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# Growth performance of normal local chicken x Isa brown in Nigeria

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## Abstract

*Indigenous chickens have some peculiarity that enables them withstand harsh weather, resistance to diseases and adaptive mechanism to the environment. However, the indigenous chickens have some disadvantages arising from rearing mortality, slow growth rates, poor egg production and attains sexual maturity late. Such birds can be improved genetically through selective breeding. The study was aimed at accessing the growth performance of Isa Brown (exotic) x Normal Local chicken progenies in a humid tropical region. Ten commercial strain (Isa Brown female) and two Normal Local Chicken (NLC), housed in ratio 1:5 and mated through natural and artificial insemination which produced 90eggs, out of which 54 eggs hatched. The hybrids were managed under an intensive system, randomly divided and allotted into six replicates with nine birds each for eight weeks. Data were collected for feed and growth parameters, linear body measurements and analyzed using Statistical Software for Social Scientists (SPSS). Significant (P<0.05) differences were observed for all the weeks for body weight, body length, shank length, body girth, wing length and keel length. The result revealed an increasing order from week 1 to week 8 as expected, with the 8th week having the superior mean value for body weight (463.45g), body length (17.71cm), shank length (11.77cm), body girth (20.87cm), wing length (15.98cm) and keel length (10.64cm). Also, there were significant (P<0.05) differences in feed efficiency and growth parameters for all the weeks; feed efficiency and daily weight gain increased from week 1 to week 3 (5.29%, 12.40%, 14.41%) and (1.50%, 4.68%,5.65%), respectively. Feed conversion ratio was high at week 1 (18.92%) of the experiment while other weeks recorded similar mean values. There were significant (P<0.05) differences for feed intake across the weeks. Result from carcass evaluation of the hybrids showed that back weight (16.44%/DWT) and breast weight (16.05%/DWT) constitutes major meat portions, followed by wing weight (9.70%/DWT) and drumstick (9.10%/DWT) while the heart (0.59%/DWT) constituted the least portion. Significant (P<0.05) positive correlations were observed for all the correlating parameters at 4th and 8th weeks; as all the parameters ranged from 0.934 to 0.975 and 0.907 to 0.964 at 4th and 8th weeks respectively. Furthermore, the adaptability of the normal local chicken masked or outperformed that of the exotic breed. However, discussion of this present study has revealed that the progenies of the crosses has more characteristic features of a layer than a meat type chicken.*

**Keywords:** Progeny, normal Chicken, cross and Isa brown

# Performances de croissance du poulet local normal x Isa brown au Nigéria

## Résumé

*Les poulets indigènes ont une particularité qui leur permet de résister aux intempéries, de résister aux maladies et de s'adapter à l'environnement. Cependant, les poulets indigènes présentent certains inconvénients liés à la mortalité d'élevage, aux taux de croissance lents, à la faible production d'œufs et à la maturité sexuelle tardive. Ces oiseaux peuvent être*

