integrity Research Journals

Journal of Animal Science and Veterinary Medicine
Volume 7(1), pages 1-5, February 2022
Article Number: 3AF90F431
ISSN: 2536-7099
https://doi.org/10.31248/JASVM2021.295
https://integrityresjournals.org/journal/JASVM

Full Length Research

Phenotypic correlation of body weight and morphometric measurements of two breeds of rabbit

Adamu, J.[1]*, Adam, A.A.[1], Yahaya, A.[2], Raji, A.O.[1], Abbaya, H.Y.[3] and Ogu, I. E.[4]

[1]Department of Animal Science, University of Maiduguri, Maiduguri, Borno State, Nigeria.
[2]Department of Animal Science and Technology, Federal University of Technology, Owerri, Imo State, Nigeria.
[3]Department of Animal Production, Adamawa State University Mubi, Adamawa State, Nigeria.
[4]Department of Animal Production, University of Agriculture, Makurdi, Benue State Nigeria.

*Corresponding author. Email: jummaiyalma1@gmail.com; Tel: +234 08166494005.

Received 28th September, 2021; Accepted 30th October, 2021

ABSTRACT: A total of one hundred (100) matured rabbit of 4 to 6 months of age with weight ranging from 1.4 to1.8 kg comprising of New Zealand White (NZW) and Dutch (DUT) breeds were used for the study to evaluate phenotypic correlation of body weight and morphometric traits. They comprise of forty-nine (49) New Zealand White rabbits (13 males and 36 females) and 51 Dutch breed comprising of 21males and 30 females. The experimental design used for the study was completely randomized design and the statistical analysis used was analysis of variance. The body weight and the morphometric traits measured were determined using digital weighing scale and flexible tape in kilograms and centimeters respectively. The data measured were body weight (BW), body length (BL), nose to shoulder length (NSL), heart girth (HG), height at withers (HW), ear length (EL), leg length (LL), tail length (TL) and height of the rabbit (HR). Positive and highly significant ($p<0.001$) correlation was observed between body weight and body length ($r=0.70^{**}$). This may indicate that selection for improvement of body weight may lead to an improvement in body length. Moderate and positive correlation ($p<0.01$) was observed between leg length (LL) and tail length (TL) $r=0.26^{**}$, nose to shoulder length and tail length 0.36^{**} respectively. Low correlation was observed between nose to shoulder length and leg length ($r=0.19^{**}$). The results revealed that increase in LL may not necessarily lead to increase in NSL. The results of this study indicated positive and highly significant ($p<0.001$) correlations between some morphometric traits measured in Dutch and New Zealand White rabbits. This is an indication that increases in one trait may lead to an increase in the other corresponding trait for the positive correlation. Meanwhile, negative correlation was also observed in the study between body weight and height of rabbit (- 0.09), height at wither and tail length (-0.11), heart girth and tail length (-0.08) and between heart girth and hearth at withers (-0.24). This implies that increase in one parameter led to decrease in the corresponding one. Therefore, selection for an increase in such a particular trait apparently leads to a decrease in the other corresponding trait.

Keyword: Breed, bodyweight, correlation, morphometric traits.

INTRODUCTION

Improvement of rabbits is important in order to increase their contribution to the much needed animal protein in this part of the world. One of the pre-requisites for genetic improvement is the knowledge of genetic parameters for important economic traits (Akanno and Ibe, 2006). Rabbit producers are interested in the relationship that exists between bodyweight and physical characteristics, since this information would be reflected in their feed efficiency and growth performance. Breeders need to establish the relationship that exists between these parameters and to organize the breeding programs so as to achieve an optimum combination of body weight and good conformation for maximum economic returns (Khalil *et al*., 2017). Rabbit are animals with high reproductive potentials and fast growth rate.

