EFFECT OF BREED ON MORPHOMETRIC CHARACTERISTICS OF TWO RABBIT GENOTYPES

M. I. Abdullahi, O. I. Suleiman, S. K. Inusa & S. S. Hussaina
Department of Animal Science, Faculty of Agriculture, Bayero University, Kano.
Correspondence: abdullahiisamustapha@gmail.com, 08035221176

ABSTRACT
The study was conducted to examine the influence of breed on morphometric characteristics of two rabbit genotypes. In achieving the objectives, linear body measurements were taken on the rabbits using a flexible tape. The measurements were body weight (BW), body depth (BD), body length (BL), fore-limb length (FLL), hind-limb length (HLL), tail length (TL) and ear length (EL). The coefficient of variability of the traits showed low to moderate values which ranged from 5.78% for ear length to 14.59% for body depth and BW had highest variability (17.22%). Breed had significant influence on morphometric characteristics with New Zealand White generally showing the best performance. The average body weights were 1.84 and 1.63 for the NZW and GRY respectively. Pearson correlation coefficients among the morphometric traits showed strong, positive and significant relationships with 'r' value ranging from 0.48 (BL×EL) to 0.86 (BW×BD). It can be concluded that morphology in the rabbits were influenced by breed. In addition, using linear body measurements to describe and evaluate body size would overcome the problems associated with visual evaluation and can be used to predict body weight.
Keywords: Morphological characteristics, breed, sex and genotypes.

INTRODUCTION
The rabbit (*Oryctolagus cuniculus)* is one of the most productive meat species among domesticated animals. The feeding habits offer no appreciable competition with man. It can subsist on greens as basal diets. Rabbits have high economic efficiency on account of inexpensive housing, low nutrient requirement, high reproductive rate, short generation interval and gestation period. Their daily weight gain is high hence rapid growth rate and sexual maturity (Aduku and Olukosi, 1990). The provision of suitable breeding stocks that are well adapted to backyard systems is a key requirement for the sustainability of low-input and smallholder rabbit production prevalent in many parts of sub-Saharan Africa (Oseni, 2012). On the basis of body weight, the rabbits can be selected for growth (Hassan *et al.,* 2012).Linear body measurements can also be used (Orheruata and Olutogun, 1994). Linear measurements provide information on animal morphology and have helped in making decisions on commercialization (Osario *et al.,* 2002). Morphometric traits are sometimes preferred because weighing machines can give biased measurements due to gut fullness (Obike *et al.,* 2010). Rabbits ranked third in protein content behind poultry and turkey and is overtaken them because of low cholesterol content (Tsado *et al.,* 2013). With reference to this and other indices, the productive potentials of rabbit stock and factors that affect them need to be identified. In Nigeria, low animal protein intake has remained a major nutritional problem, especially for low income earners and the unemployed (Amaefule and Obioha, 2005; Akinola, 2009). There is therefore urgent need to develop rabbit production as a cheap source of animal protein to bridge the wide gap between animal protein supply and consumption. The study examined the effect of breed on morphological characteristics of two rabbit genotypes.

MATERIALS AND METHODS
The study was conducted at the Rabbitry Unit of the Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Bayero University Kano, Kano state Nigeria. Kano State is located in the semi-arid area of North-western and lies between latitude 10°33' and 12°27' north of the equator and longitude 7°34' and 9°29' east of the Greenwich meridian (KNARDA, 2006). The rabbits were kept under intensive management in hutches with feeding and drinking troughs provided. The hutches were made of wire measuring 52×44×32 cm and chicken wire mesh and raised on metal pole stands at 49 cm from the concrete floor.
Data on body weight (in kg) using a weighing scale and six other linear body measurements (in cm) were taken following the description of Akanno and Ibe, 2006. The measurements included the

following: (a) Body depth – the circumference of the thoracic cavity just behind the forelimb divided by two. (b) Body length – the distance from the point of the shoulder to the pin bone. (c) Tail length – the distance from the pin bone to the tip of the tail. (d) Fore-limb length – the distance from the hock to the proximal end of the humerus (e) Hind-limb length – the distance from the proximal end of the femur to the distal end of the fibula including the distal end of the femur. (f) Ear length – the distance from the base of the ear to the tip. Data were analysed using the General Linear Model (Proc GLM) procedure of SAS®(SAS, 2014). The GLM procedure included fixed effects of breed of rabbit, and body weight and morphometric measurement as response variables. Pearson correlation procedure of SAS was used to assess the relationship among variables.