*améliorés génétiquement par un élevage sélectif. L'étude visait à accéder aux performances de croissance des descendances de poulet Isa Brown (exotique) x Normal Local dans une région tropicale humide. Dix souches commerciales (femelle Isa Brown) et deux poules locales normales (PLN), hébergées dans un rapport de 1: 5 et accouplées par insémination naturelle et artificielle qui ont produit 90 œufs, dont 54 œufs ont éclos. Les hybrides ont été gérés selon un système intensif, divisés au hasard et répartis en six répétitions avec neuf oiseaux chacune pendant huit semaines. Les données ont été recueillies pour les paramètres d'alimentation et de croissance, les mesures corporelles linéaires et analysées à l'aide du logiciel statistique pour les scientifiques sociaux (SPSS). Des différences significatives (P<0,05) ont été observées pour toutes les semaines pour le poids corporel, la longueur du corps, la longueur de la tige, la circonférence du corps, la longueur des ailes et la longueur de la quille. Le résultat a révélé un ordre croissant de la semaine 1 à la semaine 8 comme prévu, la 8e semaine ayant la valeur moyenne supérieure pour le poids corporel (463,45 g), la longueur corporelle (17,71 cm), la longueur de la tige (11,77 cm), la circonférence corporelle (20,87 cm), la longueur de l'aile (15,98 cm) et la longueur de la quille (10,64 cm). De plus, il y avait des différences significatives (P < 0,05) dans l'efficacité alimentaire et les paramètres de croissance pour toutes les semaines ; l'efficacité alimentaire et le gain de poids quotidien ont augmenté de la semaine 1 à la semaine 3 (5,29 %, 12,40 %, 14,41 %) et (1,50 %, 4,68 %, 5,65 %), respectivement. Le taux de conversion alimentaire était élevé à la semaine 1 (18,92 %) de l'expérience tandis que les autres semaines enregistraient des valeurs moyennes similaires. Il y avait des différences significatives (P < 0,05) pour l'apport alimentaire au fil des semaines. Le résultat de l'évaluation de la carcasse des hybrides a montré que le poids du dos (16,44 %/DWT) et le poids de la poitrine (16,05 %/DWT) constituent les principales portions de viande, suivis du poids des ailes (9,70 %/DWT) et du pilon (9,10 %/DWT) tandis que le cœur (0,59 %/DWT) constituait la moindre portion. Des corrélations positives significatives (P<0,05) ont été observées pour tous les paramètres de corrélation aux 4e et 8e semaines ; car tous les paramètres variaient de 0,934 à 0,975 et de 0,907 à 0,964 aux 4e et 8e semaines respectivement. De plus, l'adaptabilité du poulet local normal masquait ou surpassait celle de la race exotique. Cependant, la discussion de cette présente étude a révélé que les descendants des croisements ont plus de traits caractéristiques d'une couche qu'un poulet de type viande.*

**Mots-clés**: Descendance, Poulet normal, croisement et Isa brown

## Introduction

In Nigeria, the demand for white meat has increased tremendously in recent time due to health issues arising from red meat consumption (Jaturasitha *et al*., 2008). White meat such as chicken meat is superior to red meat in health aspects because of its comparatively low content of fat and cholesterol which is of great importance to man. Chicken meat is unique in that its price is comparatively low, easy to partition into smaller parts and no religious or traditional restriction against its consumption (Jaturasitha *et al*., 2014). There are several factors affecting the productive and carcass performance of broiler chickens, such as breed or strain, sex, nutrition, housing and stocking rate. The success of poultry production has been strongly related to the improvements in growth performance and carcass yield and composition.

Indigenous chickens have some peculiarity that enables them withstand harsh weather, resistance to diseases and adaptive mechanism to the environment. These birds have advantages such as good egg, meat flavor, hard egg shell, high dressing percentages and apparently low cost of

production. However, the indigenous chickens have some disadvantages arising from the fact that they encounter high rearing mortality, slow growth rates, poor egg production and attains sexual maturity late. Such birds can be improved genetically through selective breeding (Omeje, 1986).Local chickens in Nigeria are small in size and grows slowly and there have been reports on the characterization of local chickens in Nigeria and its potential for egg and meat production (Adebambo, 2005). The Isa Brown is a hybrid type, a sex-linked chicken which emanated from crossing Rhode Island Red and Rhode Island White. It's a hybrid and not a pure breed with preference for its egg production of almost 300eggs per hen in the first year of production, (Hendrix Genetics, 2005). Therefore, crossing the local chickens with exotic ones while estimation of the genetic parameters of the crossbred progenies will form important criteria for selection and improvement of qualitative traits of local chicken population.

## 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. The university is situated between Latitude $5^0$ $27^1$ North and Longitude $7^0$ $32^1$ East and altitude of 122 m above sea level with an annual rainfall of 2177mm and the temperature ranges between $22^0$C and $36^0$C and relative humidity of 50 – 90% depending on the season (NRCRI, 2013).

### *Acquisition of female and male parental lines*

Parent stock population used in this study comprised of 12 birds i.e. 10 Isa Brown females purchased from Gufon Farm and Veterinary Centre, Owerri, Imo State and two normal local chicken males purchased from Ndoro Local Market, Oboro, Ikwuano Local Government Area of Abia state.

### *Mating of base population*

Ten mature Isa Brown females at the point of lay and two mature Normal Local Chickens (NLC) were the parental stock. Mating system involved main crossing using the natural and artificial insemination. The mating ratio adopted in this study was one cock to five Isa brown female.

