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Growth performance and carcass characteristics of F_1 progenies of local x exotic chicken crosses

[*1]Obike, O. M., [1]Chijioke, E. I., [1]Akinsola, K. L.,[2]Ezimoha, O. C., [3]Isaac, U. C. and [1]Oke, U. K.

[1]Department of Animal Breeding and Physiology, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.
[2]Department of Animal Production and Livestock Management, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.
Department of Animal Science and Technology, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

***Corresponding Author:** uceemer@yahoo.com; obike.onyemauchechi@mouau.edu.ng*
***Phone Number:** 07055938646*

***Target Audience**: Animal breeders, farmers, students, extension workers*

Abstract

Growth performance and carcass characteristics of F_1 progenies of local hen (Black and Brown normal feathered) and exotic male (Ross 308 and Arbor Acre) strains were evaluated. Base population had 60 dams, 30 each of Brown and Black phenotype and 24 exotic sires, 12 each of Arbor Acre and Ross 308. The experiment had 4 genetic groups – Ross 308 sire x Brown dam (A_1R_1), Ross 308 x Black dam (A_1R_2), Arbor Acre sire x Brown dam (A_2R_1) and Arbor Acre sire x Black dam (A_2R_2). Growth performance traits measured were final body weight, daily feed intake, average daily weight gain (ADWG), FCR and mortality. Body weight (BW) and linear body traits (LBM) – thigh length (TL), shank length (SL), breast width (BWDT), body length (BL), wing length (WL), keel length (KL), drumstick (DS) were measured as well as carcass and organ traits. Results of growth performance traits showed significantly ($P<0.05$) higher final BW, ADWG and better FCR in A_1R_1 progenies. Significant ($P<0.05$) differences were observed among the four strains for BWDT, DS, BW. KL. SL and WL. It was also observed that F_1 progenies of A_1R_1 recorded significantly ($P<0.05$) longer TL, SL, KL, WL, and BL and weighed heavier. Carcass and organ traits showed significant ($P<0.05$) differences among the genotypes. F_1 progenies of A_1R_1 were significantly ($P<0.05$) different from the other genotypes. It was concluded that genetic variation exists among the progenies for the traits and that Ross 308 x Brown local dams is best suited for improving the local stock in the study area.

***Keywords*:** growth, performance, carcass, progeny, local, exotic

Description of Problem

Poultry plays important role in human economy through provision of food, wealth and job for our teaming population (1). Egg and meat production are the major divisions of poultry production (2), although other divisions exist such as chick production, point of lay production, feed production, poultry tools and equipment in addition to poultry processing and marketing (3). Native chickens have meat quality characteristics that are often favoured by consumers over those of commercial breeds. In addition, the meat is perceived to have superior gustatory qualities. Native chicken strains not only contribute to the conservation of poultry genetic resources, but also are of high economic value. Indigenous chickens have been acclaimed as reservoirs of valuable genes for productivity under marginal environments (4). These genetic endowments include enormous resilience for disease resistance, thriftiness,

reproductive efficiency and conversion of poor nutritive feedstuffs to valuable products – meat and egg (4, 5, 6). According to (7), Nigerian indigenous chickens exhibit higher fertility and hatchability under natural incubation, and adapt better to the prevailing diseases, physical conditions and indigenous management practices than exotic chickens. It is however, less productive (meat and eggs) than its exotic counterparts (8).

Researchers have reported that the indigenous chicken possesses great potentials for genetic improvement through breeding programmes such as selection and/or crossbreeding (9, 8). (10) stated that crossbreeding of native stock with exotic commercial birds will take advantage of artificial selection of productivity in the exotic birds and natural selection for hardiness in the indigenous birds. It is also expected that the optimal crossbred chicken would have higher growth rate, feed conversion efficiency, reproductive and carcass performance without sacrificing adaption to the local environment. (10, 12).

Growth analysis is an important component of many biological studies. (13) defined growth as the process of an animal gaining weight with time until it reaches maturity. A number of conformation traits are known to be good indicators of body growth and market value of chickens (14). Chicken weight and morphometric traits like body length and shank length have great influence on growth performances of broiler chickens as they positively affect slaughter yield of market age (15). It has been stated that measurement of a progeny's growth and development at different ages gives an insight into the growth and development intensity that varies at various age structures (16). Genetic progress in poultry is rated in measures of body growth (body weight and linear body traits) and carcass conformation.

