



## CORRELATION OF CARCASS CHARACTERISTICS AND TESTIS MEASUREMENTS OF THE INDIGENOUS COCKS IN THE SEMI ARID ZONE OF NIGERIA

<sup>1</sup>Adamu, J., <sup>1</sup>Aliyu, J., <sup>1</sup>Shettima, S. M., <sup>1</sup>Saleh, B., <sup>2</sup>Dauda, A., <sup>1</sup>Mohammed, A. A. and <sup>4</sup>Abbaya, H.Y

<sup>1,2,4</sup>Department of Animal Science, University of Maiduguri,

<sup>3</sup>Department of Animal Science, University of Calaba,

<sup>4</sup>Department of Animal Production Mubi Adamawa State University.

Corresponding Author's Email: [jummaiyalma@gmail.com](mailto:jummaiyalma@gmail.com) 08166494005

### ABSTRACT

The current study was conducted to evaluate the association between the body weight, carcass characteristics and the testis measurements of the three matured cocks of about one year to one and half months of age in the semi arid zone of Nigeria. Sixty matured cocks were used for the study with twenty from each of the genotype. The data collected on the carcass characteristics of the three genotypes of cocks were analyzed using SPSS Version 21 Statistical tool. Differences between treatments means were separated using Duncan's Multiple Range Test of the same software. The correlations between the different variables were determined using Pearson correlation. The results showed a positive correlation ( $P < 0.05$ ) between live weight and the internal organs. Also positive significant ( $P < 0.01$ ) relationship were observed between body weight and the slaughter weight ( $r = 0.97$ ). Significant relationship between live weight and the left testis was observed ( $r = 0.67$ ;  $P < 0.01$ ). In conclusion, testis measurement with live weight showed that positive correlation translates into positive genetic correlation among the traits which will lead to improvement in the other traits. This variation may be due to close genetic background of the indigenous cocks.

**Keywords:** Carcass weight, Genotype, Testis measurements, Indigenous cocks

### INTRODUCTION

Poultry production is one of the best available domestic animals reared for the purpose of animal protein (meat or egg). Poultry production plays an important role in livestock industries. It is considered as a way of livelihood and achieving a certain level of economic developments by providing income, manure and also helps in keeping the environment clean by scavenging on insect, weeds and waste (Vaisanen *et al.*, 2005).

Carcass characteristic traits depend on several factors such as strain difference, sex and age, these factors have greater influence and the process of improving carcass traits by selection based on genetic differences in carcass characteristics may help in improvements (Pikul *et al.*, 1987). The variation that exists between genetic and phenotypic relationship for carcasses characteristics may indicate a relatively large effect of environment for these factors (Musa *et al.*, 2006). Therefore, poultry production may be either for meat or egg and is positively correlated to improvements in body conformation and carcass characteristics. The achievement of poultry meat production has been positively related to advancement in growth and carcasses traits, these can be achieved by increasing breast meat and reducing fat content of the meat. In production of the indigenous cocks slaughter age effects carcass yield and meat quality.

Siddiqui *et al.* (2005) observed that performance in reproductive organ depend on the structure and function of the organs in the animal systems. The understanding of linear body measurement characteristic and reproductive organs is very important in evaluating the breeding soundness of a matured male cocks (Ibrahim *et al.*, 2012). The cocks reproductive organ

is located in the abdominal region. It consists of asymmetric testes with ductus deferens and the phallus for erection to ejaculate sperm. (Lake *et al.*, 1985). The male organ is the main producer of sperm and hormonal secretions. During the process of spermatozoa passage through the epididymis the cells produce and matured sperm are stored for mating. (Hafez and Hafez, 2000).

The differences in three genotype of indigenous cocks had been investigated by (Oke *et al.*, 2007) male either for natural mating or artificial insemination. There existed variation in feather colours of the indigenous cocks. Therefore, it is necessary to examine the potential of the cocks for the production of meat in the country (Oke and Ohemeson, 2010). The objective of this work was to sought the relationship that exists among carcass characteristics of the three indigenous cocks breeds and the correlation that existed between live weight and testis morphometric.

