

EVALUATION OF PERFORMANCE, CARCASS TRAITS AND PHENOTYPIC CORRELATIONS AMONG THREE STRAINS OF COMMERCIAL BROILERS

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ABSTRACT

A total of 135 non-sexed birds of Ross 308, Arbor Acre, and Cobb 600 strains were reared from day 1 to 56 days to evaluate growth and carcass performance of three commercial broiler strains commonly reared in Owerri Imo State Nigeria. All birds were randomly distributed into three pens with 15 chicks/pen for each strain. Data on feed intake, body weight gain, linear body measurements were collected. 3 birds were randomly selected from each pen and slaughtered at 56 days. Results showed that Ross 308 strain had higher ($p < 0.05$) initial body weight. Although the strains did not differ significantly ($p < 0.05$) for feed intake, final body weight, bodyweight gain and feed conversion ratio. At 56 days body weight was comparable among the three strains investigated. Ross 308 had the highest correlation with thigh circumference (0.257), while Cobb 600 had the highest correlation with body height. The three strains of birds did not differ significantly ($p < 0.05$) for all carcass traits. The study concluded that the Arbor Acre strain of broiler performed better than Ross 308 and Cobb 600 strains.

(**Keywords:** broiler, strain, growth, carcass, correlation)

INTRODUCTION

Poultry production is considered the fastest way to reduce the incidence of protein deficiency in Nigeria (Obasoya *et al.*, 2005). The poultry industry is experiencing a gradual but definite change in product differentiation in response to consumer and industry demands. Profitability in broiler business is the main objective of each farmer. Poultry companies generally select the broiler strains that maximize their profitability. Current commercial broiler strains are the results of successful selection programs for rapid growth, especially of the breast muscles because breast is the most valuable portion of the chicken carcass in the market, even small difference in breast yield among strain crosses could have a significant economic impact. Several factors that influence the performance of broilers, carcass traits and meat quality include strain of bird, sex, age at slaughter, plane of nutrition and post-slaughter processing (Smith and Acton, 2001). The progress in breeding and nutrition has resulted in broiler strains developing higher performances today than ever before (Amag, 2015).

Many strains of broiler chickens have been imported into Nigeria still, the high demand for good weight broiler has been an issue that most farmers has failed to deal with due to the choice of strain which the farmer uses hence this study was carried out to evaluate the growth and carcass performance of three commercial broiler strains commonly reared in Owerri Imo State Nigeria.

MATERIALS AND METHODS

The research experiment was carried out at the teaching and Research Farm (poultry unit) of Federal University of Technology Owerri (FUTO) Imo State, Nigeria. Owerri is within the tropical rain forest zone with an average temperature of 24.2°C and maximum daily temperature of about 33°C. The location also has an annual rainfall of about between 2100 and 2500mm and mean Relative Humidity of 93% along with longitude 5° 29'N and latitude 7° 02'E. One hundred and thirty five day-old unsexed broiler birds comprising of three (3) different strains (Ross, Cobb, and Arbor Acre) was used for the experiment and were raised intensively on deep litter system. All the birds were kept under the same environmental condition of housing and management. The birds were fed with commercial diet from 1 to 56 days of age. Feed and water were given *ad libitum* throughout the experiment. Necessary vaccines and drugs were administered. Each strain was randomly assigned to three pens with fifteen (15) birds per pen. Daily feed intake and weight of birds were taken on weekly basis and the differences in weekly weight were taken as weight gain using sensitive scale (5kg scale) from week 1 to week 8. Data was collected weekly on nine linear body measurements using measuring tape as follows;

- **Body weight:-** This was recorded to two decimal places using a 5Kg sensitive weighing scale.
- **Body length:-** The body length was taken with a measuring tape stretched from bird's

beak along its gently stretched neck and back, to the tip of its tail feather.