### *Egg setting and management of experimental birds*

Eggs were picked twice daily from each pen to prevent cracks and damages by the birds. The eggs were stored and managed under adequate ventilation of 21% oxygen, temperature at a range of $37.2^0$C – $39.4^0$C, relative humidity of $56^0$C – $60^0$C. Egg collection started 2 weeks after introduction of the females into the male pens, each egg was labeled according to the tag on the pen which signified the sire number, records on number of egg laid and mortality were taken daily for every pen. However, a total of 90 eggs were collected and hatched in batches.

### *Hatching procedure*

These eggs were arranged inside the incubator and on the $14^{th}$ day of incubation were candled to remove infertile ones while fertile eggs were moved into the hatcher where they remained until the $21^{st}$ day. The chicks were labeled using wing band and weighed in grams. All the chicks were vaccinated after completing all the hatchery procedures and transferred to brooding and rearing pens.

### *Housing and equipment*

On arrival of birds, a total of 54 day old chicks were used for the purpose of the experiment with nine birds to each replicate. The chicks were housed at the brooding section, covered with polythene sheets and heat was supplied through kerosene stoves and 200 watts electric bulbs. Chick feeder trays and plastic drinkers were used throughout the brooding period which lasted for two weeks. At the

end of two weeks, birds were moved to the rearing pen.

***Feeding management***

During the experiment, feed and water were served *ad libitum* to all birds. Chick mash was given to the birds at age 0 – 4 weeks, containing 23.0%CP and 2800kcal/ME/kg while at the finishing stage grower ration containing 3000kcal/ME/kg and 20.29% CP was given to the birds.

**Table 1: Nutrient composition of the starter and finisher diets**

| Parameters | Starter | Finisher |
|---|---|---|
| Maize | 46 | 55 |
| Guinea corn waste | 5.0 | 5.0 |
| Soya beans | 36.5 | 28.5 |
| Wheat offal | 6.0 | 5.0 |
| Fish meal | 3.0 | 3.0 |
| Bone meal | 3.0 | 3.0 |
| Vitamin premix | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 |
| Total | 100 | 100 |

Crudeprotein – 23.07%; Metabolizableenergy – 3000 (kcal/kg); *Vitamin/mineralpremix composition: Vit. A – 10,000,000IU, Vit. D3 – 200,000IU, Vit. E – 10,000mg, Vit. K3 – 2,000mg, Vit. B2 – 5,000mg, Folicacid – 500mg, Niacin – 15,000mg, Calpan – 5,000mg, Vit. B12 – 1,500mg, Vit. B1 – 1,500mg, Vit. B6 – 1,500mg, Biotin – 20mg, Antioxidant – 125,000mg, Selenium – 200mg, Iodine – 1,000mg, Iron – 40,000mg, Cobalt – 200mg, Manganese – 7,000mg, Copper – 4,000mg, Zinc – 50,000mg, Choline chloride – 150,000mg. Calculated composition: Ca – 3.50, P – 1.11.

***Parameters measured***

Body weight and linear body measurements were recorded, the linear body measurements include; body length, (BL), body girth (BG), wing length (WL), shank length (SL), shank thickness (ST), keel length (KL). The parameters were taken on a weekly basis for 8 weeks. Other parameters measured were: Feed intake, feed conversion ratio, percentage mortality.

***Carcass evaluation***

Ten progenies of the Isa Brown x Normal Local Chicken cross were randomly selected at eight weeks for carcass characteristics evaluation from population of the reared chickens. The selected birds for carcass evaluation were starved overnight, weighed, slaughtered manually and de-feathered. The weight of heart, liver, crop, gizzard and the intestine of each chicken were determined using an electronic balance (600g) capacity. The electronic balance is make up of Acrylonitrile Butadiene Styrene and stainless steel manufactured in China The dressed weight of each chicken slaughtered was taken and recorded after the evisceration and removal of intestine and the visceral organs. The primal-cut such as the thigh, drumstick, breast and back cut were weighed, recorded and expressed in g/kg of dressed weight. Other parts of the chickens weighed were head, neck and shank.