The objective of this study was to evaluate the growth and carcass performance of F_1 progenies of local x exotic chicken crosses.

Materials and Methods

Study Location

The study was conducted at the Poultry unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is situated between latitude 5^0 27′ North and longitude 7^0 32′ East and at an altitude of 122 m above sea level. The area has an annual rainfall of 2177 mm while the temperature ranges between 22^0 C and 36^0 C with relative humidity of 50 – 90% depending on the season (17).

Breeding Stock and Management

The base population constituted a total of 60 normal feathered local hens, 30 each of Brown and Black phenotype as well as 24 exotic sires, which comprised 12 each of Arbor Acre and Ross 308 strains. The hens were procured from Ndoro market, Umudike while the exotic strains were purchased from Agrited and Sayeed farms, Ibadan, Oyo State. The birds were housed separately in different deep litter pens and were quarantined for 2 weeks to enable them acclimatize to the environment. They were fed with commercial layer mash comprising 20% CP and 3000 kcal/kgME. Feed and clean water were supplied *ad libitum.*

Experimental Procedure

The mating scheme constituted four (4) genetic main crosses as indicated in Table 1.

Table 1. Mating procedure of the base population for the production of F_1 progenies from crosses between local dams and exotic sire lines

Exotic sire lines	Brown local hen (R_1)	Black local hen (R_2)
Ross 308 (A_1)	A_1R_1	A_1R_2
Arbor Acre (A_2)	A_2R_1	A_2R_2

Where;

A_1R_1 = Ross 308 sire x Brown dam

A_1R_2 = Ross 308 sire x Black dam

A_2R_1 = Arbor Acre sire x Brown dam

A_2R_2 = Arbor Acre sire x Black dam

Each genetic group was replicated 3 times with a mating ratio of 1:5 (1sire to 5 dams).

Egg Setting

Eggs from each genetic group were collected 2 – 3 times daily to prevent the cracking of the egg shell, and were stored for 7 days before they were incubated to avoid reduced hatchability due to prolonged storage. The eggs were covered with polythene in the hatcher to prevent drying of the egg content and incubated with an automated cabinet type incubator at a temperature of 37.7^0C and 70 % humidity. The eggs in the incubator were turned a minimum of 3 times daily to prevent adhesion, and on the 9^{th} day, the eggs were candled to evaluate the percentage fertility index of the eggs. On the 14^{th} day of incubation, the eggs were re-candled to determine the percentage dead-in-germ. The eggs were properly marked for each of the genetic group for proper identification. The incubated eggs hatched between 19^{th} and 21^{st} day. On arrival to the farm, the chicks were transferred to brooder houses according to their genetic groups and were given anti stress medication. Brooding of the chicks lasted for 2 weeks after which they were moved to the rearing pens. The birds were reared on deep litter pens, and each genetic group was replicated 3 times. They were reared in batches. Diet comprising 26 % CP, 2741Kcal/KgME and 20 % CP and 2900Kcal/kgME were fed at starter and finisher phases, respectively. Feed and water were given *ad libitum* to the birds. The experiment lasted for 12 weeks.

Vaccination and Medication

Other management practices including prophylactic medications and vaccinations were administered. The first dose of Newcastle Disease Vaccine (NCDV) was administered via intraocular on the first day to prevent early infection of Newcastle disease. On the 7^{th} day, the birds were vaccinated against infectious Bursal disease (Gumboro) (IBD) orally. On the 21^{st} and 28^{th} day, second dose of NCDV (Lasota vaccine) and IBD were repeated orally. Antibiotics and multivitamins were routinely administered. The experimental pens were cleaned frequently as the birds advanced in age.

Data Collection

Data were collected after brooding at week 2 and subsequently at bi-weekly intervals until 12 weeks of age. The following parameters were determined on each genetic group.

Growth Performance Traits

Initial Body Weight: this was measured by weighing the birds at the beginning of the experiment (2 weeks old).

Final Body Weight: this was taken by weighing the birds at the end of the experiment (12 weeks old).