### MATERIALS AND METHODS

The research was conducted at the Maiduguri Teaching and Research Farm of the University of Maiduguri, Maiduguri Borno State. Maiduguri is located on Latitude  $11^{\circ} 5' N$  and Longitude  $30^{\circ} 09'$  and an altitude 354m above sea level in North Eastern part of Nigeria. The temperature of the area ranges from  $24^{\circ}C$  to  $40^{\circ}C$  or more. The annual rain fall of Maiduguri gleans on balance 552.1mm (21.7) of rainfall per year. The ecological zone of Borno is characterized by vast grassland and few trees. The agricultural activities in the area include arable crop farming, livestock rearing, fishing and hunting (BOSHIC, 2016). The state also shares international

borders with Cameroon Republic to the East, Chad to the North-East and Niger to the North. Borno State has a population of about 5,860,200 people (BOSHIC, 2016). The weather for most part of the year is hot and dry with short raining season in the months of June to September. The soil of the study area is generally sandy-loam (BOSHIC, 2016).

#### EXPERIMENTAL BIRDS

A total of 60 matured cocks of about one to one and half months of age were used for the study consisting of 20 cocks from each of the genotype that is 20 normal feathered, 20 frizzled feathered and 20 naked neck cocks. They were housed individually in 1.0ft conventional battery cage, the cages were cleaned and disinfected before used. Top feeds growers mashed feed from premier feed mills limited Nigerian was used throughout the experimental period. The grower mash contained 18% crude protein and Metabolisable energy of 2900 kcal/kg. Feed and water were given in *ad-libitum* throughout the study period. The experimental cocks were kept for two weeks for adaptation. The duration for the experiment was one year.

#### CARCASS PARAMETERS

The experiments were conducted for 12 months from October 2016 to September 2017. Four cocks were randomly selected from each genotype and were used for the carcass experiment, weighed using digital sensitive scale with precision of 0.005 to obtain the live weight. The cocks were bled by section through the jugular vein allow blood to drain and scalded in hot water to aid plucking manually. The cocks were then eviscerated before removing the internal organs. The testis from each cocks were removed carefully with small sharp knife. The internal organs were removed to aid in measuring the length of the testis with meter rule while the width was measured using Veniercaliper. The feather weight was obtained, it was spread on a paper and air dried for three days and then weighed.

The following body parts: the head, neck, shank, wings and the thigh/drum stick were weighed according to Kleczek *et al.*, 2007.

The reproductive tract was carefully removed with the aid of shape small knife. The testis weights, length, width of both the left and right testis were measured with the aid of meter rule and venier caliper.

#### STATISTICAL ANALYSIS

The data was analyzed using statistical package SPSS version 21. Mean separation were done using Duncan's multiple range

test. The correlation between the different variable were determined using Pearson correlation of the same package.

#### RESULTS AND DISCUSSIONS

Table 1 shows the correlation coefficient between live weight and the internal organs of indigenous cocks in the Semi-Arid Zone of Nigeria. Strong Correlation ( $P < 0.05$ ;  $r = 0.97$ ) existed between slaughter weight and the live weight of the indigenous cocks. There was also a significant ( $P < 0.01$ ;  $r = 0.67$ ) relationship between live weight and the left testis. The positive significant association between the slaughter weight and live weight as well as the left testis implies that the traits are under the control of the same genes in the three genotypes (Pleiotropy). Also, the positive correlation between live weight and testis weight indicate possibility of predicting testes weight from live weight. Togun *et al.* (2006) also reported positive correlation between live weight and testes weight. Males with longer testes tend to produce more sperm than those with short and small testis (Ahemen *et al.*, 2013).

Strong and positive association was observed between slaughter weight and weight of right testis, slaughter weight and length of left testes ( $P < 0.05$ - 0.01:  $r = 0.71$ -0.74). These findings correspond with the findings of Cahaner *et al.* (1993) and Isidahomen and Njidda (2012) who showed that males tends to have higher slaughter weight after blood have been drained. Strong positive correlations were observed between the asymmetric weight of testis, between weight of left testis and length of right testis. Strong association existed between widths of right testis and weight of left testis. Significant and positive relationship observed in the present findings between the length and weight of testis does not agree with Ahemen *et al.* (2017) who observed negative ( $r = -0.87$ ). Medium and non-significant differences were observed between weight and width of left testis. Similar trend also occur between weight of left testis and weight of feathered respectively ( $r = 0.48$ ). Good and positive relationships were observed between the width of left testis and also between length of right testis similar. There was a repeat of this trend in width of right testis ( $P < 0.05$ -0.01:  $r = 0.77$  - 0.79). The strong significant association observed between the live weight and testis weight ( $p < 0.01$   $r = 0.67$ ) may help in estimating the live weight from testis weight. There exists strong association with production of sperm and also storage of the sperm as reported by (Ahemen *et al.*, 2013). Togun *et al.* (2006) found live weight to be highly significantly correlated with testis weight, and this agrees with the present studies. These may indicated that cocks with heavier testis tend to produce more sperm than lighter ones.

