ABG -10

Repeatability Estimate Using Morphometric Measurement for Rabbit Genotypes in Late Dry and Early Wet Seasons

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Abstract
The study was conducted to estimate repeatability of morphometric measurements using seven Rabbit genotypes. In achieving the objectives, linear body measurements were taken on the Rabbits using flexible tape calibrated in cm. They are body weight (BW) in kg, body depth (BD), body length (BL), tail length (TL), fore-limb length (FLL), hind-limb length (HLL) and ear length (EL).The coefficient of variability of the morphometric measurements showed low to moderate variability and ranged from 9.24% for HLL to 15.73% for TL. BW had high variability (35.88%). The Repeatability estimate for the morphometric measurements were 0.68, 0.73, 0.51, 0.63, 0.66, 0.74 and 0.68 for BW, BD, BL, TL, FLL, HLL and EL respectively in late dry season where HLL had the highest estimate in that season. Similarly, in early wet season, the repeatability estimatewas0.71, 0.81, 0.64, 0.50, 0.52, 0.66 and 0.60 for BW, BD, BL, TL, FLL, HLL and EL respectively where BD recorded the highest estimate. Thus, all the parameters measured were highly repeatable (>0.50). Pearson correlation coefficient among the morphometric characteristics showed strong, positive and significant relationships with the 'r' value ranging from 0.38 (BD x EL) to 0.82 (BW x BL).

Keywords: Morphological measurements, repeatability estimate, rabbit genotypes, seasons

Introduction

In recent times, rabbit keeping has gained ground among Nigerian households and researchers, as an alternative source of animal protein and experimental materials; and its potential in cushioning the effect of World Food Shortage has been stressed (Chen *et al*, 1978). Moreover, a quantitative measure for animal conformation (morphometric measurements) is desirable as it will enable reliable genetic parameters (repeatability) for these traits to be estimated and permit inclusion in breeding programmes (Ibe, 1989). Thus, it would be possible, by selection, use of breed diversity and genetic parameter estimates, to make rapid improvement in rabbit performance (Chineke and Raheem, 2009). However, a prerequisite for genetic improvement of stocks is the knowledge of genetic parameters (Repeatability, phenotypic and genetic correlations etc) of economic traits. The genetic parameters are used by producers and breeders, primarily to study the natural action of genes, mostly additive ones. Also, that can be used for modeling for selection criteria, and selection direction of breeding. Repeatability estimate determines the ability to repeat the expressed genotype of the individual when repeated measurements are taken on the same trait of an individual.

Therefore, the study was conceived to estimate repeatability of morphometric measurements in Rabbit genotypes in two different seasons.

Materials and Methods

The study was conducted in the Rabbit unit, Teaching and Research Farm, Bayero University Kano, Kano State, Nigeria. Kano state is located in the semi-arid area of North-West Nigeria within the latitude 10º33" and 12º27" north of the equator and, longitude 7º34" and 9º29" east of the Greenwich meridian (KNARDA, 2006). The rabbits were kept under intensive management in hutches with feeding and drinking trough provided. The hutches were made of wood measuring 76 x 62 x 42 cm and chicken wire mesh, with a raised wooden stand at 90cm high from the concrete floor.

Data on body weight (BW) 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 measurement includes the following: (a) Body depth (BD) – the circumference of the thoracic cavity just behind the forelimb divide by two. (b) Body length (BL) – the diagonal distance from the point of the shoulder to the pin bone. (c) Tail length (TL) – the distance from the pin bone to the tip of the tail. (d) Forelimb length (FLL) – the distance from the hock to the proximal end of the humerus. (e) Hindlimb length (HLL) – 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 collected were subjected to descriptive statistics of SAS® (SAS, 2004). Pearson correlation procedure of SAS was used to access the relationship among variables. Repeatability (R) was estimated using the expression outlined by Becker (1984) as follows:

$$R = \frac{\sigma 2\ \mathrm{B}}{(\sigma 2\mathrm{B} + \sigma 2\mathrm{W}}$$

Where: σ2B = Individual variance component and σ2W = error variance component

The standard error was calculated using the formula described by Becker (1984) as follows:

$$SE = \sqrt{\frac{2(1 - R2(1 + (k - 1)R)2}{\mathrm{k(k-1)(n-1)}}}$$

Where: k = number of measurement, n = number of rabbits and R = Repeatability

Result and Discussion

Table 1 showed the mean and coefficient of variation of the morphometric characteristics of rabbits population studied.The mean body weight ranged from 0.82 kg to 1.35 kg. These observed range of body weight are a bit different from reports in the literature from sub-Saharan Africa due to age and management. For instance in Cameroon, Lukefahr and Goldman (1985) reported mean of 2.5 kg for adult rabbits while means of 1.70 kg, 2.10 kg and 1.80 kg were reported from Ghana, Malawi and Nigeria respectively (Omole, 1982). The table equally showed the mean values for other morphometric measurements and their ranged values. The coefficient of variability was low for hindleg length (9.24%), foreleg length (9.76%) and ear length (9.29%) indicating that selection based on them would tend towards homozygosity. The remaining measurements had moderate variability ranging from 14.93% for body depth and 35.88% for body weight indicating that they are wide apart and require much more selection pressure.

Repeatability estimate for morphometric characteristics in two different seasons is presented in table 2. In the dry season, the estimate ranged from 0.51±0.07 for body length (BL) to 0.74±0.05 for hindlimb length while in the wet season, the estimate ranged from 0.50±0.08 to 0.81±0.01. The high repeatability estimate obtained for both season in this study shows that the rabbit genotypes have the ability to repeat their performance under the condition they were reared and also implied that fewer records are required to estimate the potential of these rabbits and to realize a high expected response from the selection.

Correlation coefficients among morphometric traits are presented in table 3. The coefficients ranged between 0.38 (BD/EL) to 0.82 (BW/BL) ($p<0.001$) which are strong, positive and significant relationships. High correlations between body weight (BW) and other traits revealed that heavy rabbits also have superior length and girth measures. The results were in harmony with the reports of Yakubu and Ayoade (2009) who recorded similar trends in a study involving New Zealand White and Chinchilla crosses; Oseni and Ajayi (2014) who worked with adult heterogeneous rabbits and Akinsola *et al.* (2014) who predicted body weight using body measurements in Hyla rabbits.

Table 1: Summary statistics for morphometric characteristics measured

S/N	Variables	Mean	CV (%)	Min	Max
1	BW	1.07	35.88	0.82	1.35
2	BD	11.46	14.93	1.18	14.50
3	BL	31.15	15.22	19.00	39.50
4	TL	8.87	15.73	6.00	19.00
5	FLL	16.33	9.76	11.50	21.00
6	HLL	24.68	9.24	18.00	28.00
7	EL	10.62	9.29	8.50	19.00

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

Table 2: Repeatability estimate for morphometric measurements of Rabbit Genotypes in different season

Season	BW	BD	BL	TL	FLL	HLL	EL
Dry	0.68±0.04	0.73±0.01	0.51±0.07	0.63±0.03	0.66±0.03	0.74±0.05	0.68±0.02
Wet	0.71±0.01	0.81±0.01	0.64±0.10	0.50±0.08	0.52±0.09	0.66±0.07	0.60±0.05

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

Factors	BW	BD	BL	TL	FL	HL	EL
BW	-						
BD	0.70**	-					
BL	0.82**	0.73 **	-				
TL	0.57**	0.52**	0.65**	-			
FL	0.69**	0.64**	0.79**	0.58**	-		
HL	0.68**	0.65**	0.80**	0.62**	0.81**	-	
EL	0.40**	0.38**	0.54**	0.42**	0.47**	0.60**	-

**($p<0.01$)

Conclusion

From the findings of this study, all the morphometric measurements considered had a high repeatability estimates. This gave an indication that fewer number of records are required for a high response from the selection. Morphometric measurements could be used in the breeding programme as a measure of direct selection for body weight and body configuration.

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