Average Daily Feed Intake (g/bird/day) =

$$\frac{\text{Quantity of feed given} - \text{Quantity leftover}}{\text{Number of birds} \times \text{Number of days}}$$

Average Daily Weight Gain (g/bird/day) =
Final live weight – Initial live weight
Number of birds x Number of days

Feed Conversion Ratio (FCR) =
Average daily feed intake per bird
Average daily weight gain per bird

Mortality Rate (%) =
Number of dead birds x 100
Initial stock x Number of weeks 1

Body Weight and Linear Measurements
Parameters measured in the experiment were;

Body weight (BWT): measured bi-weekly using a top loading 20kg CAMRY brand scale with a sensitivity of 10g. It was measured in grams.

The underlisted linear body traits were measured on each genetic group at 2, 4, 6, 8, 10 and 12 weeks of age. The linear body traits were estimated with measuring tape in centimeters.

Breast width (BWDT): This was taken at the region of breast expansion when positioned ventrally.

Keel length (KL): this is the length of the breast bone.

Shank length (SL): the length of the tarso-metatarsus from the joint to the metatarsal pad.

Thigh length (TL): length of the femur bone.

Wing length (WL): this was measured as the distance between the tip of the phalanges and the coracoids-humerus joint.

Body length (BL): the distance between the base of the neck and pygostyle.

Carcass Evaluation

At the end of the experiment, twelve (12) birds (3 per replicate) from the 4 genetic groups close to the average final weight of the birds were selected for the carcass evaluation. The birds were starved overnight before slaughter, provided with only water to ensure good meat quality. The birds were weighed, slaughtered by severing the jugular vein to ensure proper bleeding and thereafter de-feathered by scalding in hot water and later weighed again. The head, neck, shanks and visceral organs were removed to determine the dressed weight. All cut parts (breast, thigh, drumstick, wings and back) were weighed and expressed as percentage dressed weight. Visceral organs (liver, heart, intestine, kidney, gizzard, caecum and spleen) were weighed immediately using sensitive scale and were expressed as percentage dressed weight.

Live weight = weight of the bird after fasting
Dressed weight = live weight – weight of the head + shank + feather + blood + intestines.
% Dressed weight = Dressed weight x 100
Live weight x 1

Percentage of the Cut parts =
Weight of each cut part x 100
Dressed weight x 1

Percentage of the Internal organs =
Weight of each internal organ x 100
Live weight x 1

Experimental Design

The experiment was a Completely Randomized Block Design (RCBD) with genetic group as factor of interest and batch as a blocking variable.

The statistical model used is as shown below;

$Y_{ijk} = \mu + G_i + Bj + e_{ijk}$

where:

Y_{ijk} = Individual observations

μ = Population mean

G_i = Effect of genetic group (1, . . . 4)

B_j = Batch effect

e_{ijk} = Random error, assumed to be independently, identically and normally distributed with zero mean and constant variance [iind $(0, \sigma^2)$].

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) using computer Software Package for Social Sciences (18) version 20 and significant means were

separated using Duncan Multiple Range Test (DMRT) according to (19).

Results and Discussion

Growth Performance of F_1 Progenies of Local x Exotic Chicken Crosses

The results of the growth performance indices of F_1 progenies of the various genetic groups at 2 to 12 weeks are indicated in Table 2. There were significant ($P<0.05$) differences among the genetic groups for final body weight, FCR and average daily weight gain. Average daily weight gain was significantly ($P<0.05$) higher in A_1R_1 with a mean value of 8.99 g. Feed conversion ratio (FCR) is a performance index which indicates how best feed consumed by birds are utilized for meat production. The FCR of A_1R_1 (3.36) was significantly ($P<0.05$) better when compared to the other genotypes. This could be as a result of superior growth performance of A_1R_1, hence showing better efficiency of the birds to convert feed to meat, thus resulting in the most efficient value of the feed conversion ratio (20). The higher feed intake of A_1R_1 when compared with the other genotypes may be responsible for the high value of average daily weight gain and final body weight recorded by the birds. Among the four genotypes, A_1R_1 became the genotype of choice in terms of feed conversion ratio, since the lower the numerical value for FCR, the more superior the birds become in utilizing feed (21). The results of this study agreed with the observations of (22) that genotype significantly affected FCR.