***Statistical analysis***

The experimental design was Completely Randomized Design (CRD) and collected data were analyzed using statistical software package for social scientists (SPSS) version 16 (2001). The result of the analysis was subjected to Analysis of Variance (ANOVA) and significant means were separated using Duncan's Multiple Range Test (DMRT) as described by Duncan (1995). Below is the model of the analysis;

$$Y_{ij} = \mu + W_i + E_{ij}$$

Where, $Y_{ij}$ = Individual Observation

$\mu$ = Overall mean

$W_i$ = Weekly body changes (Linear

body change)

$E_{ij}$ = Residual (error) or random error.

The correlation among the various body measurements was done using Pearson Product Morrent correlation as continued in the SPSS (1999) package.

**Results and discussion**

Table 2 shows the result of linear body measurements for Isa brown X Normal local chicken cross. Significant ($P<0.05$) differences were observed for all the parameters in all the weeks. The result revealed an increasing trend from week 1 to week 8, which is a normal phenomenon with week eight having the highest mean values while week 1 had the least value. The growth rate in most animals has a characteristic sigmoid curve. The chickens estimated in this study were at the rapid phase of the growth curve, which revealed a positive linear progression. Application of the principle of heterosis to animal production is widely harnessed. Commercial livestock are generally produced by crossing breeds, strains, or lines. The work of Olawumi (2011) on pre-laying characteristics of three breeds of commercial layers in the Derived Savannah zone of Nigeria. The author obtained the following results as body weight: 567g, 532g and 530g; body length: 21.50cm, 21.20cm and 14.80cm in Isa brown, Bovan and Dominant black, respectively. These values reported for body weight by this author were higher compared to the value (463.45g) obtained in this study. However, considering the lower body weights of local stocks according to Trail (1962), we can clearly observe the effect of crossbreeding on the present result which is more or less an average value. The shank length reported in this study was superior to the value reported by Olawumi (2011). This difference ranks the progenies of this study under the long shank class of birds which are often characterized with low body weight. This experiment was in contrary with the report of Omeje and Nwosu (1988), Asiedu and weever (1993) narrated crossbreeding of the indigenous chickens with the exotic breeds as improving the growth traits, which include traits like live weights, daily gains and feed intake. Also, several researches conducted by Hendrix genetic company on Isa brown reveals that body weight at the 8$^{th}$ week is expected to be 630g, which is higher than the value recorded in this study. This happens in the case of super heterosis, where the value obtained in this study is expected to be higher than the individual parental values. According to Mekki *et al.* (2005), crossbred three indigenous (Bareneck, Betwil and Large belawi) with three exotic Rhode Island Red, Fayoumi and Bovans breeds in Sudan. The result obtained for body weight at 8$^{th}$ week ranged from218.5g in Fayoumi x Betwil, 266.0g in Fayoumi x Bare neck cross. The mean values were lower compared to (463.45g) obtained from the cross in this study at the 8$^{th}$ week. It is expected that if crossbred female progenies continues with high body weight, they will lay large eggs as larger hens within a bloodline laid larger eggs than those with small body weights (Dupleissis and Erasmus 1972; Chineke, 2001). However, Oke *et al*. (2004) reported that poultry producers wants eggs with minimum possible size and weights that will maximize production of standardized eggs at an affordable rate and also retain market carcass value at the end of the production. This poses an advantage report to the result of this study. Also, Malik *et al.*(2013) studied the growth performance and nutrient digestibility of pullet chicks fed graded levels of water hyacinth meal diets at the starter phase. The result obtained from the work revealed the body weight values of 386.21g to 409.37g, which fell below the

body weight value of this study. So, the lower values obtained from previous studies on body weights adequately emphasizes the sire effect of the Normal Local Chicken used in crossing Isa Brown.

