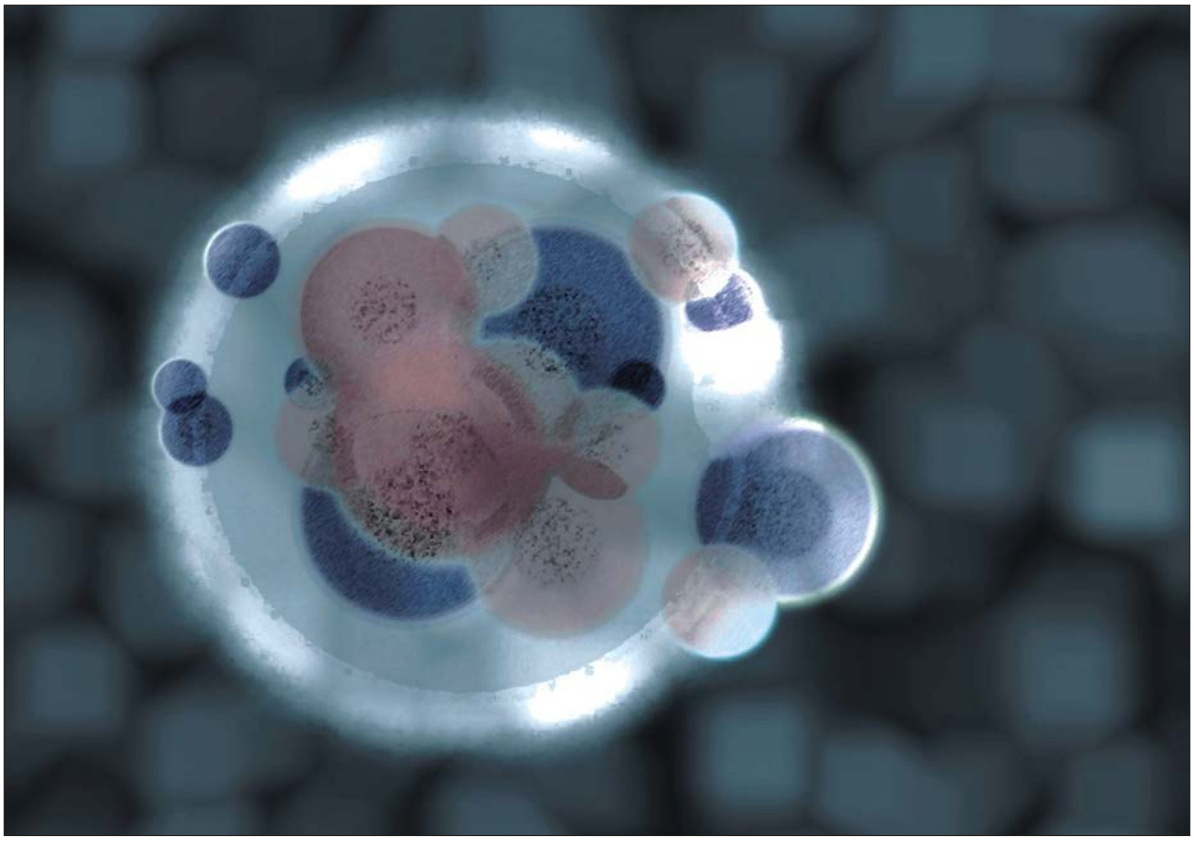

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Factors Affecting Some Traits of Economic Importance in Rabbit in a Tropical Environment of Northern Nigeria

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Abstract: Data were collected on rabbits kept at the National Animal Production Research Institute Ahmadu Bello University, Zaria. The data were collected over 7 year period. The trait studied included average Litter Size at birth (LS), Average Birth Weight (ABWT), Average Weaning Weight (AWWT) and Gestation Length (GL). ABWT ranged from 46.67±4.05 to 52.84±2.94 in the late dry and early wet season, respectively. Average weaning weight and litter size were highest for rabbit born during the early rain period with a value of 1240±78 g and 5.18 kits, respectively. The highest average birth weight was recorded for kits born during the 3rd parity with a value of 51.4±3.65 g. The average weaning weight also follow a similar trend. Litter size was however highest for kits belonging to parity 4. AWWT and LS were significantly correlated with ABWT with a value of 0.22 and -0.43, respectively. The correlation coefficient of AWWT with LS and Parity were -0.14 and 0.32, respectively. All other correlations were small and non-significant.

Key words: Rabbit, parity, litter size, season, body weight

INTRODUCTION

Rabbit production is very essential in improving animal protein intake in the developing countries which include Nigeria. This is because rabbit is very prolific as determined by the number of kits born alive at kindling and birth to weaning viability (Orunmuyi *et al*., 2006). For rabbit production to be relevant to improving protein intake in Nigeria, certain factors of production must be considered.