RESULTS ANS DISCUSSION

Table 1 shows the summary statistics of the morphometric measurements. The mean body weight range is 1kg - 2.5kg. This range is in agreement with previous report (Lukefahr and Goldman, 1985) they reported a mean of 2.5kg for adult rabbits while a range of 1.70 - 2.1kg was reported by Omole, 1982. The present result is not in agreement with (Suleiman, Muhammad and Muhammad, 2017) who reported a range of 0.82 to 1.35kg body weight. Table 1 equally shows the means for other morphometric measurements. The coefficient of variabilities were low for ear length (5.78%), hind limb length (8.05%), tail length (8.35%) and body length (9.73%) indicating that selection base on them would tend towards homozygosity. The remaining measurements had moderate variabilities of 14.59% for body depth and 17.22% for body weight indicating that much more selection pressure can be applied on them.

Table 1. Summary statistics of morphometric characteristics measured

S/N	Variables	Mean	CV (%)	Min	Max
1	BW	1.78438	17.22	1.00	2.50
2	BD	14.23750	14.59	10.00	19.50
3	BL	25.37639	9.73	17.50	30.10
4	FLL	15.64097	10.84	11.00	18.50
5	HLL	22.61111	8.05	17.00	26.00
6	TL	11.25208	8.35	8.00	13.20
7	EL	11.56667	5.78	10.00	13.00

The mean value and variables were clearly showed. BW = Body weight, BD = Body depth, BL = Body length, FLL = Fore limb length, HLL = Hind limb length, TL = Tail length, EL = Ear length.

Table 2 shows the effect of breed on morphometric characteristics of the two rabbit genotypes. The breed generally had significant effects on morphometric characteristics ($P<0.01$) with NZW showing the better performance. This is an indication that rabbit breed has influence on morphological characteristics in terms of body form and structure.

Table 2. Effect of breed on morphometric characteristics of two rabbit genotypes

factors	BW	BD	BL	FLL	HLL	TL	EL
breeds	**	NS	*	NS	**	**	**
NZW	1.85[a]	14.39	25.65[a]	15.73	22.92[a]	11.39[a]	11.67[a]
GRY	1.63[b]	13.83	24.67[b]	15.42	21.79[b]	10.88[b]	11.28[b]
SEM	0.026	0.173	0.206	0.141	0.080	0.083	0.058

*(P<0.05),** (P<0.01), ***(P<0.001), SEM = Standard Error of Mean

Pearson correlation coefficients (Table 3) among the morphometric characteristics showed strong, positive and significant relationships with `r` ranging from 0.48 (BL×EL) to 0.86 (BW×BD). These results are similar to Suleiman, Muhammad and Muhammad, (2017) who recorded 0.38 (BD×EL) and 0.82 (BW×BL). This measurement on one character could be used to indicate another.

Table 3. Pearson correlation matrix for the morphometric traits of rabbit genotype

factors	**BW**	**BD**	**BL**	**FLL**	**HLL**	**TL**	**EL**
BW							
BD	0.86**						
BL	0.83**	0.79**					
FLL	0.77**	0.83**	0.74**				
HLL	0.79**	0.82**	0.75**	0.78**			
TL	0.78**	0.78**	0.72**	0.72**	0.76**		
EL	0.66**	0.56**	0.48**	0.62**	0.62**	0.60*	

** (P<0.01)

CONCLUSION AND RECOMMENDATIONS

From the results, it could be concluded that morphometric characters vary with breed of rabbits. Selection based on any of the morphometric measurements will positively influence the others. Furthermore, using linear body measurements to describe and evaluate body size would overcome the problems associated with visual evaluation and can be used for body weight prediction.

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