**Table1: Correlation between Live Weight and Testis Measurement of the Indigenous Cocks**

	LW	SKW	WLT	WRT	Let LT	Let RT	Wth LT	Wth RT	Wt F
LW	1								
SKW	0.976**	1							
WLT	0.597	0.641	1						
WRT	0.657	0.708**	0.965**	1					
LetLT	0.677**	0.745*	0.876**	0.890**	1				
Let RT	0.507	0.443	0.702*	0.709*	0.660	1			
Wth LT	0.390	0.475	0.535	0.608	0.494	-0.045	1		
Wth RT	0.530	0.547	0.852**	0.917**	0.775*	0.799**	0.469	1	
Wt F	-0.125	-0.144	0.484	0.394	0.052	0.204	0.397	0.376	1

LW: Live weight; SKW: slaughter weight; WLT: weight of left testis; WRT= weight of right testis; LLT: length of left testis; LRT= length of right testis; WthLT= width of left testis; WthRT = width of right testis; WF = weight of feather. \* $P < 0.05$  ; \*\* $P < 0.01$ .

**Table 2** presents the association between carcass traits of the indigenous cocks. Correlation coefficient (r) were mostly positive ( $P < 0.05-0.01$ ) with the exception of few ( $P > 0.05$ ). The relationship between the breast and drum stick meat were significantly ( $P < 0.01$ ;  $r = 0.90$ ) correlated. This implies that a significant increase in breast will bring about a significant increase in drum stick. The investigation in this study are higher than the findings of Tougan *et al.* (2013). The variation obtained in the present studies may be due to genotype and environmental variation among the indigenous cocks. The relationship between the breast and thorax were significantly ( $P < 0.05$ ;  $r = 0.72$ ) correlated and the correlation between the breast and neck, breast and head followed similar trend ( $P < 0.05$ ;  $r = 0.71-0.75$ ) respectively.

Positive and significant correlation existed between drum stick and thigh, between drum stick and thorax, between drum stick and neck and between drum stick and head ( $P < 0.05-0.01$ ;  $r = 0.67-0.94$ ). According to Muhiuddin (1993), the strong phenotypic relationship may lead to strong genetic correlation thus; selection for one trait may lead to improvement in the other the other. Strong and positive correlation among most parameters demonstrated inter-relationship among these parameters of carcass traits. These are in accordance with other finding especially in other strains like broiler chicken where they reported positive strong significant correlation between carcass weight and organs (Zerehraran, 2005; Isidahomen and Njidda (2012), Ojedapo *et al.*, 2008 and Musa *et al.*, 2006). Overall, characteristics of carcass are correlated with their weight in all the ecotypes studied (Tongan *et al.*, 2013).

**Table 2: Combined Correlation among Carcass Characteristics of the Indigenous Cocks**

	BM	DSM	TM	BKM	Thorax	NK M	SHK M	Head M	Wing
BW	1								
DW	0.903**	1							
TW	0.951	0.949**	1						
BKW	0.088	0.217	0.798	1					
Thorax	0.723*	0.860*	0.731*	0.163	1				
NW	0.756*	0.673*	0.757*	-0.147	0.657	1			
SW	0.513	0.550	0.513	-0.133	0.280	0.296	1		
HeadW	0.711*	0.741*	0.751**	0.943	0.417	0.483	0.296	1	
Wing	0.553	0.458	0.469	0.516	0.534	0.577	0.483	0.927**	1

BW = Breast weight; DW = Drumstick weight; Th W = Thing weight; BKW = Back weight; Thorax weight; Neck W = Neck weight; SW = Shank weight; Head W = Head weight; WW = wing weight. \*  $P < 0.05$ ; \*\*  $P < 0.01$ .

