OSTEOLOGICAL CHARACTERIZATION OF INDIGENOUS PIGS IN NASARAWA STATE, NIGERIA

Akwashiki, M.A.[1*], Yakubu, A.[1], Idahor, K.A.[1], Mallam, I[2]., Oshibanjo, D.O.[3], Ezekiel, F.A.[1] and Ahmadu, G.B.[1]

[1]Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi, Shabu-Lafia Campus, P.M.B. 135, Lafia, Nasarawa State, Nigeria.

[2]Department of Animal Science, Kaduna State University, Kafanchan Campus, Kaduna State, Nigeria.

[3]Department of Animal Production, Faculty of Agriculture, University of Jos, Plateau State, Nigeria.

*Corresponding author: mosesaudu1990@gmail.com, +2348147807721.

ABSTRACT

The study explored the osteological characterization of indigenous pigs in Nasarawa State, Nigeria. Sampling was carried out at Lafia, Nasarawa Eggon and Kokona Local Government Areas (LGAs) of the State, representing Nasarawa South, North and West Agricultural Zones, respectively. A total of 30 finisher pigs of both sexes (10 from each study area) were sampled. Osteological parameters such as weight, length and width of humerus, femur, ulna, tibia, fibula bones were measured after water maceration with the aid of a digital weighing scale for weight, a ruler for length, and a digital vernier caliper for bone width. All the parameters were subjected to analysis of variance (ANOVA) to test the effect of location, and significant means were separated using Duncan's Multiple Range Test. There were significant (P<0.05) variations in most of the osteological parameters based on location. Generally, pigs from Nasarawa Eggon tend to have strong numerical values as compared to those of Kokona and Lafia LGAs, respectively.

Keywords: Osteological, Characterization, Indigenous Pigs, Nigeria.

INTRODUCTION

Indigenous pigs, often referred to as Nigerian Indigenous Pigs (NIP), exhibit unique skeletal features that reflect their evolutionary adaptations to the local environment and management practices (Adeola *et al*., 2013). This characterization not only aids in the conservation of these genetic resources but also enhances breeding programs aimed at improving productivity and resilience in pig farming (Adeola *et al*., 2013). In Nasarawa State, the indigenous pig population is an integral part of the agricultural landscape, supporting local economies and cultural practices. These pigs are typically smaller and have distinct physical characteristics compared to commercial breeds, which may include variations in snout length, ear shape, and body size. Such morphological traits are crucial for identifying breed-specific attributes that can influence management strategies and breeding decisions.

Pigs are well adapted for the production of meat because they grow and mature rapidly. Nigeria as a country lying within the tropical belt is deficient in food production and protein malnutrition is rapidly increasing in most parts of the country especially among the urban and rural populations. In view of this, there is the need to intensify efforts to increase food production especially that of animal origin. Pig production can readily provide solution to animal protein deficiencies. Pig production can yield a relatively rapid rate of economic returns on capital due to the high fecundity and growth rate. Efforts have been directed therefore towards improving their productivity of pigs through adequate nutrition (Ladokun *et al*., 2016). Osteological studies can potentially differentiate groups of similar species (Tschopp *et al.,* 2022). In domestic animals, they have played an important role in the identification of their wild ancestors.

MATERIALS AND METHODS

The study was conducted in three Local Government Areas (LGAs) of Nasarawa State, Nigeria. Lafia, Nasarawa Eggon and Kokona Local Government Areas of the State, representing Nasarawa South, North and West Argo-Ecological Zones,

Sampling of Animals

A total of 30 pigs (10 per LGA) of equal sexes that have reached the final growth stage were randomly selected at the slaughterhouse to retrieved fore and hindlimbs to macerate for osteological studies.

Data Collection

The bones from 30 finisher pigs of equal sexes were obtained from the butchers at slaughter houses within the three LGAs. The hindlimbs and forelimbs were dissected and subjected to water maceration in a plastic water butt for one week. The water in the maceration container was changed daily to avoid mold formation on the surface of the water. The bones were identified, described and weighed using a digital weighing scale. The length was determined using a meter rule, while the width was measured with digital vernier caliper with a 0.01mm accuracy following the method of Von den Driesch (1976).

Statistical Analysis

The osteological parameters of the pigs were subjected to analysis of variance to test the effect of location and Means were separated using Duncan's Multiple Range Test.