Table 2. Growth Performance Characteristics of F_1 Progenies of Local x Exotic Chicken Crosses at 2 to 12 Weeks of Age

Parameters	A_1R_1	A_1R_2	A_2R_1	A_2R_2	SEM
IBW (g)	14.39	14.27	10.56	10.70	0.56
FBW (g)	1240.00^a	1070.00^b	998.00^c	1050.00^b	47.91
ADFI (g/b/d)	300.24	290.83	300.03	290.64	0.07
AWG (g/b)	1190.61	1025.73	950.44	1004.30	33.87
ADWG (g/b/d)	8.99^a	8.70^b	6.44^d	6.62^c	0.35
FCR	3.36^b	3.42^b	4.66^a	4.47^a	0.17
Mortality (%)	2.00	3.00	3.00	4.00	0.00

$^{a-c}$ Means with different superscripts in the same row are significantly different ($P<0.05$), S.E.M: Standard Error of Mean, IBW = Initial Body weight, FBW = Final Body weight, AWG = Average weight gain, ADWG = Average Daily weight gain, ADFI = Average Daily Feed intake, FCR = Feed Conversion ratio.

Body weight and linear body measurements of the F_1 progenies of local x exotic chicken crosses at the 2nd, 4th and 6th weeks of age

Table 3 shows the mean values of body weight and linear body measurements of the F_1 progenies of local x exotic chicken crosses at week 2, 4 and 6. There were significant differences ($P<0.05$) among body weight and linear body parameters of the various genetic groups at the different weeks. A_1R_1 and A_1R_2 genotypes had higher body weights (198.53 ± 0.98 g and 171.00 ± 11.9 g at week 4, followed by that of A_1R_1 genotype (245.58 ± 10.80 g) which was not significantly ($P>0.05$) different from A_1R_2 genotype (223.14 ± 18.80 g) at week 6. The significant differences observed in this study is in line with the reports of (23), (24), (25) and (26). These authors from their various studies claimed that growth traits of chickens varied based on the genotype of the chickens. (25) affirmed variations in early growth traits of chicken progenies produced from chicken sires crossed with Fulani ecotype dams which is in consonance with these current findings. However, (27) reported differences in growth traits of two commercial broiler chickens. The authors found variations in the growth traits of pure and crossbred chicken progenies under derived savannah area of Nigeria. (28) reported the body weight of

Arbor Acre x local normal feathered hen at 6 weeks to be 208 ± 23.4 g which was lower than the values reported in this study.

There were significant (P<0.05) differences in the mean body length of all the genotypes at weeks 2 and 4. A_2R_2 progenies had significantly (P ≤ 0.05) longer bodies than those of other genotypes except for A_1R_1 at week 2. In week 4, A_1R_1 progenies had significantly (P ≤ 0.05) longer bodies (15.23 ± 0.17 cm) than A_1R_2 and A_2R_2 genotypes but compared favourably (P>0.05) with progenies of A_2R_1 (20.75 ± 1.56 cm). The mean values of shank length ranged from 3.29± 0.04 to 4.53±0.23 for A_1R_1 genotype, 2.79±0.20 to 4.64±0.34 for A_1R_2 genotype, 2.73±0.24to 4.19±0.38 for A_2R_1 genotype and 3.26±0.09to 4.05±0.35 for A_2R_2. A_1R_1 had significantly longer shanks (P<0.05) in weeks 2 and 4. The mean values of drumstick ranged from 3.10± 0.11 to 7.51±0.35 for A_1R_1 progenies, 3.38±0.24 to 7.48±0.58 for A_1R_2, 2.71±0.24to 6.72±0.60 for A_2R_1 and 4.05±0.09 to 6.64±0.56 for A_2R_2 at 2-6 weeks of age. There were significant (P<0.05) differences among the genotypes at week 2 with A_2R_2 genotypes having longer drumstick. However, at week 4, A_1R_1 recorded significantly (P<0.05) longer drumstick when compared to the other genotypes. The mean values of keel length and breast width showed significant (P<0.05) differences among the progenies of the crosses. At week 2, A_1R_1 had significantly (P<0.05) longer keel compared to other genotypes but had similar values with A_1R_2 and A_2R_1 at week 4, though not significant (P>0.05). A_2R_2 had significantly (P<0.05) larger breast width at week 2 while A_1R_2 recorded significantly (P<0.05) higher value compared to other genotypes at week 4.