Other attributes are short gestation period, early sexual

maturity and ability to rebreed shortly after kindling. These qualities confer on rabbits a potential to bridge the shortage of animal proteins in developing countries. The practical potential of rabbit meat in supplying world's protein needs has been reported (Roa *et al*., 2011). Over the years, selection for growth is usually done on the basis of body weight. The decision to use an indirect measurement for selection purposes for growth will depend on the ease of taking the measurements and how these measurements can predict body weight. One of such substitutes is the use of morphometric measurements (Orheruata, 2016). The different body parts develop at varying rates and these changes determine the shape, conformation and body proportion of the animal at a given time (Olutogun *et al*., 2003). Animal growth involves an increase in body weight (mass) and changes in shape (conformation) of the various component parts of the body. These dynamic processes of multidimensional growth are accompanied by concomitant changes in the phenotypic variances and co-variances and their components (Cheverud *et al*., 1993). Thus, the objective of this study was to evaluate phenotypic correlation of body weight and morphometric traits of two breeds of rabbit.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Livestock Teaching and Research Farm, University of Maiduguri, Borno State. Maiduguri, the state capital is located within the Sahelian (semi - arid) region of West Africa on latitude 11^{o} 50' North and longitude 13^{o}09' East and at altitude of 354 m above sea level. Maiduguri is characterized by short period of rainy between June and September, with extreme dry weather during the rest of the year. The average annual rainfall is estimated at 645 mm with monthly July, August and September estimate of 138.1, 198.6, and 157.4 mm respectively. Based on the temperature of the study area, the months have been grouped into three distinct seasons. These are: dry hot (February - May), wet (June - September) and dry cold (October - February). The dry hot season have a range of temperature 39.80 to 44.7^{o}C and during the dry cold the temperature can fall to as low as 29 to 33^{o}C (Raji *et al*., 2013)

Management of experimental stock

A total of one hundred (100) matured rabbit of 4 to 6 months of age comprising of New Zealand White (NZW) and Dutch (DUT) breeds were used for the study. They comprise of forty nine (49) New Zealand White comprising of 13 males and 36 females and 51 Dutch breed comprising of 21 males and 30 females. The experimental design used for the study was completely randomized design (CRD). The rabbits were sourced from two different places: one from University of Maiduguri Livestock Teaching and Research Farm, Borno State for the Dutch breed while the New Zealand white were sourced from a reputable small holder's farmers within Maiduguri Metropolitan council. The rabbits in the Livestock Teaching and Research Farm were managed intensely by housing them based on breed and sex. Each rabbit is kept in a cage measuring 33 cm x 38 cm x 45 cm and the cages were tagged for easy identification, measurement and weighing. The cages were slightly raised above the ground for cross ventilation and to facilitate cleaning. Plastic drinkers (cups) and metallic feeding troughs were provided in each cage. Feed and clean water were supplied *ad libitum* including fresh grasses as well as fresh vegetables were used during the study. The other rabbits sourced from reputable farmers were managed under semi-intensive management system.

Data collection

Data were collected on body weight (BW), body length (BL), nose to shoulder length (NSL), heart girth (HG), height at withers (HW), ear length (EL), leg length (LL), tail length (TL) and height of rabbit (HR).

Body weight: Body weight was measured with a digital weighing scale in kilograms.

Body length: This was measured using flexible tape as the distance between the cranial part of the shoulder to the junction between the hip and the tail that is the pin bone.

Nose to shoulder length: This was measured using flexible tape as the distance from nose to the point of shoulder.

Heart girth: This was measure using flexible tape as the circumferential measurement taken around the chest region behind the front legs.

Height at wither: This was measured using flexible tape as the distance from the toe to the highest point of the shoulder using graduated measuring stick.

Ear length: This was measured using flexible tape from the tip of the ear to the base of the ear.

Leg length: This was measured using flexible tape from the ball socket joint of the pelvic girdle to the shank and the toe of the hind legs.

Tail length: This was measured using flexible tape from the base of the tail to the end of the tail.

Height of the rabbit: This was measured using flexible tape as the distance from the ground to the back bone by using graduated measuring stick.

Table 1. Combined Pearson correlation of morphometric measurement of two breed of rabbits.

PRM (cm)	BW	BL	NSL	HG	HW	EL	LL	TL	HR
BW	1.00								
BL	0.70**	1.00							
NSL	0.03	0.03	1.00						
HG	0.02	-0.01	0.07	1.00					
HW	0.16	0.03	-0.07	-0.05	1.00				
EL	0.09	0.13	-0.08	-0.01	-0.11	1.00			
LL	0.11	0.07	0.19**	0.12	-0.24	0.03	1.00		
TL	0.10	0.10	0.26	-0.08	-0.11	0.03	0.36**	1.00	
HR	-0.09	0.01	0.16	0.05	0.14	0.05	-0.03	-0.11	1.00

Where; ** = significant at p<0.001, * = significant at p<0.05, PRM: Parameters, BW: Body weight, BL: Body length, NSL: Nose to shoulder length, HG: Heart girth, HW: Height at wither, EL: Ear length, LL: Leg length, TL: Tail length and HR: Height of the rabbit.

Statistical analysis

The data collected were subjected to analysis of variance as describe by Onasanya *et al*. (2017) and the significant means separation was performed using Duncan's multiple range test. The statistical tool used was SAS version 2000. Pearson's correlation was used to analyze the association between body weight and the morphometric traits.

