ABG -06

Phenotypic Correlation of Body Weight and Linear Body Measurement in New Zealand white and Chinchilla Rabbits (*Oryctolagus cuniculus*)

[1]Mallam, I., [2]Nwagu, B.I., [1]Kabir, M., [2]Alao, R.O. and [1]Alu, M.A.
1Department of Animal Science, Ahmadu Bello University, Zaria; 2National Animal Production Research Institute/Ahmadu Bello University, Shika-Zaria
Corresponding author: E-mail: mallamiliya2011@gmail.com. Phone: +2348188146452

Abstract
Data on 16 weaner rabbits from two different breeds were used for this study. The breeds were New Zealand White (NZ), Chinchilla (CH). The rabbits were obtained from the crosses between New Zealand White × New Zealand White (NZ× NZ), Chinchilla × Chinchilla (CH×CH). The experiment was conducted at the Skills Acquisition and Entrepreneurship Development Centre of National Agricultural Extension Research and Liaison Services (NAERLS), Ahmadu Bello University, Zaria-Nigeria. Data on body weight and linear body measurements (LBMs) namely: body length (BL), chest girth (CG), head-to-shoulder(HS), shoulder-to-tail drop (ST), length of hind leg (LHL), ear length (EL), height at withers (HTW) ear length (EL), heart girth (HG), body length (BL), head to shoulder (HS), leg length (LL) and tail length (TL) were collected after weaning (6 to 14 weeks of age). The relationships among the measured traits were determined using Linear Correlation Procedure of SAS (version 8.0, 2004). The value of the Pearson's linear correlation coefficient determines the level of relationship between the LBMs. Correlation coefficients ranged from 0.18-0.99 and 0.01-0.98 in NZ and CH respectively. The correlation coefficients varied from positive to negative; low to moderate and high correlation coefficients were observed among body weight and LBMs. In conclusion, offspring from crosses between NZ×NZ and CH×CH breed of rabbits had both positive and negative correlation coefficients between the LBMs and body weight.

Keywords: Rabbit, breed, LBMs, Phenotypic correlations.

Introduction

Body weight and body measurements are good indicators of growth performance in domestic animals including rabbits. Body weight and body linear measurements are used to characterize rabbit breeds, contrast variation in size and shape (Shahin and Hassan, 2000). According to Margherita (2008), it is intrinsically difficult to perform a thorough oral examination and measurement on rabbits and rodents, because of the size and oral anatomy of rabbits. Rabbit producers are interested in the relationship that exists between body weight and physical characteristics, since this information would reflect in their feed utilization and performance of the rabbits (Okoro *et al.,* 2010). Therefore, breeders need to establish the relationship that exists between these parameters and to organize the breeding programmes so as to achieve an optimum combination of body weight and good conformation for maximum economic returns. Breeds such as New Zealand White and Chinchilla are the most commonly identified ones, which have peculiar characteristics that distinguish them from one another. This study was conducted to identify the level of phenotypic correlation that exists between the linear body measurement and body weight of New Zealand White and Chinchilla rabbits at post-weaning (after weaning).

Materials and Methods

Description of experimental site: The study was conducted at the Skills Acquisition and Entrepreneurship Development Centre of National Agricultural Extension Research and Liaison Services (NAERLS), Ahmadu Bello University, Zaria, Kaduna State, Nigeria. Zaria is located within the Northern Guinea Savannah Zone of Nigeria between latitude 110 33' N and longitude 120 33'E (Ovimaps, 2016).

Experimental animals and management: The weaner rabbits were fed concentrate ration (16% crude protein and 2504 Kcal/kg metabolizable energy) and forage legume. Forage legume (*Digitaria smutssi*) was chopped and mixed with the formulated feed before feeding. Routine management operations such as regular cleaning of the cages and feeders were carried out throughout the research period. A total of 16 weaner rabbits consisting of 8 from each breed with the main treatment effect being the breed were housed in individual row cages of metal and wire-gauze of 60 × 44 × 50 cm^3.

Data Collection and analysis: The traits measured were body weights (BW) and linear body measurements (LBMs) namely: body length (BL), chest girth (CG), head-to-shoulder (HS), shoulder-to-tail (ST), length of hind limb (LHL), ear length (EL) and height at withers (HTW). Body weight was taken in grams using a weighing scale (Dimensions: 56 x 47 x 37cm, Model Number:

KFC, Manufacturer: Yongkang Huaying weighing apparatus company limited, China) and height at withers with a ruler in centimeters. Measurements were done after weaning on a bi-weekly basis for 5 weeks (6, 8, 10, 12 and 14 weeks). All the traits, except for body weight and height at withers were measured using measuring tape in centimeters. The relationships among the measured traits were determined using Linear Correlation and Analysis Procedure of SAS (version 8.0, 2004).