**Table 2: Least squares means showing the linear body measurements of Isa brown X normal local chicken hybrid from 1 to 8 weeks of age**

| Parameter | WEEKS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | SEM |
| Body weight | 43.47$^{h}$ | 76.20$^{g}$ | 115.72$^{f}$ | 141.22$^{e}$ | 195.19$^{d}$ | 265.47$^{c}$ | 362.89$^{b}$ | 463.45$^{a}$ | 9.91 |
| Body length | 6.98$^{h}$ | 8.38$^{g}$ | 9.70$^{f}$ | 10.26$^{e}$ | 10.90$^{d}$ | 13.10$^{c}$ | 16.22$^{b}$ | 17.71$^{a}$ | 0.25 |
| Shank length | 4.84$^{h}$ | 5.92$^{g}$ | 6.81$^{f}$ | 7.30$^{e}$ | 8.10$^{d}$ | 9.01$^{c}$ | 10.26$^{b}$ | 11.77$^{a}$ | 0.16 |
| Body girth | 9.08$^{h}$ | 10.93$^{g}$ | 11.51$^{f}$ | 13.05$^{e}$ | 13.93$^{d}$ | 16.74$^{c}$ | 18.40$^{b}$ | 20.87$^{a}$ | 0.27 |
| Wing length | 6.02$^{h}$ | 7.96$^{g}$ | 9.36$^{f}$ | 10.71$^{e}$ | 11.32$^{d}$ | 13.05$^{c}$ | 14.36$^{b}$ | 15.98$^{a}$ | 0.23 |
| Keel length | 3.43$^{f}$ | 5.17$^{g}$ | 6.43$^{f}$ | 7.24$^{e}$ | 7.35$^{d}$ | 7.93$^{c}$ | 8.96$^{b}$ | 10.64$^{a}$ | 0.16 |

Means with different superscripts across the rows are significantly different at P<0.05; SEM-Standard Error of Mean

***Feed efficiency, feed conversion ratio, daily weight gain and daily feed intake of Isa brown X normal local chicken hybrid***

Table 3 shows the result of feed efficiency, feed conversion ratio, daily weight gain and daily feed intake of Isa brown X Normal local chicken hybrid. There were significant (P<0.05) differences in all the weeks for all the parameters. Feed efficiency and daily weight gain increased from week one to three and later a decline was observed on the 4$^{th}$ week. This might be as a result of increase in the metabolic demand of the animals for body tissue build up at the growing phase. This explanation is further buttressed by the increasing feed intake at the 4$^{th}$ week, this could be as a result of extreme weather condition. For feed conversion ratio, there was significant (P<0.05) difference across the weeks, as week 1 had the superior value compared to other weeks. There was a decline trend from week one to week three and later increase at the 4$^{th}$ week. Reduction in the values in weeks two and three could be due to the chicks attempt to acclimatize completely to the new environment. However, the increase noticed at week 4 indicates that the chicks' intake was high at this week but this result was not accompanied by a resultant increase in weight gain for reasons given above. Feed intake was obtained as 32g/d at the 4$^{th}$ week according to the multiple researches conducted by Hendrix Genetic Company on Isa brown, the result reported was lower than the value (52.86g) obtained in this study. Also, Malik *et al*. (2013) worked on growth performance and nutrient digestibility of pullet chicks fed graded levels of water Hyacinth [Eichhorniacrassipes (Martius) SolmsLaubach] meal diets at the starter phase (0-8 weeks). The researchers obtained values which were computed as 6.35g/d to 6.78g/day for daily weight gain, 19.31 to 19.77g/day for daily feed intake and 2.86 to 3.07g/day for feed conversion ratio. The daily weight gain value obtained from their finding at 8$^{th}$ week was double the value (3.64g/day) obtained in this study at 4$^{th}$ week, this implies that if more time is given, the daily weight gain will improve for the cross. However, the daily feed intake values obtained by the authors were associated with lower body weight values (386.21g to 409.37g), this could help to explain why their 8$^{th}$ week daily feed intake value was lower than the 4$^{th}$ week value obtained in this study. Furthermore, the depression in their daily feed intake may be as a result of some unfavorable environmental factors. Folorunso and Onibi

(2012) obtained daily weight values ranging from 45.30 to 50.95g/day; daily feed intake 130.55 to 151.49g/day; and feed conversion ratio 2.82 to 3.22 in 2000 Anak broilers at the 4th week. These results are higher than the values reported in this present study except for feed conversion ratio (FCR). Note, this does not mean that the $F_1$ obtained in this study is better than that of the broilers. This was as a result of the low figure of daily weight gain used for the calculation. Also, Hassanien (2011) obtained daily weight gain ranging from 51.64 to 60.70g/bird/day in Hubbard broiler chicken; daily feed intake which ranged from 97.32 to 106.09g/bird/day, and feed conversion ratio: 1.71 to 1.89 at the 4th week. Similar inference made by Folorunso and Onibi (2012) holds for the results obtained by Hassanien (2011). Generally, meaty breeds are distinguished for their ability to consume more feed and gain more rapidly. There was significant ($P<0.05$) difference in the mortality percent. The mortality percent experienced a protozoan infestation (Coccidiosis) at the 2nd week with 9.26%. The low mortality obtained in this study shows that these hybrids were hardy and highly adaptable.