RESULTS AND DISCUSSION

Phenotypic correlations of body weight and Morphometric traits

The phenotypic correlation of body weight and morphometric traits was presented in Table 1. Positive and highly significant (p<0.001) correlation was observed between body weight and body length. This implies that as body weight is increasing, body length is also increasing. Therefore, selection for an increase in body weight leads to increase in body length. The result of this study was in agreement with the result of Okoro *et al*. (2010) who reported positive and highly significant (p<0.001) relationship between body weight and body length. The result of Afolabi *et al*. (2012) and Akinsola *et al*. (2014) are also in agreement with the present study. Akinsola *et al*. (2014) reported the highest value of correlation (r=0.94) between body weight and body length. Ologbose *et al*. (2017) and Sam *et al*. (2020) reported positive but not significant (p>0.05) correlation between body weight and body length, and they concluded that increase in body weight may probably or perhaps may not lead to increase in body length.

The correlation between leg length (LL) and tail length (TL), nose to shoulder length (NSL) and leg length (LL) in this study was observed to be positive and highly significant (p<0.01). This implies that increase in LL or NSL selection for increase in LL or NSL can lead to increase in TL or LL. Positive and highly significant (p<0.01) correlation observed in this study was in agreement with apparently lead to an increase in TL or LL. Therefore, the report of Sam *et al*. (2020) for relationship between LL and NSL. This is also in line with Ayyat *et al*. (2005 and Oke *et al*. (2011).

Also, it is worth to note that increase in any one parameter may not necessarily lead to an increase in the corresponding parameter. Therefore, selection for increase in such trait may not lead to increase in the corresponding trait. This is in agreement with the report of Sam *et al*. (2020) who reported positive and low correlation between body weight and nose to shoulder length (0.12), leg length (0.20), ear length, and nose to shoulder length (0.10) among others. The finding of Ologbose *et al*. (2017) also was in agreement with the present study.

Meanwhile, the study also revealed negative and low correlation among some morphometric traits. The association between BW and HR (-0.09), BL and HG (-0.01), NSL and HW (-0.07), NSL and EL (-0.08), HG and HW (-0.05), HG and EL (-0.01), HG and TL (-0.08), HW and EL (-0.11), HW and LL (-0.24), HW and TL (-0.11), LL and HR (-0.03), TL and HR (-0.11) were all negative, very low and non-significant. This implies that increase in any trait lead to decrease in the corresponding trait. Therefore, selection for increase one trait leads to decrease in corresponding trait. Some authors in the literature reported also negative correlation among some morphometric measurements. Onasanya *et al*. (2017), Sam *et al*. (2020) and Okoro *et al*. (2010) all reported negative correlation among some morphometric traits.

Descriptive statistics of morphometric measurements of two breeds of rabbit

Table 2 presents the result of the descriptive statistics of morphometric measurements of rabbit. The highest mean value of BL (31.01 cm), while the lowest was obtained in EL with the value of 10.08. This is similar to that reported by Afolabi *et al*. (2012). Others such as NSL (10.59 cm), HW (13.24 cm), HG (13.83 cm), EL (10.08 cm), LL (13.99 cm), TL (10.48 cm), and HR (13.67 cm) were slightly

Table 2. Descriptive statistics of morphometric measurement of two breeds of rabbit.

Parameters (cm)	Mean	Coefficient of variation	Standard deviation	Maximum	Minimum
BW	1.86	11.24	0.21	2.40	1.40
BL	31.01	8.41	2.63	38.00	25.50
NSL	10.59	9.37	1.02	15.00	9.00
HG	13.24	10.09	1.37	23.00	11.00
HW	13.83	9.20	1.35	16.50	11.00
EL	10.08	6.88	0.69	12.00	8.50
LL	13.99	8.32	1.38	16.50	11.00
TL	10.48	7.63	0.93	13.00	9.00
HR	13.67	8.87	1.21	16.00	11.00

Where; BW: body weight, BL: body length, NSL: nose to shoulder length, HG: Heart girth, HW: height at wither, EL: ear length, LL: leg length, TL: tail length, HR: height of rabbit.

different with the finding of Afolabi *et al*. (2012). BW recorded highest coefficient of variation (11.24) and EL had lowest value (6.88). The highest coefficient of variation obtained in body weight is an indication of the potential of this trait to be selected for improvement. This study also indicated highest standard deviation for BW (2.63) followed by LL (1.38), HG (1.37), and HW (1.35) and the least standard deviation recorded is that for BW (0.21). Afolabi *et al*. (2012) reported high standard deviation of BW (5.67) and HG (4.07) respectively, while the results obtained indicated the least deviation for TL.

