PHENOTYPIC CORRELATION OF MORPHOMETRIC TRAITS IN NEW ZEALAND WHITE RABBITS REARED UNDER TROPICAL CONDITION

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ABSTRACT
A total of 48 New Zealand White (NZW) rabbit was used for the study. Morphometric traits such as Fore Limb (FL), Hind Limb (HL), Body Length (BL), Thigh Girth (TG), Abdominal Circumference (AC) and Leg Length (LL) in NZW rabbit were measured using measuring tape in centimetre (CM) at 4, 8 and 12 weeks of age. The data were analysed using the simple linear correlation procedure of SAS analytical package to obtain the phenotypic correlation between the various morphometric traits studied. From the study the phenotypic correlations obtained were all positive and ranged between moderate (0.47, the lowest value) and high (0.89, the highest value) correlated value for all ages considered for the NZW rabbit. This shows that as the animal grows, there is a positive relationship between the various morphometric traits and further implies that even growth is expected in NZW rabbit.

Key words: New Zealand rabbit, morphometric traits, correlations, hind limb, fore limb

INTRODUCTION
Improvement of rabbit genetically, is a vital scope on the way to increasing their contribution to the much needed animal protein in **developing countries** (Okoro *et al*., 2010). However, the importance and efficacy of rabbit production in Nigeria has not been fully harnessed with respect to the profitability and their impact in meeting the much needed animal protein in Nigeria. In other to reduce the production cost and increase the profitability of rabbit production, genetic improvement of the adapted breed has to be undertaken. One of the pre-requisites for genetic improvement is the knowledge of genetic parameters for important economic traits (Akanno and Ibe, 2006). Towards value addition in rabbit production, rabbit producers are more interested in the various part of the animal body in relation to others to optimize returns on production, as it has direct impact on their feed efficiency and performance. Thus, breeders need to establish the relationship that exists between these morphometric traits and to organize the breeding programmes so as to achieve an optimum combination of bodyweight and good conformation for maximum economic returns (Khalil et al., 1987). This makes the work of the breeders easier and faster as effects can then be concentrated on traits that are easier to measure. Breeds such as New Zealand white, Dutch and Chinchilla remain the most commonly identified ones which have peculiar characteristics in terms of body weight that distinguish them from one another (Okoro *et al*,.

2010). Therefore, this study aimed at identifying the phenotypic correlation coefficient between the morphometric traits of New Zealand White (NZW) rabbits at ages 4, 8 and 12 weeks.

MATERIALS AND METHODS

Study site

The study was carried out at the Rabbitory Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Nigeria. The farm lies on the Latitude within the rain forest belt of Western Nigeria, Latitude $7^0$10´North, Longitude $3^0$2´East and altitude 76 masl. The climate is humid with a mean annual rainfall of 1,037mm, mean temperature of 34.7^{o}C and mean relative humidity of 82 %. The vegetation interplays between tropical rainforest and derived savannah.

Experimental animals and management

A total of 48 New Zealand White rabbits kittens were used for the phenotypic parameter estimation study. The kittens after birth were allowed to stay with their mother till 28 days before being weaned. After weaning, the rabbits were housed in wooden cages with wire mesh floor (40 × 50 × 60 cm) and were provided with concrete feeders and watering system. Four rabbits were kept per cage. After two weeks of birth, the kittens were introduced to commercial grower mash (CGM) and lasted till the end of the study. The animals were fed solely on the commercial grower mash diets with the following characteristics; 17.5% crude protein, 16% crude fibre and 2500 kcal/kg diet digestible energy *ad libitum*. Water was provided freely. Routine management was observed and drugs were applied as when necessary.

