

Research Article

Effect of Feed Form on Body Conformation Traits of Different Hybrids of Broiler Chickens

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This research was conducted to measure the exterior characteristics in four hybrids of broilers fed pelleted and commercial mash feed. A total of 112 one-day-old chicks from four broiler hybrids, namely, Arbor Acre, Cobb 500, Marshall, and Ross 308 were used for this experimentation and allocated into four treatments with 28 birds of each hybrid and were replicated four times with 7 birds per replicate in a 2×4 factorial experiment. Pelleted and milled (mash) commercial feed was used for this experiment. The feeding trial lasted at the age of 59 days old, and data on the conformation trait were recorded. The results of the conformation traits showed no significant difference ($P > 0.05$) in any of the parameters measured. Most of the conformation traits examined were positive and strongly correlated with one another. Finally as a suggestion, further deep study needed to be conducted by considering different factors including an interaction effect of the main factors.

1. Introduction

Broilers are domesticated chickens that are specially bred and raised for meat production [1]. Broilers are in the group of chickens that could be slaughtered within 7-8 weeks if provided with adequate feed, water, hygiene, vaccination, and other routine daily measures [2]. Ojedapo et al. [3] stressed that poultry in Nigeria made a tremendous contribution to the main source of animal protein for human consumption, as it accounted for about 10% of the total national livestock production. The expansion and improvement of the Nigerian poultry industry is prioritized by the federal government in order to improve the consumption of animal protein for citizens [4]. As a result, the Nigerian poultry industry has been inundated with various exotic hybrids of broilers over the years.

In poultry production, the two main nutrients taken into consideration in the diet are energy and protein. Energy is needed for growth, vital activities, and maintaining body temperature; this is provided by the carbohydrate, lipid, and

protein metabolism [5]. Nowadays, different commercial feed mills manufacture different forms of broiler feed for different age groups of birds. The physical form of the feed (pellets and mash) is a determining factor, although diet is ground and mixed so finely that birds cannot easily separate the ingredient. The mash diet leads to greater standardization. However, ground feed is not as tasty and does not retain its nutritional values as well as unground feed [6]. Feed pelletization is really a modification of the mash into hand-dried pellets or artificial grain. It is generally accepted that the feeding pellets, when compared to mash, improve the growth rate of broilers with increased feed intake. Pelletizing is a processing technique used by feed manufacturers to improve livestock performance. The pellet feed is extruded to approximately 1/8 inch in diameter and 1/4 inch in length [7].

Poultry breeders have tried to establish the relationship that exist between body conformation in different breeds of broiler chicken such as shank length, breast width, head length, neck length, back length, and thigh length, as these indices reflect the performance of the broiler birds. Besides,

this will help to organize the breeding program in order to achieve an optimum and good conformation for maximum economic return [8]. A study by Udeh et al. [9] observed that many breeds of broiler have been imported into Nigeria. The performance of these birds is affected by their feeding program as well as the rearing environment. Body weight and conformation traits such as breast width, shank length, and thigh length are known to be good estimators of body growth and market value of broiler [10]. Edward [11] reported that selection program is mainly focused on these economic traits.

The different hybrids Arbor Acre, Cobb 500, Marshall, and Ross 308 differ greatly in their body conformation, and this must be taken into account before venturing into broiler rearing [12]. Genetically enhanced poultry breeds have made a significant contribution to the success of the poultry industry, which is an important source of animal protein for the human population in most countries of the world [13]. According to Ewart [14], the proportion of poultry raised for meat production has increased dramatically, and this is the case in all countries where broilers are raised for human consumption. Therefore, it is necessary to consider the physical characteristics of the body before venturing into broiler rearing and which breed of broiler is best suited for meat production among existing feeding forms and systems. The aim of this study was therefore to evaluate the effect of pelleted and mash feeds on the conformation traits of various hybrids of broiler chicken raised at the Bora of Federal College of Animal Health and Production Technology, Oyo State, Nigeria.

2. Materials and Methods

2.1. Description of the Study Area. The study was conducted at experimental site of Bora of Federal College of Animal Health and Production Technology, Apata, Ibadan, Oyo State of Nigeria. It is situated at 8° 0' 0" North, 3° 11' 0" East [15].