Results and Discussion

The phenotypic correlation among Body weight and LBMs of New Zealand White and Chinchilla weaner rabbits are presented in Table 1. The growth traits measured showed varying degrees of linear relationship. The phenotypic correlations were positive and negative, low to high, ranging from 0.01 to 0.99. For NZ, significant ($p<0.01$ and 0.001) correlations were observed between BW and CG (0.96), BW and HS (0.97), BW and LHL (0.89), BW and HTW (0.89), BL and ST (0.95) CG and HS (0.99), HG and HTW (0.97), HS and HTW (0.97). Significant correlations ($p<0.05$) were observed between BW and EL (0.59), BL and HG (0.49), BL and HS (0.47), BL and HTW (0.58), CG and LHL (0.87) HG and EL (0.44), CG and ST (0.59), HS and LHL (0.82), HS and EL (0.39), HS and ST (0.55), LHL and EL (0.81), LHL and ST (0.38) and LHL and HTW (0.67), ST and HTW (0.59). Other traits measured did not show any significant ($p>0.05$) correlation. In the CH breed, very highly significant ($p<0.001$) correlations were obtained between BW and BL (0.98), LHL and ST (0.98) while other correlated traits are significant ($p<0.05$) with the exception of BW and HS (-0.33), BW and HTW (0.28), BL and EL (0.31), BL and HG (0.36), CG and HS (-0.68), HS and LHL (-0.81), HS and HTW (-0.01), LHL and HTW (0.08). The highest correlation coefficients were obtained between HS and CG (0.99) while the least was between HS and HTW (-0.01).

Table 1: Phenotypic correlation among Body weight and LBMs of New Zealand White and Chinchilla weaner rabbits

Breed	Traits	BW(g)	BL(cm)	CG(cm)	HS(cm)	LHL(cm)	EL(cm)	ST(cm)	HTW (cm)
NZ	BW(g)	-							
	BL(cm)	0.24^{NS}	-						
	CG(cm)	0.96***	0.49*	-					
	HS(cm)	0.97***	0.47*	0.99***	-				
	LHL(cm)	0.89***	0.16^{NS}	0.87**	0.82**	-			
	EL(cm)	0.59*	-0.44^{NS}	0.44*	0.39*	0.81**	-		
	ST(cm)	0.36^{NS}	0.95***	0.59*	0.55*	0.38*	-0.18^{NS}	-	
	HTW(cm)	0.89***	0.58*	0.97***	0.97***	0.67*	0.18^{NS}	0.59*	
								-	
CH	BW(g)	-							
	BL(cm)	0.98***	-						
	CG(cm)	0.84**	0.79**	-					
	HS(cm)	-0.33N^{S}	-0.17^{NS}	-0.68^{NS}	-				
	LHL(cm)	0.80**	0.67**	0.86**	-0.81^{NS}	-			
	EL(cm)	0.37*	0.31^{NS}	0.81**	-0.82^{NS}	0.64*	-		
	ST(cm)	0.64**	0.47*	0.70**	-0.85^{NS}	0.98***	0.54*	-	
	HWT(cm)	0.28^{NS}	0.36^{NS}	0.40*	-0.01^{NS}	0.08^{NS}	0.37*	-0.37^{NS}	-

NZ=New Zealand White, CH=Chinchilla, BW=Bodyweight, BL=Body length, CG=Chest girth, HS=Head-to-shoulder, LHL=Length of hind leg, HTW=Height at wither, EL= Ear length, ST=Shoulder-to-tail drop, NS=Not significant ($p>0.05$), *=$p<0.05$, **=$p<0.01$, ***= $p<0.001$.

Both positive and negative correlation coefficients were obtained in all the growth traits. Phenotypic correlation values between body weight and other linear parts ranged from low to high (0.01- 0.99) in the both genotypes. The high coefficients of correlation suggest possible strong relationship between the traits, and the likelihood of pleiotropic effect of genes operating on them. Therefore, any attempt to select for one trait in a breeding programme will automatically result to improvement on those other correlated traits. Previous studies have indicated positive and significant correlations between live weight and body dimensions in farm animals, body dimensions are good indicators and can be used to predict the body weight of rabbits. The positive and negative phenotypic correlations obtained in this study disagreed with the findings of Okoro *et al.* (2010). The authors observed positive relationship between body weight and LBMs such as EL, BL, HS, LL, HG and TL in Chinchilla breed

at week 3, 6 and 8 weeks of age. The possible reason for this variation may be due to breed or genotype differences, age of the animals and other environmental factors like climate, temperature and feeds. The positive correlation coefficients simply means that as any one LBMs or BW is increasing a corresponding increase is expressed in the other while the negatively correlated traits are the reverse. The moderate to high correlation coefficients obtained corroborates the work of (Akanno and Ibe, 2005) in various breeds of rabbits. The current results obtained are similar with the findings of Tiamiyu *et al.* (2000) who reported both positive and negative correlation coefficients among medium breed rabbits.

Conclusion

The result indicates that offspring from crosses between New Zealand White × New Zealand White and Chinchilla × Chinchilla breed of rabbits had both positive and negative correlation coefficients between the LBMs and body weight. However, there is need for further investigation of this study with larger number of rabbits.

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