Table 3 presents the effect of genotype on live weight and reproductive organ of the three genotypes of cocks. Differences observed among the genotypes were no significant ( $P > 0.05$ ). However, frizzle feathered cocks obtained the highest live weight followed by naked neck while normal feathered obtained lowest weight. This observation disagreed with Ahemen *et al.* (2017) and Oke and Ohemeson (2010) in their report that investigated variation in frizzle feather cock significant ( $p < 0.05$ ) different as compared to the two genotypes. The variation obtained in this study may be due to different in environmental conditions and there close genetic background. The non-significant effect of genotype on the reproductive organs also agreed with the report of Ahemen *et al.* (2017) who also reported non-significant differences on frizzle feathered as compared to reproduced traits other local chickens in Nigeria. Isidahomen and Njidda (2012) also observed better performance in live weight of naked neck chickens than the other genotypes which disagrees with the present's study. This may be attributed to environment and their adaptation to different tropical environment.

**Table 3: Effect of genotype on live weight and Testis Measurements of the Indigenous cocks**

Parameters	Na cocks	FF cocks	Nn cocks	SEM	P- Values
LW (g)	1707.3	2006.7	1960.3	77.89	0.31 <sup>ns</sup>
SW (g)	1633.3	1925.3	1840.0	62.58	0.22 <sup>ns</sup>
WLT(g)	7.67	12.67	9.00	1.85	0.54 <sup>ns</sup>
WRT(g)	5.67	7.33	9.33	1.29	0.50 <sup>ns</sup>
LLT(CM)	33.00	40.33	35.00	2.32	0.83 <sup>ns</sup>
LRT (CM)	30.67	34.00	33.33	1.78	0.67 <sup>ns</sup>
WLT(mm)	24.10	24.23	24.00	3.33	0.99 <sup>ns</sup>
WRT (mm)	20.43	23.00	24.00	1.76	0.67 <sup>ns</sup>
FW (g)	71.00	63.33	64.00	4.91	0.78 <sup>ns</sup>

Where; LW = Live weight, SW = slaughter weight, WLT = Weight of left testis, WRT = weight of right testis, LLT = Length of left testis, LRT = Length of right testis, WLT = width of Left testis, WRT = width of right testis, FW = Feather Weight

## CONCLUSIONS

The positive correlation between live weight and reproductive organs can be maximized to improve the fertility and reproductive fitness of the indigenous chickens in Nigeria. Our study showed that variation in the genetic differences of frizzle

feathered cocks performed better in all the parameters measured. The use of frizzle-feathered cocks as seen their performance in this study should be encouraged in crossbreeding programs with both local and exotic strains. This will help to improve in terms of meat quality and quantity.