RESULTS

Table 1 presents the effect of location on osteological parameters of finisher pigs.

Table 1: Effect of location on osteological parameters of finisher pigs

Parameters	Lafia	Kokona	Nas/Eggon	P- Value
HW(g)	46.99±5.29	42.56±5.25	53.05±2.28	0.3867^{NS}
HL (cm)	3.87±0.22^{b}	3.98±0.27^{b}	4.70±0.23^{a}	0.0331*
HWI (inches)	15.08±0.90^{a}	13.28±0.49^{b}	14.26±0.40^{ab}	0.0504*
SW (g)	32.93±2.22	29.83±2.05	35.39±2.25	0.2285^{NS}
SL (cm)	4.75±0.20^{b}	4.66±0.26^{b}	5.39±0.20^{a}	0.0427*
SWI (inches)	8.57±0.34	7.98±0.30	8.88±0.35	0.1694^{NS}
RW (g)	18.33±1.30^{ab}	17.40±1.32^{b}	21.53±1.38^{a}	0.0447*
RL (cm)	3.58±0.21^{b}	3.61±0.20^{b}	4.44±0.23^{a}	0.0119*
RWI (inches)	8.66±0.50	8.69±0.55	9.73±0.59	0.2533^{NS}
UW (g)	20.12±1.05^{ab}	18.33±1.06^{b}	22.92±1.08^{a}	0.0588*
UL (cm)	4.00±0.23^{b}	4.46±0.22^{b}	5.12±0.27^{a}	0.0099*
UWI (inches)	8.07±0.43^{b}	8.00±0.45^{b}	9.46±0.44^{a}	0.0470*
CAW (g)	2.72±0.26	2.83±0.21	3.26±0.28	0.3180^{NS}
CAL (cm)	0.64±0.09^{b}	0.87±0.02^{b}	1.28±0.07^{b}	0.0002*
CAWI (inches)	8.15±0.27^{b}	8.41±0.24^{ab}	9.17±0.25^{a}	0.0394*
MCW (g)	6.32±0.53	5.50±0.54	6.30±0.53	0.4724^{NS}
MCL (cm)	1.78±0.11^{b}	1.92±0.19^{b}	2.32±0.97^{a}	0.0397*
MCWI (inches)	7.64±0.40	7.91±0.43	8.28±0.34	0.5476^{NS}
FW (g)	43.31±4.30	43.59±4.34	52.19±4.33	0.2722^{NS}
FL (cm)	4.08±0.21^{b}	4.83±0.22^{a}	5.18±0.25^{a}	0.0045*
FWI (inches)	13.17±0.49	13.19±0.45	13.92±0.56	0.4856^{NS}
TW (g)	35.65±2.59	36.80±2.13	40.69±2.53	0.3692^{NS}
TL (cm)	4.35±0.29^{b}	5.00±0.28^{ab}	5.47±0.20^{a}	0.0442*
TWI (inches)	12.90±0.37	12.78±0.31	13.61±0.30	0.2493^{NS}
FIW (g)	3.20±0.19	3.02±0.18	3.59±0.17	0.1389^{NS}
FIL (cm)	4.18±0.20^{b}	4.74±0.28^{ab}	5.21±0.22^{a}	0.0172*
FIWI (inches)	3.57±0.29^{b}	3.22±0.25^{ab}	4.30±0.28^{a}	0.0465*
TAW (g)	9.31±0.61^{ab}	8.00±0.61^{b}	10.00±0.63^{a}	0.0369*
TAL (cm)	1.74±0.09^{b}	1.81±0.11^{b}	2.21±0.05^{a}	0.0424 *
TAWI (inches)	8.95±0.44^{ab}	8.11±0.40^{b}	9.47±0.46^{a}	0.0159*
MSW (g)	6.72±0.46	6.59±0.42	7.77±0.44	0.1652^{NS}
MSL (cm)	1.92±0.09^{b}	2.27±0.01^{a}	2.42±0.19^{a}	0.0025*
MSWI (inches)	8.17±0.34	7.86±0.44	8.80±0.36	0.1661^{NS}