2.2. Sources of Experimental Birds and Duration of Experiment. All experimental broilers were obtained from various local hatcheries in Nigeria. Arbor Acre plus hybrid of broiler was obtained from the Federal College of Animal Health and Production Technology Hatchery Ibadan, Oyo State; Ross 308 hybrid was obtained from Agrited Nigeria Limited, Ibadan, Oyo State; Marshall and Cobb 500 hybrids were obtained from Zartech Hatchery Ibadan, Oyo State. A total of one hundred twelve (112) day-old chicks comprised of the Arbor Acre, Cobb 500, Marshall and Ross 308 hybrids were used to compare their conformation characteristics. The birds were acclimated for 10 days with broiler starter feed (pelleted or pureed) and randomly assigned to four treatments of 28 birds each and replicated four times with 7 birds per pen in a 2 × 4 factorial experiment. The feeding trial lasted in 49 days.

2.3. Routine Management. The broiler house was cleaned, washed, and fumigated two weeks before the day-old chicks arrived. The drinking troughs, feed troughs, and

other test materials were disinfected. After drying, the test pen was divided into sixteen (16) separate pens of equal size using wire mesh. The wall of the brooder house was covered with polythene sheath. Two days before the arrival of the birds, the floor of the brooder was covered with wood shavings to a depth of about 5 cm, and the wood shavings were kept dry during the entire test period by regularly changing the litter. On the day of arrival, the drinking troughs in the brooder were filled with water, and each hybrid of broiler was carefully unpacked and allocated into their pens. The birds were brooded and reared on deep litter systems. All chicks were fed a broiler starter feed (pelleted or pureed) ad libitum up to 28 days of age. The birds were then given broiler finisher feed (pelletized or mashed) for up to 59 days of age. The birds were vaccinated against Newcastle, Marek's, and Gumboro diseases. Occasionally, vitamin supplements were given to increase productivity, and other routine medications and managements were practiced in due progress, and proper records were kept.

2.4. Data Collection and Management

2.4.1. Conformation Traits. Back length (BKL) was measured from the base of the neck to the uropygial gland at the base of the tail. Body length (BDL) was measured from the top of the head to the cloaca. Circumference of the chest (CCC) was measured around the chest region. Shank length (SHL) was obtained by measuring from the hock, joint to the base of the three toes. Wing span length (WSL) was measured from the tip of one wing to the tip of the other wing via the back part of the bird. Thigh length (THL) was taken from the hock joint to the hinge joint. Head length (HDL) was taken from the fore head to the beginning of the neck. To ensure accuracy, each the trait was measured twice, and all the measurements were taken by using tape rule calibrated in centimeters (cm). These conformation traits were measured every week up to 8 weeks. The anatomical reference points were considered as previously described [16, 17]. Collections of the entire data were done using the guideline of the ethical procedure approved by Ethical Approval Committee of Federal College of Animal Health and Production Technology, Ibadan, Nigeria.

2.4.2. Statistical Analysis. The collected data were analyzed using SPSS v.20 [18]. Analysis of variance (ANOVA) was employed to test the effect of feed forms and hybrids of chicken on conformation traits. The Duncan multiple range test was used to detect the differences between means. Phenotypic correlation was assessed to quantify the degree of association between the traits.

3. Result

3.1. Proximate Analysis of Feed Samples for Both Starter and Finisher Phase. The proximate analysis of starter and finisher diet of different feed forms is given in Table 1.

TABLE 1: Proximate analysis of feed samples for both starter and finisher phase.

Parameters (%)	Starter pelletized	Starter mash	Finisher pelletized	Finisher mash
Dry matter	95.90	93.87	95.00	94.86
Crude protein	20.00	23.69	19.20	21.20
Crude fibre	9.90	4.87	8.40	6.14
Ash	6.90	7.86	5.80	7.88
Ether extract	16.30	6.04	20.20	5.31
Nitrogen-free extract	46.9	57.84	46.40	59.41

3.2. *Effect of Feed Forms on Body Conformation Traits of Broiler Chickens.* Result showed that there were no significant effects ($P > 0.05$) of feed forms on conformation traits of broiler chicken (Table 2).

3.3. *Effect of Genotype on Body Conformation Traits of Broiler Chicken.* Table 3 provides the effect of genotype on conformation traits of broiler chicken. The result showed that there was no significant effect ($P > 0.05$) of genotype on conformation traits of broiler chicken.