Data collection and Statistical analysis

The linear body measurement of individual rabbits was taken at 4, 8 and 12 weeks with the aid of a measuring tape in centimetre (cm). Traits studied were Fore Limb (FL), Hind Limb (HL), Body Length (BL), Thigh Girth (TG), Abdominal Circumference (AC) and Leg Length (LL). The phenotypic correlations of the morphometric traits at different ages were estimated using the simple linear correlation procedure of SAS (2000) analytical package to examine the linear relationship between the traits at different ages. The correlation coefficient between the different weights are written as:

$$r = \frac{\sum XY}{\sqrt{\sum X \sum Y}} \qquad i = 1,\ldots,N$$

Where r = pearson correlation
X_i = first random variable of the ith body weight
Y_i = second random variable of the ith body weight

The Pearson correlation is defined between -1 and +1 ($-1 \leq r \leq 1$) where -1 indicates a perfect decreasing (negative) linear relationship, +1 indicates a perfect positive (increasing) linear relationship and some values between -1 and +1 in all other cases indicate the degree of linear relationship between the X and Y parameters.

RESULTS AND DISCUSSION

The results of the phenotypic correlations are as presented in Tables 1, 2 and 3 for 4, 8 and 12 weeks of age respectively. As observed from the tables for all ages considered, the phenotypic correlation coefficient values, among the morphometric traits in all the ages, ranged from moderate to high correlation, and were all positive, which means that as any one morphometric trait is increasing; a corresponding increase is expressed in the other. This shows that morphometric growth in NZW rabbit is asymmetrical with other body parts. It is also indicative that as this breed of rabbit grows, all the other parts are growing concurrently. High phenotypic correlation between the studied morphometric traits agreed with the report of Janssens and Vandepitte (2004) and that of Oke *et al*. (2004) where they found positive, and highly significant ($p<0.01$) correlations between the morphometric traits of interest. The highest phenotypic correlation coefficient value of 0.82 was obtained between TG and HL while the lowest of 0.54 was obtained between LL and TG at 4 weeks of age. This indicated that the thigh and the hind limb are highly correlated since they are on similar proximity of the animal. At 8 weeks of age (Table 2), TG and HL were highly correlated (0.89) among other morphometric traits. The lowest phenotypic correlated value of 0.47 was obtained between TG and FL (Table 2). In Table 3, HL and FL were lowly correlated phenotypically followed by LL and AC. However, HL was highly correlated with TG (0.82) and LL (0.82).

Table 1: Phenotypic correlation of morphometric traits in NZW rabbit at 4 weeks of age

Parameters	FL	HL	BL	TG	AC	LL
FL						
HL	0.55					
BL	0.78	0.62				
TG	0.68	0.82	0.75			
AC	0.77	0.68	0.70	0.63		
LL	0.65	0.75	0.70	0.54	0.63	

FL = Fore limb, HL = Hind limb, BL = Body length and TG = Thigh girth, AC = Abdominal circumference, LL = Leg length

Table 2: Phenotypic correlation of morphometric traits in NZW rabbit at 8 weeks of age

Parameters	FL	HL	BL	TG	AC	LL
FL						
HL	0.68					
BL	0.53	0.76				
TG	0.47	0.89	0.50			

AC	0.72	0.77	0.55	0.75	
LL	0.82	0.66	0.69	0.65	0.80

FL = Fore limb, HL = Hind limb, BL = Body length and TG = Thigh girth, AC = Abdominal circumference, LL = Leg length

Table 3: Phenotypic correlation of morphometric traits in NZW rabbit at 12 weeks of age

Parameters	FL	HL	BL	TG	AC	LL
FL						
HL	0.55					
BL	0.78	0.62				
TG	0.68	0.82	0.75			
AC	0.77	0.68	0.70	0.63		
LL	0.65	0.82	0.68	0.61	0.59	

FL = Fore limb, HL = Hind limb, BL = Body length and TG = Thigh girth, AC = Abdominal circumference, LL = Leg length

CONCLUSION AND RECOMMENDATION

This study revealed that positive, and moderate to high phenotypic correlation values exists between morphometric traits in NZW breed of rabbits. This is an indication that growth in this breed of rabbit is evenly and well distributed around the body. This is however, a good indicator for rabbit breeders and producers who aimed at morphometric traits for optimizing their production process.

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