***Carcass evaluation of Isa brown x normal local chicken hybrid***

The result of carcass values of progenies of Isa Brown X Normal Local Chicken hybrid. It was showed that the back weight (16.44% per dressed weight) and breast weight (16.05% per dressed weight) constituted major meaty portions of the broiler chicken, followed by the wing and drumstick. The heart weight (0.59% per DWT) constituted the least portion as expected, alongside with the intestine weight (2.17% per DWT) and gizzard weight (2.77% per DWT). The dressed weight value (540g) at the 8th week revealed that the hybrid of the Isa Brown X Normal Local chicken has less potential to serve as a meat-type chicken when compared to the values of broiler chickens at the 8th week. The sire effect of the Normal Local Chicken was thus evaluated. However, sex was not blocked in this experiment, which would have permitted this result to be evaluated based on sire effect on the male and female progenies.

Onu *et al.* (2011) evaluated the performance and carcass characteristics of broilers raised on three different litter materials. The authors obtained dressed weight ranging from 2000g to 2025g, neck (6.54 to 6.65% DWT), breast (20.49 to 21.08% DWT), shank (7.95 to 8.26% DWT), thigh (15.48 to 15.75% DWT). Also for the liver weight, they obtained (2.20 to 2.30), heart (1.09 to 1.20) and gizzard (2.92 to 2.94) were expressed as percent of body weight. The values obtained for dressed weight (540g) I this present study was quite lower than the value obtained by the aforementioned authors.

**Table 3 : Least squares means showing the feed efficiency, feed conversion ratio, daily weight gain and daily feed intake of Isa brown X normal local chicken hybrid from 1 to 8 weeks**

| Parameters | Weeks | | | | SEM |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Feed Efficiency (%) | $5.29^{b}$ | $12.40^{ab}$ | $14.41^{a}$ | $6.89^{b}$ | 1.47 |
| Feed Conversion Ratio | $18.92^{a}$ : 1 | $8.07^{b}$ : 1 | $6.94^{b}$ : 1 | $14.51^{b}$ : 1 | 1.55 |
| Daily weight gain/week (g) | $1.50^{b}$ | $4.68^{ab}$ | $5.65^{a}$ | $3.64^{ab}$ | 0.64 |
| Daily feed intake/week (g) | $28.30^{c}$ | $37.71^{bc}$ | $39.18^{b}$ | $52.86^{a}$ | 2.91 |
| Mortality % | $0.00^{b}$ | $9.26^{a}$ | $0.00^{b}$ | $0.00^{b}$ | 1.23 |

Means with different superscripts across the rows are significantly different at $p<0.05$; SEM- Standard Error of Mean

**Table 4: Carcass evaluation of Isa brown X normal local chicken cross**

| Parameters | Means | SEM |
|---|---|---|
| Dressed weight (g) | 540.00 | 5.77 |
| Head weight (g) | 21.00 | 5.77 |
| Shank % DWT | 4.54 | 1.09 |
| Drumstick weight % DWT | 9.10 | 1.04 |
| Thigh weight % DWT | 8.51 | 1.04 |
| Wing weight % DWT | 9.70 | 1.04 |
| Neck weight % DWT | 5.13 | 1.09 |
| Crop weight % DWT | 3.55 | 1.11 |
| Heart weight % DWT | 0.59 | 0.11 |
| Liver weight % DWT | 3.55 | 1.11 |
| Large Intestine weight % DWT | 2.17 | 0.55 |
| Small Intestine weight % DWT | 8.11 | 1.05 |
| Back weight % DWT | 16.44 | 0.96 |
| Breast weight % DWT | 16.05 | 0.96 |
| Gizzard weight % DWT | 2.77 | 0.54 |

