.34a±0.16	41.29a±0.16	41.29a±0.09	41.22a±0.14	41.24±0.07
Heart beat	135.77a±19.07	130.18a±14.57	124.23a±13,94	122.45a±16.12	128.16±7.90
Respiratory rate	26.95a±0.81	18.18a±9.31	18.05a±0.75	17.32a±0.74	20.13±2.35

Means with the same superscripts are not significantly different.

There was no significant difference across all breeds in all physiological parameters. **Table 3** shows the age effect on body weight and physiological parameters of the broiler. There was a significant ($P<0.05$) of age in the body weight of broilers. There was a progressive increase in weight as the age of the broiler increased, in which the highest weight was observed in week 10. In the respiratory rate, there was no progressive increase as there were fluctuations in their increase. Similar trends also occurred in the body temperature where there were significant differences ($p>0.05$) between weeks 4, 6, 8. Body temperature showed no significant difference between weeks 2 and 4 while there was a significant difference of age in week 6. Heart beat showed no significant difference between week 2 and 4 and also between 8 and 10.

Table 3: Effect of age on physiological parameters

Parameters	2nd Week	4th week	6th Week	8th Week	10th Week
Body weight	282.95±7.88 ^{e}	611.95±20.67^{d}	1241.60±43.61^{c}	1772.80±67.52 ^{b}	2067.35± 66.84 ^{a}
Body temp	40.54± 0.08^{a}	41.20±0.68 ^{a}	38.97± 0.46^{b}	40.70± 0.29 ^{a}	40.23± 0.59^{ab}
Rectal temp	40.81± 0.14^{b}	40.93±0.14^{b}	41.15± 0.08^{b}	41.76± 0.09 ^{a}	42.01± 0.12 ^{a}
Heart beat	60.25± 0.71^{c}	63.85±1.42^{c}	126.20± 2.04^{b}	223.80± 10.62^{a}	224.50± 3.33 ^{a}
Respiratory rate	19.20± 0.51^{b}	16.35±0.54^{b}	14.55± 0.46 ^{b}	19.55± 0.79^{b}	47.25± 29.97^{a}

Means with the same superscripts are not significantly different @ $p<0.05$.

DISCUSSION

The findings of the study demonstrated a significant difference ($p<0.05$) in the effect of age on body weight and physiological parameters measured in the broiler chickens. This confirms the finding of Haque and Howlider (2000). A consistent trend emerged as the study progressed to weeks 2, 4, 6, 8 and 10. Broiler chickens consistently exhibited higher values in all measured parameters as they grew. Cobb broiler chickens consistently exhibited higher values in all measured parameters compared to the other three breeds. However, statistical significance ($p<0.05$) was observed in all stages of age (Kokoszyński *et al*., 2022). These findings indicate that age has a more substantial influence on physiological parameters than breeds during these early stages, with Cobb generally having higher values possibly reflecting their developmental processes. This report also confirms a study by Havenstein *et al. (2003)* that compared the growth patterns of broilers from the 1950s to those from the 1990s and 2000s.

The researchers found that modern broiler strains (e.g., Ross and Cobb) exhibited significantly higher body weights at the same ages compared to older strains. By week 10, Broiler chickens still exhibited higher parameter values, consistent with the patterns observed throughout the study. However, it is noteworthy that age has a significant impact ($p>0.05$) on all of the measured parameters, especially between 2nd and 4th week. Lilburn *(1994)* also demonstrated that broilers typically double their weight within the first week, with the most rapid growth occurring between 2 to 4 weeks of age. After this period, the rate of weight gain begins to slow down as the bird approaches market weight. Interestingly, there were no significant differences ($p>0.05$) in most of the parameters in the effect of breed on physiological parameters. At week 10, broiler chickens again showed higher values in most parameters, with exceptions for Body weight, Respiratory rate, and Body temperature which were higher in the Marshal Breeds. Significantly, in Table 1 it was observed that Cobb had the highest respiratory rate which confirms the reports in a comparative study by Liu *et al. (2017)*, it was found that faster-growing broiler strains exhibited higher heart rates in the early stages of life compared to slower-growing strains.

CONCLUSION

Certain measures exhibited significant changes at specific developmental stages, indicating that age played a more crucial role in influencing these parameters. However, as the broiler chicks approached the 10-week mark, age-related variations became less pronounced, suggesting a degree of physiological stability. These findings have important implications for chicken management, emphasizing the need for age-appropriate care and monitoring, particularly during the early stages of development.

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