Conclusions and Recommendation

The result of this study indicated positive and highly significant ($p<0.001$) correlations among some morphometric traits measured in Dutch and New Zealand White breeds of rabbits. This is an indication that increases in one trait lead to an increase in the corresponding trait. The result also revealed low and positive correlation among some morphometric traits. Meanwhile, negative and low correlation was also observed in the study. This implies that increase in one parameter leads to decrease in the corresponding one. Therefore, selection for increase in such trait leads to decrease in the other corresponding trait. Selection for improvement should be carried out on body weight, body length, tail length, leg length, and nose to shoulder length. This is due to the significant relationships that exist among the above parameters studied.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

Afolabi, K. D., Orimoloye, P. O., Awah, A. A., Lalabe, B. C., & Odekina, F. O. (2012). Estimation of inter-relationship between body weight and morphometric structural measurements of domestic rabbits reared under matured rubber plantation. *World Journal of Young Researchers*, *2*(5), 83-87.

Akanno, E. C., & Ibe, S. N. (2006). Weight of domestic rabbit at different stages of growth using linear body measurements. *Nigerian Journal of Animal Production*, *33*(1), 3-8.

Akinsola, O. M., Nwagu, B. I., Orunmuyi, M., Iyeghe-Erakpotobor, G. T., Eze, E. D., Shoyombo, A. J., Okuda, E. U., & Louis, U. (2014). Prediction of bodyweight from body measurements in rabbits using principal component analysis. *Scientific Journal of Animal Science*, *3*(1), 15-21.

Ayyat, M. S., Abdullah, A. B., & Okuda, E. U. (2005). Prediction of body weight from body linear measurements in rabbit. *Annals of Biological Science, 3*(2), 1-9.

Cheverud, J. M., Leamy, L. J., Atchley, W. R., & Rutledge, J. J. (1983). Quantitative genetics and the evolution of ontogeny: I. Ontogenetic changes in quantitative genetic variance components in randombred mice. *Genetics Research*, *42*(1), 65-75.

Khalil, M. H., Owen, J. B., & Afifi, E. A. (2017). A genetic analysis of litter traits bauscat and giza white rabbit. *Journal of Animal Production, 45*(1), 123-124.

Oke, U. K., Ibe, S. N., Onyiro, O. M. &Nwichi. C. (2011). Influence of age and sex on the productive traits of rabbit in the humid tropics. *Proceedings of the 28th Annual NSAP Conference, Ibadan.* Pp. 122-124.

Okoro, V. M. O., Ezeokeke, C. T., Ogundu, U. E., & Chukwudum, C. (2010). Phenotypic correlation of body weight and linear body measurements in chinchilla rabbits. *Journal of Agricultural Biochemistry and Sustainable Development, 2*(2), 27-29.

Ologbose, F. I., Ajayi, F. O., & Agaviezor, B. (2017). Effects of breeds, sex and age on interrelationship between body weight and linear body measurement in rabbits. *Journal of Fisheries and Livestock Production*, *5*(3), 250.

Olutogun, O., Abdullah, A. R., Raji, A. O., Adetoro, P. A., & Adeyemi, A. (2003). Body conformation characteristics of white Fulani and Gudali (zebu) cattle breeds of Nigeria. *Proceedings of 28th Annual Conference, Nigerian Society of Animal Production, Ibadan, Nigeria.16th – 30th March.* Pp. 129-132.

Onasanya, G. O., Ikeobi, C. O. N., & Amusan, S. A. (2017). Effects of genotype on growth and morphometric traits of tropically adapted pure and cross bred exotic rabbits. *Nigerian Journal of Agricultural Food and Environment, 13*(2), 10-17.

Orheruata, A. M., Oyedeji, J. O., Omoyakhi, M., & Ofuom, F. (2016). Effect of sex on body weight and linear body

measurement of goats. *Proceeding of the 2nd Annual Conference of Animal Production. Ibadan.* Pp. 34-41.

Raji, A. O., Oke, U. K. & Ibe, S. N. (2013). Influence of age and sex on productive traits of rabbit in tropics. *Journal of Animal Genetics, 8,* 122-128.

Roa, O. R., Sunk, A. K., Jhonson, W. M., & Chen, R. (2011). Post natal growth of New Zealand White rabbit. *Journal of Animal Science, 44*,1021-1025.

Sam, A. B., Alawa, J. P. &Amakiri, A. O. (2020). Effect of of breed and sex on morphometric measurements of rabbit. *Journal of Animal Science, 3*, 49.