Table 3. Means ± SE of body weight and linear body parameters of the F_1 progenies of local × exotic chicken crosses at 2, 4 and 6weeks of age

Age (weeks)	Genotype	BWT	BL	BD	WL	SL	DS	KL	BWDT
2	A_1R_1	76.04±0.12^{a}	9.29± 0.13^{ab}	11.15± 0.76	6.36± 0.39^{c}	3.29 ± 0.04^{a}	3.1± 0.11^{bc}	5.99 ± 0.10^{a}	2.41 ± 0.04^{ab}
	A_1R_2	65.74±4.48^{b}	8.73±0.62^{b}	9.52 ± 0.65	7.68±0.53^{b}	2.76 ± 0.20^{b}	3.38± 0.24^{a}	4.68 ± 0.31^{b}	2.08± 0.15^{b}
	A_2R_1	62.92±4.49^{b}	8.22±0.65^{b}	8.98±0.71	6.61±0.54^{bc}	2.73± 0.24^{b}	2.71±0.24^{c}	4.79± 0.40^{b}	2.27± 0.20^{ab}
	A_2R_2	75.63±0.62^{a}	10.07±0.13^{a}	10.90±0.16	9.00±0.12^{a}	3.26± 0.09^{a}	4.05±0.09^{a}	5.23± 0.07^{b}	2.61±0.08^{a}
4	A_1R_1	198.53± 0.95^{a}	15.23± 0.17^{a}	14.40± 0.19	12.98± 0.29	4.13±0.44^{a}	5.37±0.05^{a}	7.29±0.11^{a}	2.80±0.04^{a}
	A_1R_2	171.00± 11.97^{a}	12.31± 0.88^{b}	12.27± 0.88	11.76± 0.83	3.60±0.25^{ab}	4.40±0.32^{b}	6.41±0.45^{ab}	2.31±0.16^{b}
	A_2R_1	141.17± 12.30^{b}	13.58± 1.18^{ab}	13.00± 1.12	15.92± 3.87	3.49±0.30^{ab}	4.01±0.35^{b}	6.42±0.56^{ab}	2.29±0.20^{b}
	A_2R_2	106.28± 10.22^{c}	11.75± 0.93^{b}	14.95± 3.54	10.58± 0.85	3.40±0.26^{b}	3.77±0.30^{b}	5.95±0.46^{b}	1.91±0.15^{b}
6	A_1R_1	245.58±10.80^{a}	20.91±0.90	17.84±0.81^{ab}	19.14±0.86	4.53±023	7.51±0.35	8.00±0.45	2.54±0.12
	A_1R_2	223.14±18.80^{ab}	20.75±1.56	19.45±1.47^{a}	19.54±1.48	4.64±0.34	7.48±0.58	8.61±0.70	3.38±0.88
	A_2R_1	189.59±17.72^{b}	17.83±1.58	15.04±1.35^{b}	16.12±1.44	4.19±0.38	6.72±0.60	7.43±0.66	2.38±0.21
	A_2R_2	189.06±16.22^{b}	17.64±1.48	15.15±1.28^{b}	16.11±1.36	4.05±0.35	6.64±0.56	7.59±0.64	3.38±0.20

^{abc} means on the same column for each week, with different superscripts are significantly different (P<0.05). A_1R_1 = Ross 308 sire x Brown dam, A_1R_2 = Ross 308 sire x Black dam, A_2R_1 = Arbor Acre sire x Brown dam, A_2R_2 = Arbor Acre sire x Black dam, BWT = body weight, BL = body length, BD = body depth, WL = wing length, SL = shank length, DS = drumstick, KL = keel length, BWDT = breast width. SE = standard error

Morphometric traits are the quantitative analyses of the structure, shape and size of an organism (29). The results of the present study showed significant genotype effect on body weight and linear body measurements. This shows variations in the genetic constitution of the birds which is a major determinant of growth and physiological development. This is consistent with the reports of (30). (31) reported the body weight, body length and shank length of indigenous normal feathered hen crossed with exotic to be 353.00 g, 33.43 cm and 4.03 cm at week 4, respectively. These values were higher than the values reported in

this work except for the value of shank length for A_1R_1, which was 4.13 cm. The difference in values could be attributed to differences of strain, environment and management.