## REFERENCES

- Ahemen, T, Abu, A.H and Orakaanya , T.T. (2013) .Sperm quality, testicular morphology of rabbits fed dietary levels of water spinach ( *Ipomoea aquatic* ) leaf meal. *Agricultural Biology Journal* 4(3); 352-357 <http://www.scihub.org/ABJNA>
- Ahemen, T, Ochefu, J .and Mtem, S. (2017). Biometry of male Genitalia and Internal organ characteristics of indigenous genotypes of domestic fowl in the southern guinea savanna region of Nigeria. *Greener Journal of Agricultural Science* 6(4) 167-172.
- BOSHIC (2016). Borno state ministry of home affairs information and culture. Retrieved from <http://www.bornonigeria.com/index.:geography> on 26<sup>th</sup> April 2019
- Cahaner, A. Deeb, N and Gutman, M.( 1993).Effects of the Plumage –reducing naked neck ( Na gene on the performance of fast growing broiler at normal and high ambient temperatures. *Poultry Science* 72; 767 – 775.
- Hafez, B and Hafez, E.S.E (2000). Reproduction in farm Animals 7th 5-7. Lea and Fabiger, Philadelphia.
- Ibrahim, A. A., Aliyu, J. Ashiru, M and Jamilu, M. (2012). Biometric study of the reproductive organs of three breeds of sheep in Nigeria. *International Journal and morphometric* 30(4) 1597-1603./
- Isidahomen, C.E. and Njidda , A.A.( 2012). Haematology and carcass characteristics of naked neck, frizzled and normal feathered indigenous chickens in southern Nigeria. *Savannah Journal of Agriculture* 7:12-19.
- Sahomen, C.E., Ilorin, B. M. and Akano, K. ( 2012). Genetic and sex Differences in Carcass Traits of Nigeria Indigenous Chickens. *Journal of Animal Science Advance* 2(7): 637 -648.
- Kleczek, K. Wilkiewicz-Wawro, E. Wawro, K and Makowski, W. ( 2007) . Effect of body weight on day –old Muscovy duckling on growths and carcass traits. *Arch’Tier. Dummerstorf.* ( 2 ) 204 -213.
- Lake, P. E., Rule, O. and Naddington, N. (1985). Some effects of the composition of inseminated semen and site of domestics. *Animal reproduction sciences* 9: 273-284.
- Muhiuddin, G. ( 1993) .Estimates of genetic and phenotypic parameters of some performance traits in beef cattle. *Animal Breed Abstract.* 66; 495-522
- Musa , H. H., Chen, G .H.,Cheng, J. H., Li, G. C. and Mekki, D . M. (2006). Study on carcass characteristics of chickens breeds raised under intensive condition. *International Journal of Poultry Journal Science* 5 (6) 530 – 533.
- Ojedapo, L. O., Akinokun, O., Adedeji, T. A.,Olayeni, T. B.,Ameen, S. A. and Amao,S.R.( 2008).Effect of strain and sex on carcass characteristics of three commercial Broilers Reared in Deep litter System in the Derived Savannah Area of Nigeria. *World Journal of Agric Science.*4 (4) 487- 419.
- Oke , U.K .and Ohemeson ,C.(2010) . Effects of genotype on morphometric differentiation of the productive organ and sperm reserve in the Nigerian local chickens. *Livestock Resource Rural Development* pp 22
- Oke, U. K. and Ohemson, C. ( 2010). Effect of genotype on the morphometric differentiation of the reproductive organs and sperm reserves in Nigeria local chickens *Livestock Research for Rural Development* 22(23) .[www.irrd.org/irrd22/3/oke22053.htm](http://www.irrd.org/irrd22/3/oke22053.htm)-Cached.
- Oke, U. K.,Herbet,U. Ebuzeome,C and Nwachukwu, E. N.( 2007) .Effect of genotype on Hematology of Nigeria local chickens in : Proceeding of the 22nd Annual Conference of the Nigeria Society of Animal Production NSAP Calaba, Nigeria.Pp 123 – 1256.,
- Pikul, J., Doruchowski, W. Tanski, S and Reksinki, J. ( 1987) .Slaughter yield , carcass composition , chemical analysis and technological properties. <http://books, Google.co.Za./book>.
- Siddiqui, H.U.R.,Ahmad ,A. and Khan, M.Z.(2005). Biometrical studies of testes of ram short communication . *Journal of Agricultural and social science* 1(1):78-9
- Statistical package for windows version 21.0.( 2013). Armonk, NY. IBM Corp.
- Togun, V. A. and Egbunike, G. N. (2006) . Seasonal variation in sperm production characteristics of Zebu (white Fulani) cattle genitalia in the humid tropical environment. *Middle- East Journal of Science Resources* 1;87-95.
- Tougam, P. U., Youssao, A. K. I., Dahauda, M Salifou, C. F. A., Ahounou, G. S., Kpodekoni, M., Mensah, C. and Thewiss, A. (2013a). Variability of carcass traits of local poultry. Population of Gallus Gallus species of Benin by genetic type, breeding made and slaughter age. *International journal of Applied Bioscience* 69:5510 -5522
- Vaisanen, J . Hakanssan, J and Jensen, P. (2005) .Social interaction in red jungal fowl (*Gallus gallus* and white leghorn layers in stable group and after grouping .*Journal of British poultry science* 46(2): 156-168.
- Zerehraran, S. Vereijken, A .L. J. Vereijken, A. L. J., VanArendok, J.A.M. and Vander Waaiji, E . H. (2005).Effect of age and Housing system on genetic parameters for broilers carcass traits. *Poultry Science Journal* 184; 833 -838



©2021 This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International license viewed via <https://creativecommons.org/licenses/by/4.0/> which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is cited appropriately.