HW=humerus weight, HL= humerus length, HWI= humerus width, SW= shoulder weight, SL= shoulder length, SWI= shoulder width, RW= radius weight, RL= radius length, RWI= radius width, UW=ulna weight, UL= ulna length, UWI= ulna width, CAW= carpal weight, CAL= carpal length, CAWI= carpal width, MCW= metacarpal weight, MCL= metacarpal length, MCWI= metacarpal width, FW= femur weight, FL= femur length, FWI= femur width, TW= tibia weight, TL= tibia length, TWI= tibia width, FIW= fibula weight, FIL= fibula length, FWI= fibula width, TAW= tarsal weight, TAL= tarsal length, TAWI= tarsal width, MSW= metarsal weight, MSL= metarsal length, MSWI= metarsal width, NS= Not significant , *= Significant at 0.05

The result obtained on osteological parameters had significant effect (P<0.0) on humerus length (HL), shoulder length (SL), ulna weight (UW) and others. No significant effect was found in humerus weight (HW), shoulder weight, radius, femur length (FL) and most other parameters were affected by location. at (P<0.05). For humerus length (HL), Nassarawa Eggon had significantly higher values compared with Lafia and Kokona. However, for humerus width, pigs in Lafia local government had significantly (p<0.05) higher value compared with Kokona and Nassarawa Eggon.For radius weight and radius length those in Nassarawa Eggon had significantly (p<0.05) higher values compared to those in other two local government areas.

DISCUSSION

This study sampled equal population of male and female pigs in Lafia, Nasarawa Eggon and Kokona Local Government Areas of Nasarawa State with a mean humerus weight of (42.56±5.25, 53.05±2.28 and 46.99±.40±5.29 g, respectively). The 53 g humerus weight observed in this study from Nasarawa Eggon is close to the 54 g reported by Maren (2020). The differences observed in some of the parameters may be due to type of food, genotype and environmental factors that contribute to bone development. The interplay of location plays a crucial role in shaping both the osteological characteristics of pigs across their life stages. Gebru *et al*. (2023) reported that Ecogeographical habitat variation has led to morphological and osteological diversity in endotherm species of new perspectives on ecology of early domestic fowl, the result of this study on effect of location can be attributed to the findings of Gebru *et al*. (2023). This study enhances the selection of animals for hind and fore limbs further osteological research. Environmental factors such as climate and management practice at specific location can modify these effects, leading to variation in productivity among indigenous pigs thereby optimizing breeding strategies and improving livestock performance in diverse environment. The significant effect observed in the number of the parameters evaluated for osteology may be due to variation in environmental conditions, management practices, housing and better welfare which may result to bone development. Pigs tend to show higher value in bone weight, length and width in Nasarawa Eggon compared to those from Kokona and Lafia. The slight difference observed could be attributed to environmental factors like climate, nutrition and management practices.

CONCLUSION

This study revealed that location had significant effect on some osteological parameters and that finisher pigs with larger bones tend to have higher backfat. Pigs from Nasarawa Eggon have shown strong numerical values for osteological parameters and can be considered for breeding purpose for the improvement of indigenous pigs in Nasarawa State, Nigeria.

REFERENCES

Adeola, A., Oseni, S. and Omitogun, O. (2013). Morphological characterization of indigenous and crossbred pigs in rural and peri-urban areas of southwestern Nigeria. *Open Journal of Animal Sciences*, 3: 230-235. doi: 10.4236/ojas.2013.33034.

Gebru, G., Belay, G., Dessie, T., Zenebe, K.M., Birhanie, D.M. and Hanotte, O. (2023) Morphological and osteological characterization of indigenous domestic chickens (*Gallus gallusdomesticus*): validation of Rensch's, Bergmann's and Allen's rules. *Frontier Ecology Evolution*, 11:1032082. doi:10.3389/fevo.2023.1032082.

Ladokun, A.O. Egbunike, G.N, Adejumo, D.O. and O.A Sokunbi (2006). The effect of three dietary crude protein levels on digestibility and tests function in male pubertal rabbits. *Tropicultura*, 24(1): 3-6.

Maren, T.H. (2020). "Does obesity really make the femur stronger? BMD, geometry, and fracture incidence." *Journal of Bone and Mineral Research*, 35(7): 136-137.doi:1002/jbmr.3965.

Tschoop. E, Mateus O. and Benson R.B.T. (2016). "Osteology of Galeamopus pabstips.nov. (Sauropoda: Diplodocidae) and its implication for the evolution of the Diplodocidae" Peer J, 4, e3179 doi:10.7717/peerj.3179.