Litter size at birth is one of such factors. Litter size is the number of kittens per doe. Orunmuyi *et al*. (2006) reported that size at birth of 4.81 kittens. The higher the litter size, the higher the income of the farmer. More fur could also be obtained for production of clothing. Rabbit with large litter size is more likely to be selected for breeding purpose.

Litter size at weaning and weaning weight are also traits of economic importance in rabbit. Orunmuyi *et al*. (2006) reported 3.6 litter size at weaning. They also reported gestation of 30.3 days. Parity was found to have significant effect on weaning weight indicating that the higher the parity the heavier the weaning weight. Prayaga and Easdy (2002) had earlier made similar observation. Litter size was also found to affect the weaning weights of rabbit. The higher the litter size at birth, the smaller the weaning weights of rabbits. Reddy *et al*. (2000) reported that litter size at birth and gestation length had a significant effect on weaning weight of rabbits.

Shingh (1981) reported that litter size at first and second parities appears to be constant. From second to 6th litter size increases and will start to decrease from the seventh upward. Rouvier (1973), however suggested that rabbits should be culled after the sixth party for a profitable enterprise.

Gestation length is normally constant within species. Bruce and Solviter (1957) and Lucas *et al*. (1958) suggested that the seasonal effects on gestation length is probably via this seasonal fluctuations of the activity which declines with increasing temperature (Brooks and Rose, 1962) and that thyroid deficiency prior to pregnancy season and litter size on gestation usually results in prolong gestations. Thus gestations resulting from services in the hottest months when thyroid activity will supposedly be at a minimum from February to July should be longer than the mean.

Litter size at birth in rabbit has been known to be negatively correlated with individual rabbit weight at birth. In rabbit, a good doe usually produces 6-8 kittens per litter. This number varies as some factors in the womb influence the number of embryo that can develop into full kittens. An increase in litter size can reduce individual birth weight (Vicente *et al*., 1995).

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The main objective of this paper is to report the effect of season of kindling on average body weight at birthandat weaning, litter size at birth and gestation length. In addition, the effect of parity on Average Body Weight (ABWT), Average Weaning Weight (AWWT), Litter Size (LS) and Gestation Length (GL) were also studied. Effect of litter size at birth (LS) on ABWT, AWWT and GL were also reported. Finally, the correlations between all the studied traits were reported.

MATERIALS AND METHODS

This study was carried out at the rabbitry unit of National Animal Production Research Institute of Ahmadu Bello University, Shika, Zaria.

Shika is geographically situated between latitude 11°12'N and longitude 7°33'E at an altitude of 640 m above sea level (Akpa *et al*., 2002). It is located 22 km northwest of Zaria city and is vegetationally in the northern guinea savanna zone of Nigeria. The details of Shika climate has been described by Kabir *et al*. (2006).

The rabbits used for this experiment were housed in cages. Feed materials as well as fresh water were brought to them every morning and old feed materials as well as remnant of water given previous day were removed. Figure 1 shows a typical cage house for these rabbits. The feed materials given include concentrate (maize 44.4%, groundnut cake 37.2%, wheat offal 15%, bone meal 2.8%, vitamin mineral premix 0.3% and salt 0.3%) and forage. The different types of forage fed include mucuna, lablab, groundnut haulm and digitaria.

Data was accumulated over 7 years, from 1997 to 2004.

Each year is divided into 4 seasons for the purpose of data analysis. The fixed effect of seasons of kindling, parity and litter size on ABWT, AWWT and GL were studied.

Fig. 1: Typical cage house for rabbit in this experiment

Two linear models were fixed using the SAS procedure of general linear model (SAS, 1995) as follows:

$$Y_{ij} = \mu + S_i + e_{ij}$$

$$Y_{ii} = \mu + P_i + e_{ij}$$

and

$$Y_{ii} = \mu + L_i + e_{ij}$$

Where Y_{ij} is the observed individual measurement S_i P_i and L_i are the effects of the ith season, panty or litter size on the response variable AWWT, ABWT LS and GL. Pearson correlation coefficient between all the response variables were also determined using the SAS procedure of correlation (SAS, 1995).

RESULTS

Table 1 shows the least square means of ABWT, AWWT, LS and GL with the associated standard error. Rabbits kindled in the early and late seasons had the highest body weight at birth (52.4 and 51.8 g, respectively). Rabbits weaned during the early dry season however, had the highest weight of 1240.6 g. Litter size at birth was also highest during the early dry season. The longest gestation length was recorded during he late raining season.

ABWT increased from 44 g for parity 1 to 51 g for parity 3 and thereafter decreased. AWWT seemed to reduced from the value of 408.5 g for kits born within parity 1 decreasing to 362 g for those belonging to panty 2. However the highest value of AWWT was reported for rabbits born within parity 3. The longest litter size on the average was recorded for parity 4. Parity seemed not to have any effect on gestation length as the range is 31.00 to 31.85 being lowest for parity 4 and highest for parity 3 (Table 2).