3.4. *Phenotypic Correlation of Body Conformation Traits of Hybrids of Broiler Chickens Fed Pelletized and Mash Feeds.* Table 4 provides phenotype correlation of conformation traits of broiler chicken fed pelletized and mash feeds. The overall result showed that there were strong and positive correlations across all parameters. Results showed that there were strong and positive correlations between back length and body length ($r = 0.92$), circumference of the chest and back length ($r = 0.95$), circumference of the chest and body length ($r = 0.93$), shank length and back length ($r = 0.77$), shank length and body length ($r = 0.84$), shank length and circumference of the chest ($r = 0.78$), wing span and back length ($r = 0.95$), wing span and body length ($r = 0.93$), wing span and circumference of the chest ($r = 0.95$), wing span and shank length ($r = 0.80$), thigh length and back length ($r = 0.89$), thigh length and body length ($r = 0.92$), thigh length and circumference of the chest ($r = 0.87$), thigh length and shank length ($r = 0.79$), thigh length and wing span ($r = 0.91$), head length and back length ($r = 0.75$), head length and body length ($r = 0.79$), head length and circumference of the chest ($r = 0.73$), head length and shank length ($r = 0.74$), head length and wing span ($r = 0.74$), and head length and thigh length ($r = 0.73$).

3.5. *Correlations between Conformation Traits of Each Hybrid of Broiler Chickens.* The result given in Tables 5 and 6 shows the coefficient of correlations of body conformation traits of the four hybrids of broiler chicken. The relationship between all the body conformation traits were strong and positively related to each other and significant at ($P < 0.01$) in each of the hybrids of broiler chicken. The coefficient of correlation ranges from 0.72 to 0.97, 0.65 to 0.96, 0.71 to 0.97, and 0.72 to 0.96 in Arbor Acre, Cobb 500, Marshall, and Ross 308. The highest significant ($P < 0.01$) positive correlations were recorded for back length and wing span ($r = 0.97$) in Arbor Acre and Marshall Broiler. In Cobb 500, the strongest

TABLE 2: Effect of feed forms on body conformation traits of broiler chicken.

Parameters (cm)	Mash	Pelletized	SEM (\pm)	P value
Back length	22.69 ^a	22.97 ^a	0.22	0.528
Body length	37.36 ^a	37.45 ^a	0.38	0.912
Circumference of the chest	31.17 ^a	31.48 ^a	0.34	0.642
Shank length	8.68 ^a	8.97 ^a	0.08	0.083
Wing span	42.41 ^a	42.90 ^a	0.38	0.520
Thigh length	13.23 ^a	13.49 ^a	0.17	0.440
Head length	8.42 ^a	8.58 ^a	0.06	0.176

Means in the same row with the same superscript are not statistically different ($P > 0.05$). SEM, standard error of mean.

significant ($P < 0.01$) positive association was observed for body length and wing span ($r = 0.96$), and likewise, strong positive relationships were recorded between wing span with that of the circumference of the chest and back length ($r = 0.96$) in Ross 308 hybrid of chicken.

4. Discussion

The effect of genotype on conformation traits of broiler chicken showed no significant variation. Some of the results of this study do not agree with previous findings [19] that reported significant differences among the body conformation traits, namely, body length, wing span, and thigh length between Arbor Acre, Marshall, and Ross 308 hybrids of broiler chicken. These discrepancies in conformation traits could be due to hybrids differences, management, and environmental factors. However, the observed result of shank length across all hybrids (Arbor Acre, Marshall, and Ross 308 broiler) was not statistically different, and it is in line with the findings of [19] who observed insignificant differences in shank length among all the above listed hybrids of broiler chicken. The result of overall phenotypic correlation of body conformation traits of broiler chicken fed pelletized and mash feed shows that there was a strong and positive correlation across all the parameters. This was in line with the findings of [20] who indicated strong and positive correlations, while insignificant correlations between shank length and body length were also recorded. Likewise, the coefficient of correlations of body conformation traits of all hybrids of broilers was strongly and positively associated with each other. The result of this study is in agreement with the finding of [19] who observed strong positive associations of traits between chest width with that of shank length and wing length from Arbor Acre broiler and also

TABLE 3: Effect of genotype on body conformation traits of broiler chicken.