DWT – Dressed weight; SEM – Standard Error of the Mean

***Correlation between body weight and linear body measurements in Isa brown and normal local chicken cross at 4$^{th}$ and 8$^{th}$ week***

The result of the correlation between body weight and other linear measurements at the 4$^{th}$ and 8$^{th}$ weeks. There were significant ($p<0.05$) positive correlations observed for all the correlating parameters at the 4$^{th}$ and 8$^{th}$ weeks. This positive associations indicates that an increase in body weight would result with an increase in body length, shank length, body girth, wing length and keel length. The correlation coefficients indicate the strength of a linear relationship between two traits and thus provide useful information about the traits involved for the purpose of breeding and improvement plan (Ige, 2013). The correlation result of this study is explained by the concept of pleiotrophy (Ibe, 1998). In this case, any attempt to improve the genetic progress of the body weight, will automatically result in an associated improvement in the correlated traits based on the established associations of this study. The high positive correlations reveal that favourable relationships exist among traits with higher correlation coefficients. This further explains that such traits could be collectively included in the selection index to achieve positive genetic progress (Ojo, 2010). According to Ige (2013), who obtained highly significant ($p<0.05$) positive associations, at week 4. Body weight and shank length (0.89), wing length (0.68), body length (0.77), keel length (0.64) and body girth (0.99) while at the 8$^{th}$ week, body weight and shank length (0.90), wing length (0.94), body length (0.55), keel length (0.98), body girth (0.85). The result obtained by Ige (2013) is in consonance with the result of this present study. Also, the result of this study is in agreement with the finding of Lilja (1983) who reported a high value (0.93) between body weight and shank length. The high value obtained at older age (8$^{th}$ week) in this study for body length, shank length, body girth indicates that reasonable genetic progress can be made as the chickens grow older. Okoro and Ogunde (2006) equally recorded high and positive coefficients of correlation between body weight and other growth traits and it was concluded that these traits are good indicators of body weight. However, in contrast in some breeds, body weight is negatives correlated with body length Udeh and Ogbu (2011). The negative association between body weight and body length (-0.43) in Arbor Acre and (-0.37) in Ross broilers. However, these authors reported a moderately positive association (0.50) in Anak broilers.

**Table 5. Correlation between body weight and linear body measurements in Isa brown X normal local chicken hybrid at 4th and 8th weeks**

| WEEKS | | BL | SL | BG | WL | KL |
|---|---|---|---|---|---|---|
| 4TH | BW | 0.934** | 0.936** | 0.922** | 0.968** | 0.975** |
| 8TH | BW | 0.964** | 0.960** | 0.962** | 0.941** | 0.907** |

BW-Body weight, BL-Body length, SL-Shank length, BG-Body girth, WL-Wing length, KL-Keel length

## Conclusion

The linear body measurements values obtained in this study were lower compared to values reported for broiler breeds. This shows that the $F_1$ of the cross in this study shared more features in common with laying birds than the meat-type chickens. The difference in performance between the $F_1$ and the broilers are so large such that, it will take more intense selection and improvement strategies to produce a hybrid with an average performance similar to broilers. However, the result of the linear body measurements in this present study was higher than the results of local pullets' performance, but less than the results obtained from improved or exotic pullet strains. This shows that the $F_1$ enjoyed heterotic advantage by averaging the performance of the exotic parent (Isa brown) and the local parent (Normal local chicken).

The result of this study has revealed that daily weight gain in poorly improved birds is low and is seldom accompany by high feed conversion ratio. This implies that the chicks may have increased intake but converts less feed to meat. This weight gain portrays the $F_1$ as a laying strain. The higher body weight of the $F_1$ cross compared to local stocks has shown that F could develop to a choice breed with characteristic high body weight and larger sized eggs, since these two traits are highly correlated. The low percentage of mortality (9.26%) obtained in this present study shows that the hybrid progenies adapted effectively to humid tropical environment. The high, positive and significant correlations between body weight and linear body measurements indicate that the measured parts can be used as criteria for selection of body weight in $F_1$ of crosses involving local and exotic parents. The result of the carcass showed that the back weight (16.44% per DWT) and breast weight (16.05% per DWT) constitutes major meaty portions of the dressed chicken, followed by the wing weight and drumstick. These values are lower than the values obtained for meat type chickens.

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