The significant variation in BW and linear body measurements of the resulting progenies of the different crosses are consistent with the reports of (32) and (33) in which breed differences had significant effect on growth performance of different strains of birds. It was observed that A_1R_1 progenies were significantly higher ($P<0.05$) in BW, BL, SL, KL and BWDT, this superiority could be attributed to genetic differences among the progenies.

Table 4: Means ± SE of body weight and linear body parameters of the F_1 progenies of local × exotic chicken crosses at week 8 – 12

Age (weeks)	Genotype	BWT	BL	BD	WL	SL	DS	KL	BWDT
8	A_1R_1	541.65±38.17^{a}	30.52±3.51	18.05± 1.09	20.09±1.48	4.70± 0.29	8.20±0.48	9.44 ± 0.70	2.68 ± 0.15
	A_1R_2	461.14±32.61^{ab}	28.66±1.61	20.17± 1.46	20.02± 1.13	4.95 ± 0.33	8.83± 2.72	8.75± 0.53	2.47± 0.18
	A_2R_1	461.83±27.77^{ab}	23.54±1.29	17.62±1.10	18.75±3.47	4.59± 0.29	7.34±0.57	7.96± 0.50	2.43± 0.15
	A_2R_2	421.17±35.35^{b}	26.44±1.62	16.81±1.41	17.24±1.44	4.46± 0.36	7.71±0.66	8.06± 0.68	2.46±0.21
10	A_1R_1	775.00± 52.02	38.03± 1.76	29.39± 1.49	20.60± 1.49	5.23±0.39	9.41±0.69	9.35±0.68	2.77±0.19
	A_1R_2	826.29± 52.97	35.78± 1.62	27.52± 1.56	20.11± 1.41	5.18±0.37	9.53±0.68	8.66±0.66	2.64±0.20
	A_2R_1	751.92± 60.35	30.99± 1.60	28.20± 1.66	18.91± 6.52	4.91±0.44	8.47±0.72	7.18±0.71	2.38±0.22
	A_2R_2	817.54± 56.26	30.92± 1.64	25.61± 6.64	19.05± 1.50	5.03±0.39	8.60±0.77	8.42±0.66	2.65±0. 21
12	A_1R_1	1240.83±65.63	45.34±1.81	32.49±1.90	29.71±1.52	6.25±0.40	10.66±0.79	10.07±0.72	2.86±0.19
	A_1R_2	1070.89±71.01	42.03±1.79	32.02±1.56	29.49±1.53	6.18±0.38	10.00±0.71	9.48±0.72	2.65±0.18
	A_2R_1	998.69±73.39	37.31±8.41	30.37±1.88	24.61±1.82	6.00±0.46	9.53±0.80	9.51±0.87	2.42±0.22
	A_2R_2	1050.19±69.62	40.41±2.11	30.29±1.56	22.74±1.85	6.08±0.43	9.21±0.78	9.70±0.81	2.79±0.21

^{abc} means on the same column for each week, with different superscripts are significantly different ($P<0.05$). A_1R_2 = Ross 308 sire x Black dam, A_2R_1 = Arbor Acre sire x Brown dam, A_2R_2 = Arbor Acre sire x Black dam, BWT = body weight, BL = body length, BD = body depth, WL = wing length, SL = shank length, DS = drumstick, KL = keel length, BWDT = breast width. SE = standard error

Body weight and linear body parameters of the F_1 progenies of local × exotic chicken crosses at 8, 10 And 12 weeks of age

Table 4 gives the mean body weight and linear body parameters of the F_1 progenies of local x exotic genotypes at 8, 10 and 12 weeks of age. There was significant ($P<0.05$) difference in the mean body weight of all the genotypes at week 8, A_1R_1 genotype was significantly ($P\leq0.05$) heavier compared to A_2R_2. A_1R_1 had the highest numerical values of 775.00 g and 1240.83 g in weeks 10 and 12 respectively.