Parameters (cm)	Arbor Acre	Cobb 500	Marshall	Ross 308	SEM (\pm)	P value
Back length	23.18 ^a	22.56 ^a	22.55 ^a	23.03 ^a	0.22	0.656
Body length	36.96 ^a	37.00 ^a	37.81 ^a	37.85 ^a	0.38	0.736
Circumference of the chest	31.42 ^a	30.79 ^a	31.44 ^a	31.67 ^a	0.34	0.818
Shank length	8.81 ^a	8.86 ^a	8.84 ^a	8.68 ^a	0.08	0.824
Wing span	43.08 ^a	42.13 ^a	42.49 ^a	42.92 ^a	0.38	0.814
Thigh length	13.56 ^a	13.28 ^a	13.05 ^a	13.55 ^a	0.16	0.651
Head length	8.67 ^a	8.55 ^a	8.41 ^a	8.38 ^a	0.06	0.249

Means in the same row with the same superscript are not statistically different ($P > 0.05$). SEM, standard error of mean.

TABLE 4: Overall phenotypic correlation of body conformation traits of broiler chickens fed pelletized and mash feeds.

Parameters	BKL	BDL	CFC	SHL	WGS	THL	HDL
Back length		0.92*	0.95*	0.77*	0.95*	0.89*	0.75*
Body length			0.93*	0.84*	0.93*	0.92*	0.79*
Circumference of the chest				0.78*	0.95*	0.87*	0.73*
Shank length					0.80*	0.79*	0.74*
Wing span						0.91*	0.74*
Thigh length							0.73*
Head length							

BKL, back length; BDL, body length; CFC, circumference of the chest; WGS, wing span; THL, thigh length; HDL, head length; SHL, shank length. *Significant at $P < 0.01$.

TABLE 5: Coefficient of correlations between conformation traits of each hybrid of broiler chickens (above diagonal for Arbor Acre and below diagonal for Cobb 500).

Traits	BKL	BDL	CFC	SHL	WGS	THL	HDL
BKL	1	0.93*	0.94*	0.74*	0.97*	0.89*	0.72*
BDL	0.91*	1	0.93*	0.83*	0.93*	0.92*	0.78*
CFC	0.94*	0.94*	1	0.73*	0.94*	0.83*	0.73*
SHL	0.65*	0.78*	0.72*	1	0.75*	0.78*	0.74*
WGS	0.93*	0.96*	0.96*	0.73*	1	0.89*	0.72*
THL	0.83*	0.94*	0.86*	0.71*	0.91*	1	0.72*
HDL	0.72*	0.77*	0.73*	0.73*	0.74*	0.74*	1

*Correlation is significant at the $P < 0.01$ level. BKL, back length; BDL, body length; CFC, circumference of the chest; WGS, wing span; THL, thigh length; HDL, head length; SHL, shank length.

TABLE 6: Coefficient of correlations between conformation traits of each hybrid of broiler chickens (above diagonal for Marshall and below diagonal for Ross 308).

Traits	BKL	BDL	CFC	SHL	WGS	THL	HDL
BKL	1	0.93*	0.95*	0.85*	0.97*	0.94*	0.73*
BDL	0.93*	1	0.92*	0.89*	0.94*	0.94*	0.80*
CFC	0.96*	0.94*	1	0.85*	0.96*	0.90*	0.71*
SHL	0.87*	0.89*	0.88*	1	0.86*	0.86*	0.74*
WGS	0.96*	0.93*	0.96*	0.90*	1	0.92*	0.72*
THL	0.92*	0.90*	0.91*	0.86*	0.92*	1	0.76*
HDL	0.81*	0.83*	0.77*	0.78*	0.81*	0.72*	1

*Correlation is significant at the $P < 0.01$ level. BKL, back length; BDL, body length; CFC, circumference of the chest; WGS, wing span; THL, thigh length; HDL, head length; SHL, shank length.

recorded strong associations between wing length and thigh length too from the same hybrid of chicken.

5. Conclusions

This study was conducted to evaluate the effect of feed forms on body conformation traits of different hybrids of

broiler chicken. The study showed that feed forms (pelletized and mash) and hybrids of broiler chicken (Arbor Acre, Ross 308, Cobb 500, and Marshall) do not have any effect on body conformation traits. All body conformation traits of hybrid of broilers chicken are strongly and positively correlated to each other. As a suggestion, further deep study needed to be conducted by considering

different factors including an interaction effect of main factors.

Data Availability

The datasets used for this study are available from the corresponding author.

Conflicts of Interest

The authors declare they have no conflicts of interest.

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