- **Shank length** :- This was measured from the hock joint to the foot pad using a measuring tape.
- **Wing length**:- The wing length was measured from the humerus-coracoid junction to the distal tip of the phalangeal digits, using a measuring tape.
- **Keel length**:- This was measured as the length between the anterior and the caudal end of the keel.
- **Thigh circumference**:- This was measured as the circumference of the thigh (drumstick) at the hip bone region with the use of measuring tape.
- **Thigh length**:- This was taken as the distance from the tip of the hock to the ball joint of femur, measured by the use of a measuring tape.
- **Body circumference**:- This was measured as the circumference of the body using a measuring tape.
- **Breast circumference**:- The breast circumference was measured around the deepest region of the breast.

- **Body Height**:- The height was measured from the toe to the comb of the bird.

STATISTICAL ANALYSIS

Descriptive statistics of performance traits were calculated using the UNIVARIATE procedure in SAS® University Edition (SAS, 2017). The statistical model is

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where Y_{ij} is observation on each strain, μ is the population mean, T_i is the strain effect and e_{ij} is the random error. Significant means were separated using Duncan multiple range test procedures (SAS, 2017).

RESULTS AND DISCUSSION

Performance of broiler chicken strains

Final body weight, feed intake and feed conversion ratios did not differ significantly ($p < 0.05$) among broiler strains (table 1). However Arbor Acre had highest value for final body weight and body weight gain, while Cobb 600 recorded the highest value for feed intake. The result equally showed that although Arbor Acre had the lowest initial body weight, it performed better than Ross 308 and Cobb 600. This result did not follow a priori expectation that heavier day-old chicks should have better overall performance.

Table 1. Performance of three strains of broiler

Parameter	Ross 308	Arbor Acre	Cobb 600	SEM
Initial weight (g)	48.89 ^a	39.39 ^c	45.11 ^b	0.456
Final Body weight (g)	2732.50	2761.54	2722.22	22.998
Body weight gain (g)	2383.76	2400.85	2359.11	27.340
Feed intake (g)	3470.27	3484.44	4199.12	368.112
FCR	1.46	1.46	1.77	0.154

^{abc}: means within rows with different superscript differ significantly ($p < 0.05$)

FCR: feed conversion ratio.

Cobb 600 recorded highest value ($P < 0.05$) for body weight, keel length, thigh circumference, thigh length and wing length (Table 2), while body circumference, breast circumference, body length and body height did not differ significantly ($P < 0.05$) among the strains at 7 days of age. This report is similar with the finding of Abdullah *et al.* (2010)

who reported significant body weight at 7 days of age among different broiler strain. Gonzalez *et al.* (1998) reported that weight gain was affected by strain, with Ross broilers achieving higher weight gain compared to other strains. Genetic variation between the strains could have resulted in body weight gain variation.

Table 2 Performance of Broiler Strains at 7 Days of age

Parameter (cm)	Ross 308	Arbor Acre	Cobb 600	SEM
Wing length	6.66 ^a	6.54 ^{ab}	6.23 ^b	0.069
Shank length	3.32 ^b	3.38 ^{ab}	3.43 ^a	0.022
Keel length	5.77 ^b	6.11 ^a	5.75 ^b	0.056
Thigh circumference	5.13 ^b	5.73 ^a	5.39 ^{ab}	0.068
Thigh length	5.57 ^a	5.47 ^a	5.09 ^b	0.044
Body circumference	19.96	21.04	17.19	1.500
Breast circumference	6.66	6.42	6.38	0.064
Body length	16.06	16.07	16.20	0.057
Body height	16.08	16.91	23.13	1.508
Body weight (g)	154.22 ^b	163.05 ^b	173.52 ^a	2.058

^{ab}: means within rows with different superscript differ significantly ($p < 0.05$)

Arbor Acre strain had higher values ($p < 0.05$) for wing length, breast circumferences, body length and body height at 56 days of age when compared to other strains (Table 3). The birds had comparable

body weight, shank length, keel length, thigh circumference, thigh length and body circumference which did not differ ($p < 0.05$) significantly at 56 days of age .