There were no significant ($P>0.05$) differences between the genotypes at weeks 8, 10 and 12 for body depth, wing length, shank length, drumstick, keel length and breast width. (31) reported the body weight, body length and shank length of indigenous normal feathered hen crossed with exotic to be 846.65 g, 53.37 cm and 6.56 cm at week 8, respectively. The values were higher compared to the findings in this work. The authors also recorded the body weight, body length and shank length at 12 weeks to be 1469.62 g, 59.31 cm and 8.21 cm, respectively. The body weight and body length were higher than values obtained in this work. However, the shank length was lower than the recorded values in this study at 12 weeks. (28) reported the body length of 36.60±0.60 cm, wing length of 18.93±0.73cm, keel length of 12.13±0.38cm, shank length of 8.60±0.21cm and breast width of 12.67±6.67cm at 18 weeks of age. Except for body length and wing length, which were lower than the findings of this work, keel length, shank length and breast width were higher than what was obtained in the course of this study. These inconsistencies between results obtained and earlier findings could be due to strain differences as well as environmental and managerial deviations. The

overall increase in all the body measurements of birds in each genotype as age increased is a normal phenomenon and agrees with the reports of (34) and (35) who noted that age is a major determinant of growth and physiological development.

Table 5: Carcass yield and % cut-parts of the F_1 progenies of local x exotic chickens crosses at 12 weeks

Parameters	A_1R_1	A_1R_2	A_2R_1	A_2R_2
Live weight (g)	1240.83± 65.63	1070.89±71.01	998.69±73.39	1050.19±69.62
Dressed weight (g)	1160.67±194.62^{a}	991.67±172.99^{b}	820.83±231.06^{b}	733.33±128.51^{c}
Dressing percentage (%)	54.73±6.24^{a}	48.42±7.63^{b}	53.45±6.22^{ab}	51.92±3.48^{b}
Breast cut	22.03±1.75^{a}	23.86±3.25^{a}	21.28±2.16^{b}	20.60±2.48^{b}
Back cut	18.56±2.20	17.93±2.98	17.83±2.85	18.42±2.13
Drum stick	14.46±2.02^{ab}	15.59±2.49^{a}	13.62±1.75^{b}	14.76±2.77^{ab}
Thigh	15.94±1.80	16.59±2.37	14.93±2.55	15.39±1.38
Wings	13.21±0.58^{b}	14.23±2.24^{a}	12.27±1.35^{b}	13.91±1.81^{a}
Shank	5.46±0.86	6.45±1.29	5.67±1.37	6.37±1.41
Neck	7.69±0.81	7.64±1.43	7.39±0.89	7.65±0.89
Head	4.81±0.81	5.04±0.70	5.17±1.03	5.40±0.86

$^{a–b}$Means with different superscripts in the same row are significantly different ($p<0.05$),

Carcass characteristics of the F_1 progenies of local x exotic chicken crosses

The carcass characteristics of the progenies of the four genetic groups are presented in Table 5. It was observed that back cut, thigh, shank, neck and head were not significantly ($P>0.05$) different among the four genotypes. Nevertheless, significant ($P<0.05$) differences were observed in the dressed weight, dressing percentage, breast cut, drumstick, and wings in the four genotypes. The values of the cut parts expressed as percentage of live weight gives carcass yield (dressed weight) percentage (36).

From the result of the present study, A_1R_1 had the highest ($P<0.05$) live weight (1240.83 g) and dressed weight (1160.67 g). The dressing percentage of A_1R_1 progenies (54.73 %) was statistically similar to those of A_2R_1 (53.45%). The value of drumstick in A_1R_2 (15.59 %) is not significantly ($P>0.05$) different from A_1R_1 genotype (14.46%). For wings, A_1R_2 genotype had significantly higher ($P<0.05$) value than the other genotypes.