Table 1: The least square means (±SE) of some traits of rabbits as affected by season of kindling

	Trait			
Seasons	ABWT (g)	AWWT (g)	LS	GL (days)
Early dry	47.25±4.05	1240.63±78.53	5.18±0.31	30.52±0.71
Late dry	46.67±2.08	660.70±55.53	4.76±0.18	31.42±0.44
Early wet	52.84±2.94	670.13±55.53	4.64±0.18	31.79±0.47
Late wet	51.78±4.27	921.83±104.71	4.10±0.32	32.80±0.89

Table 2: The least square means (±SE) of some traits of rabbits as affected by parity

	Trait			
Parity	ABWT (g)	AWWT (g)	LS	GL (days)
1	43.98±2.04	408.53±31.37	4.98±0.17	31.43±0.46
2	45.71±2.67	362.54±65.70	4.07±0.28	31.14±0.86
3	51.40±3.65	758.33±96.71	4.20±0.41	31.85±1.11
4 and above	46.33±8.16	683.33±136.78	6.33±0.91	31.00±2.32

Table 3: The least square means (±SE) of some traits of rabbits as affected by litter size

	Trait		
Litter size	ABWT (g)	AWWT (g)	GL (days)
1	91.67±11.88	916.67±288.16	33.67±2.52
2	80.47±4.99	1040.00±101.88	30.57±0.85
3	61.36±6.20	942.68±106.41	31.18±0.83
4	44.41±3.18	723.96±75.24	32.13±0.58
5	46.50±3.53	744.63±80.97	31.05±0.60
6	41.55±4.39	722.79±101.88	31.65±0.70
7	43.58±4.72	851.63±101.88	32.16±0.78
8	43.00±8.40	724.14±188.65	32.39±1.08

Table 4: Correlation coefficient of some traits in rabbits

	Traits				
	ABWT	AWWT	LS	GL	Parity
ABWT	1.00				
AWWT	0.21*	1.00			
LS	-0.43*	-0.14ns	1.00		
GL	-0.15ns	-0.03ns	0.03ns	1.00	
Parity	0.16ns	0.32*	-0.12ns	0.004ns	1.00

ns = non significant; *Significant ($p<0.05$)

ABWT range from 91.67 g when litter size is only one kit to 28.00 g, when there were 9 kits in the litter.

Similarly AWWT ranged from 917 and 1040 g when litter size contain 1 or 2 kits, respectively to as low as 350 g when litter size is as high as 9 kits. The gestation length also ranged from 33.7 days to 30.57 days (Table 3).

AWWT was positively correlated to ABWT while the opposite was the case for the LS with ABWT. Litter size is also negatively correlated to AWWT. Parity was positively correlated to AWWT. All other correlation where very low and non significant (Table 4).

DISCUSSION

The gestation length of the rabbits in the study fluctuated from 30.52 days during the early dry season to 32.80 day during the late rain season. This is similar to the result by Bruce and Solviter (1957) and Lucas *et al.* (1958) which suggested that seasonal effects of gestation was probably via the seasonal fluctuation of the activity which declines with increasing temperature (Brooks and Rose, 1962), Thus gestation resulting from services in the hottest months when thyroid activity will supposedly be at a minimum (February to July) should be longer than the mean. This tallied with the result obtained in this study as the gestation was higher during late raining season followed by the early raining season. Litter size and AWWT were higher during he early dry season. This is probably due to availability of crop residues and other forages available during the mating period that proceeded the pregnancy and subsequence kindling.

Late dry season and early wet season are known for limited feed supply in the tropic. This might be the reason for the low AWWT recorded for this 2 seasons. AWWT were high for early dry season because crop residues from groundnut haulm and other crops were readily available to feed the rabbits. Similarly, high AWWT were recorded during late rain season because forages such mucuna and digitaria and lablab were already available for feeding the rabbits.

There was a steady decrease in average birth as the litter size increased. The number of kits born varies as a result of some factors in the womb which influence the number of embryos that can develop into full kittens the longer the litter size, the lower the birth weight. This was in agreement with Vincent *et al.* (1995) in rabbits.

The high correlation obtained for ABWT and AWWT arose because a rabbit with high body weight at birth will have equally large weight at weaning. This is similar to Odubote and Somade (1992) and Orunmuyi *et al.* (2006). The negative correlation reported in this study between gestation length and ABWT and AWWT is similar to what was reported by Orunmuyi *et al.* (2006).

In conclusion this study support the fact that rabbit should be bred such that the kindling will take place during he raining seasons for bigger kits. However if high weaning weight is desired, then kindling should be target towards early dry season and late raining seasons. Kindling during the early dry season will also result in the highest number of kits per litter.

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