EFFECT OF SIRE AND DAM GENOTYPE ON LITTER PERFORMANCE OF RABBITS IN THE TROPICS.

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Abstract

The study investigated the effect of sire and dam genotype on litter performance of rabbits reared at different seasons in Abeokuta, Nigeria.A total of 39 rabbit of 6 genotypes (California White, New Zealand Red, Chinchilla breeds, Chinchilla x California White, Chinchilla x New Zealand Red and California White x New Zealand Red) and comprising 9 purebred bucks (3 per genotype) and 30 pure and crossbred does (5 per genotype) were mated to generatepure and crossbred kittens. Data on litter size and litter weight from each genetic group at 3 and 6 weeks of age were subjected to analyses of variance. Results revealed that sire genotype had significant ($p < 0.05$) effect only on litter weight. The New Zealand Red sire produced kittens with the highest ($p < 0.05$) litter weight, this as followed by kittens sired by the Chinchilla, thenthe California White rabbit. Litter size and litter weight of rabbits were however significantly ($p < 0.05$) influenced by dam genotype. Results further showed that litter weight was higher ($p < 0.05$) in crossbred dams than their purebred counterparts. Kitten also recorded higher ($p < 0.05$) litter size and weight during the wet seasons when compared to the dry seasons at 6 weeks of age. The present work suggests that the use of performance records of both sire and dam genotype as well as impact of seasonal variations should be considered when planning breeding programmes aimed at improving litter traits in rabbits.

Key words: Rabbit, genotype, season, litter traits.

Introduction

Rabbit farming is becoming more attractive due to its production potentials, which include low cost of rearing, possession of high prolificacy, good mothering ability, short gestation and short generation interval (Ogunbiyi, 2004). Thus, in recent years, more research and developmental activities have been undertaken at improving rabbit production through the use of modern animal breeding techniques (Dinh, 2008). In South-West Nigeria, rabbit breeds commonly found in most farms are the Chinchilla, New Zealand White and Red, California White, Florida White, Dutch, Flemish Giant, Sable etc (Orunmuyi *et al.*, 2006). However, observed differences in their reproductive performance which include litter traits, in relation to particular environment, are an important potential source of genetic improvement in rabbits (Obike and Ibe, 2010). Genetic improvement can be achieved through the use of gains in performance from complementary breed effects and heterosis in crossbreeding (Abd El-Halim, 2005). Hence, the objective of this study was to investigate the effect of sire and dam genotype on litter size and litter weight of some selected pure and crossbred rabbits at three and six weeks of age and reared at different seasons.

Materials and Methods

Location of the Experiment

The research was carried out in the Rabbit Unit, Directorate of University Farms, Federal University of Agriculture, Abeokuta, Nigeria. The farm is located on 7°10`N and 3°2`E in Odeda Local Government Area of Ogun State, Nigeria. The area has a prevailing tropical climate with a mean annual rainfall of about 1037 mm and a yearly average relative humidity of about 82% (Department of Water and Agro-meteorology, Federal University of Agriculture, Abeokuta).

Experimental Animals and Management

A total of 39 breeder rabbits of 6 genotypes (California White, New Zealand Red, Chinchilla breeds and crosses of Chinchilla x California White, Chinchilla x New Zealand Red and California White x New Zealand Red) comprising 9 purebred bucks (3 per genotype) and 30 pure and crossbred does (5 per genotype) were mated to generate pure and crossbred kittens. The breeder rabbits weighed between 1200 g and 1800 g and were within the age range of 7 and 9 months. They were raised individually in wooden cages with cell size of 60 x 40 x 40cm and fedon compound diet that supplied 16.90% crude protein and

2715.35Kcal/Kg metabolisable energy.The concentrate was also supplemented with forages such as *Asphillia africana* and *Tridax procumbens.* Nest boxes (40 x 30 x 15cm) were provided in the cages of pregnant does for the purpose of kindling and nursing of litters. Kittens were counted and weighed according to each genetic group within 12 hours after kindling and thereafter, on weekly basis. The period (months) of the research was divided into four seasons which were; early dry (October to December), late dry (January to March), early wet (April to June) and late wet (July to September) seasons.

Data Collection

1. Litter Size: - This was calculated as the number of live kittens and it was done on weekly basis till 6 weeks of age.
2. Litter Weight: - This was done by weighing individual litters at day - old till 6 weeks of age with the aid of both sensitive balance of 0.05 g sensitivity.

Data Analyses

Data collected on litter traits at three and six weeks of age were subjected to analyses of variance (ANOVA), using the General Linear Model procedure of the Statistical Analyses System Program (SAS, 1999) in order to investigate the effects of sire and dam genotypes as well as season on litter size and litter weight of kittens. The significant means was separated using the Duncan's New Multiple Range Test.

Results and Discussion

The effect of sire genotype is presented in Table 1. Results showed significant variation in litter weight of different sire genotype. The observed differences in litter weight of sire progenies used in this study is in line with the reports of Attalah (2005) who stated that sire genotype had significant influence on litter weight of growing rabbits. The differences in litter weight due to sire effect indicated that estimates of variance components due to sire effects for litter weight are variable among different genotypes of rabbits. Kittens sired by the New Zealand Red irrespective of the dam used in the mating consistently recorded the highest ($p < 0.05$) litter weight, followed by the Chinchilla, then the California White (Table 1). The superior litter weight obtained for kittens sired by the New Zealand Red as compared to the other purebreds suggests that the New Zealand Red breed was developed for faster growth, which resulted in cumulative higher litter weight observed. This submission is in line with the report of Bolet *et al.* (2007) using New Zealand Red sire.Crossbred dams irrespective of the sire used in mating were observed to have produced significantly ($p < 0.05$) heavier litters when compared with their purebred counterparts at the different stages of growth (Table 2). Kalamah *et al.* (2001) reported that the better performance in litter traits of the crossbred progenies over their purebred counterparts could be attributed to the effect of heterosis.