(37) recorded live weight of 1937.50 g, 2048.88 g and 2215.00 g for Abor Acre, Cobb and Marshall strains, respectively. These values were higher than the values obtained in this work. This may be due to the breed/strain differences. (38) reported a value of 24.43 % for breast cut which was similar to the values reported in this study (23.86%) and drumstick (19.10 %) for Cobb 500 strain which was higher than the findings of this work. (39) reported values of 17.93 % and 9.2 % for breast and drumstick respectively in his research with Cobb 500 strain. These values were lower than what was obtained in this work. (40) reported that the breast percentage of Hubbard broiler strain was 42.29 % and its drumstick percentage was 27.69 %. (41) also reported that Ross 308 recorded the breast percentage of 24.49 % and drumstick percentage of 19.14 %. (42) reported breast percentage 23.4% and drumstick percentage 16%, these values were similar to the values obtained in this work. The differences in values obtained in these studies compared to the findings reported in this work could be attributed to genetic variations as well as the researches being carried out in different locations.

Internal organ proportion of the F_1 Progenies of local x exotic chicken crosses

The mean values ± standard errors of the internal organ proportions of the F_1 progenies of the local x exotic crosses are given in Table 6. The liver, gizzard, proventiculus, large intestine, small intestine, pancreas, crop and lungs were significantly ($P<0.05$) different among the four genetic groups. However, no significant ($P>0.05$) differences were observed for the heart, spleen and kidney.

A_1R_1 progenies had significantly ($P<0.05$) higher weights for gizzard, liver, proventiculus, large intestine, small intestine, pancreas, crop and lungs than the other genotypes. For organ weight, liver weight of A_1R_2, A_2R_1 and A_2R_2 genotypes were not significantly different ($P>0.05$) from each other. The liver weight of A_1R_1 had the highest ($P<0.05$) value of 2.33 %. This could be attributed to the changes in both the ability and functions of the liver during digestion as reported by (43).

Table 6: Organ proportions of the F_1 progenies of local x exotic chickens at 12 weeks

Parameters	A_1R_1	A_1R_2	A_2R_1	A_2R_2
Gizzard	2.66±0.31^{a}	2.15±0.24^{b}	2.28±0.29^{b}	2.18±0.20^{b}
Liver	2.33±0.28^{a}	2.08±0.24^{b}	2.13±0.24^{b}	2.00±0.21^{b}
Heart	0.33±0.94	0.29±0.05	0.34±0.08	0.34±0.05
Spleen	0.10±0.02	0.09±0.03	0.09±0.02	0.14±0.18
Emptied proventriculus	0.46±0.05^{a}	0.39±0.06^{bc}	0.43±0.05^{ab}	0.36±0.05^{c}
Large intestine	1.45±0.20^{a}	1.38±0.13^{b}	1.24±0.19^{bc}	1.20±-.20^{c}
Small intestine	6.58±0.59^{a}	6.04±0.42^{ab}	6.10±0.87^{ab}	6.00±0.63^{b}
Pancreas	0.31±0.10^{a}	0.30±0.06^{ab}	0.29±0.07^{ab}	0.24±0.32^{b}
Crop	1.23±0.13^{a}	1.07±0.06^{ab}	1.20±0.10^{a}	1.02±0.34^{b}
Lungs	0.44±0.08^{a}	0.37±0.04^{b}	0.46±0.05^{a}	0.36±0.08^{b}
Kidney	0.32±0.09	0.28±0.06	0.28±0.12	0.24±0.07

$^{a–b-c}$Means with different superscripts in the same row are significantly different ($p<0.05$), S.E.M: Standard Error of mean.

From these findings, it was discovered that the value of organs of A_1R_1 was greater than the others. This could imply that there may be a higher digestive metabolic activity that took place in the organs of this genotype. It could also be attributed to existence of genetic variability among the progenies.

Conclusion and Applications

1. The study revealed that growth performance, carcass characteristics and organ proportion were affected by genetic group. This implies that genotype had a significant impact on the performance of the birds. A_1R_1 (Ross 308 x Brown dam) showed superiority when compared to the other genotypes for the parameters measured – growth performance, body weight and linear body traits, organ and carcass characteristics.
2. It was also observed that body weights and linear body measurements increased as age increased in the four (4) genotypes. This result opines that these body measurements were directly proportional to age.
3. The findings revealed that Ross 308 x Brown local dams is best suited for improving the local stock in the study area.

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