Table 3 Performance of broiler strains at 56 days

Parameter	Ross 308	Arbor Acre	Cobb 600	SEM
Wing length	16.01 ^{ab}	16.23 ^a	15.70 ^b	0.106
Shank length	10.62	10.46	10.66	0.044
Keel length	57.84	17.39	65.09	20.432
Thigh circumference	14.56	14.54	14.47	0.085
Thigh length	14.51	14.71	14.61	0.041
Body circumference	52.31	51.27	52.58	0.398
Breast circumference	11.71 ^a	11.61 ^a	11.32 ^b	0.054
Body length	51.79 ^a	52.14 ^a	49.76 ^b	0.248
Body height	46.34 ^{ab}	46.97 ^a	46.09 ^b	0.169
Body weight (g)	2732.50	2761.54	2722.22	22.998

^{ab}.means within rows with different superscript differ significantly($p < 0.05$)

Carcass traits of broiler strains at 56 days of age

Carcass traits of broiler strains at 56 days of age are shown in Table 4. There were no significant difference ($p < 0.05$) in the live weight, carcass, breast, drum sticks, thigh, neck, back, wing, leg, head and the abdominal fat of broiler strains. This result

indicates that the strains compared favourable in terms of cut parts. This result is in agreement with Abdullah *et al.* (2010) that reported Similar carcass weights and dressing percentages among broiler strains

Table 4 Carcass traits of broiler strains at 56 days of age

Parameter (%)	Ross 308	Arbor Acre	Cobb 600	SEM
Live weight (g)	2732.50	2761.54	2722.22	22.998
Carcass	88.10	87.12	82.21	1.850
Breast	25.29	25.91	23.27	1.334
Drum sticks	10.67	10.91	10.37	0.329
Thigh	12.79	12.12	11.58	0.393
Neck	4.81	4.85	5.00	0.231
Back	13.07	13.18	12.92	0.487
Wing	8.25	8.79	8.99	0.181
Leg	3.99	3.79	4.03	0.150
Head	1.86	1.82	2.69	0.191
Abdominal fat	0.78	0.59	0.38	0.176

Phenotypic correlations between body weight and linear body measurements

After 56 days of age the correlation of the body weight with other body measurements (Table 5) showed that Ross 308 had the highest positive correlation with thigh circumference (0.257), while Cobb 600 had the highest correlation with body height (0.213).Ige (2013) reported that high, positive and significant correlation coefficient between body weight and linear body measurement indicates that

easily measured body parts can be used as criteria for selection of body weight. This result suggests that an improvement in body weight of commercial broiler chickens would lead to an improvement in linear body parameters. This result also corroborates the reports of Yahaya *et al.*, (2012) and Alabi *et al.* (2012) that high positive correlation exist between body weight and linear body measurements in broilers and naked neck/Venda chickens of South Africa, respectively

Table 5 Phenotypic correlation between body weight and linear body measurement at 56 days

Parameters(cm)	Ross308	P value	ArborAcre	Pvalue	Cobb 600	Pvalue
Wing length	-0.040	0.806	0.034	0.835	-0.027	0.877
Shank length	-0.272	0.090	0.018	0.914	0.034	0.846
Keel length	0.193	0.233	-0.043	0.793	-0.250	0.142

Thigh circumference	0.257	0.110	0.120	0.468	0.013	0.938
Thigh length	0.199	0.219	0.136	0.411	-0.015	0.932
Body circumference	-0.050	0.760	-0.018	0.912	0.134	0.434
Breast circumference	0.050	0.758	-0.085	0.608	0.182	0.289
Body length	0.242	0.132	-0.104	0.530	-0.266	0.116
Body height	0.069	0.670	0.259	0.111	0.213	0.212

CONCLUSION

The result of the study showed that Arbor Acre strain of broiler performed better than Ross 308 and Cobb 600 strains. It also suggests that there are high positive correlations between body weight and linear body measurements. The implication is that an improvement in body measurements could lead to an improvement in body weight. This relationship may be used in selection programme for further genetic improvement of commercial broiler chickens.

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