Results further showed that early and late wet season kindlers recorded significantly ($p < 0.05$) higher litter size (4.16 ± 0.19 and 3.97 ± 0.62 respectively),when compared to the early and late dry season kindlers (3.59 ± 0.12 and 3.61 ± 0.08 respectively) at 3 weeks of age. This result is comparable to that of Abd El-Halim (2005) who also recorded significantly ($p < 0.05$) higher litter size of kittens in the wet season that at the dry season. However, at 6 weeks of age, wet season kindlers recorded significantly ($p < 0.05$) higher litter size and litter weight than the dry season kindlers (Table 3). These results are comparable to those reported by earlier workers such as, Fayeye and Ayorinde (2010) and Farid *et al.* (2004). These authors attributed difference in litter traits to variations in climatic and weather conditions, such as rainfall, humidity and variations in atmospheric temperature, which tend to have direct effect on availability of forages. Thus, it could be implied that rabbits available during the wet seasons were likely to have had unhindered access to adequate nutrient for proper growth at these seasons than at the dry season, resulting in higher litter weight recorded during the wet seasons.

Conclusion

This study indicated New Zealand Red sire and all the crossbred dams used in this study produced kittens with superior performance for litter weight than their purebred counterparts. Observed differences in the performance of litter traits was also due to variations in seasonal changes. Litter weight of rabbits at different stages of growth could serve as an important trait for selection of sire and dam genotypes to be used in multiplication program of rabbits.

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Table 1: Litter weight of rabbits as affected by sire genotype at 3 and 6 weeks of age.

Weeks	Sire genotype	Litter size (No)	Litter weight (g)
3	CW	3.78 ± 0.25^{a}	801.70 ± 2.51^{c}
	NZR	3.84 ± 0.18^{a}	995.60 ± 0.39^{a}
	CH	3.76 ± 0.20^{a}	949.90 ± 5.99^{b}
6	CW	2.82 ± 0.19^{a}	1302.8 ± 246.71^{c}
	NZR	2.82 ± 0.21^{a}	1640.9 ± 241.21^{a}
	CH	2.53 ± 0.34^{b}	1472.0 ± 240.11^{b}

[a, b] Means in the same column with different superscript are significantly different ($p < 0.05$).
Key: CW = California White; CH = Chinchilla; NZR= New Zealand Red

Table 2: Litter size and litter weight of rabbits as affected by dam genotype at 3 and 6 weeks of age.

Weeks	Dam genotype	Litter size	Litter weight (g)
3	CW	3.67 ± 0.24^{ab}	753.40 ± 3.77^{b}
	NZR	3.69 ± 0.15^{ab}	784.90 ± 0.38^{b}
	CH	3.86 ± 0.15^{a}	793.70 ± 2.55^{b}
	CH x CW	3.91 ± 0.04^{a}	1015.50 ± 8.65^{ab}
	CH x NZR	3.88 ± 0.13^{a}	1510.80 ± 1.33^{a}
	NZR x CW	3.86 ± 0.15^{a}	1480.00 ± 9.29^{a}
6	CW	2.70 ± 0.17^{a}	1477.60 ± 1.40^{b}
	NZR	2.64 ± 0.18^{ab}	1452.70 ± 2.56^{b}
	CH	2.84 ± 0.20^{a}	1331.60 ± 7.41^{b}
	CH x CW	2.99 ± 0.21^{a}	1701.20 ± 0.35^{ab}
	CH x NZR	2.80 ± 0.19^{a}	1819.40 ± 8.43^{a}
	NZR x CW	2.33 ± 0.17^{ab}	1354.40 ± 9.95^{ab}

[a, b] Means in the same column with different superscript are significantly different ($p < 0.05$).
Key: CW = California White; CH x CW = Chinchilla x California White,
NZR = New Zealand Red; NZR x CW = New Zealand Red X California White,
CH = Chinchilla; CH x NZR = Chinchilla x New Zealand Red

Table 3: Litter size and litter weight of rabbits as affected by season at 3 and 6 weeks age.

Weeks	Season	Litter size	Litter weight
3	Early dry	3.59 ± 0.12^{b}	950.7 ± 119.77^{a}
	Late dry	3.61 ± 0.08^{b}	754.9 ± 151.88^{a}
	Early wet	4.16 ± 0.19^{a}	1043.2 ± 129.99^{a}
	Late wet	3.97 ± 0.62^{ab}	868.2 ± 165.92^{a}
6	Early dry	1.82 ± 0.15^{b}	1096.7 ± 110.80^{b}
	Late dry	1.84 ± 0.18^{b}	1005.5 ± 139.32^{b}
	Early wet	2.83 ± 0.16^{a}	1400 ± 119.25^{a}
	Late wet	2.51 ± 0.20^{a}	1213.4 ± 152.20^{ab}

[a, b] Means in the same column with different superscript are significantly different ($p < 0.05$).