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SHORT NOTE [NOTA CORTA]

EFFECT OF BREED AND BREEDING SYSTEM ON REPRODUCTIVE PERFORMANCE OF RABBITS IN A HUMID TROPICAL ENVIRONMENT

[EFECTO DE LA RAZA Y MÉTODO DE CRIANZA SOBRE EL COMPORTAMIENTO REPRODUCTIVO DE CONEJOS EN UN AMBIENTRE TROPICAL HÚMEDO]

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SUMMARY

Data were collected from 36 does and 116 kits recorded in a 2 X 2 factorial experiment in CRD over a period of 12 weeks from artificial insemination and natural mating of 18 Newzealand white and 18 chinchilla does respectively to investigate the effect of breed and breeding system on the reproductive performance of rabbits. Analysis of data showed that breed had no significant effect ($p>0.05$) on most of reproductive traits measured. The statistical similarity ($p>0.05$) between both strains of rabbits may be attributed to indiscriminate breeding of rabbits and lack of pure breed. Percent conception was significantly ($p<0.05$) highest when natural mating was practiced, however, all other reproductive traits were non-significant ($p>0.05$). Breeding system had a significant effect on average kit weight when artificial insemination was practiced, while other post-partum litter traits were not significant ($p>0.05$). Chinchilla and Newzealand white may be selected for breeding and improvement in the humid tropical environment. However, natural mating which produced significant ($p<0.05$) higher percent conception rate 79.9% relative to 56.4% produced by artificial insemination should be practiced. Artificial insemination may not be encouraged on both breeds of rabbits except when interest is on average kit weight at weaning.

Keyword: Breed; breeding system; reproductive performance; rabbits and humid tropics.

RESUMEN

Se recolectó información de 36 hembras y 116 crías por un período de 12 semanas a partir de la inseminación artificial y monta natural de 18 hembras New Zealand White y 18 chinchillas respectivamente para investigar el efecto de la raza y método de crianza sobre el comportamiento reproductivo. La raza no tuvo efecto ($P>0.05$) en la mayoría de los caracteres reproductivos medidos. El porcentaje de concepción fue mayor ($P<0.05$) cuando se practicó la monta natural, sin embargo los caracteres restantes fueron similares ($P>0.05$). El sistema de crianza tuvo efecto sobre el peso de las crías, con un mayor peso, cuando se empleo inseminación artificial ($P<0.05$), mientras los caracteres restantes no fueron afectados. Ambas líneas pueden ser empleadas en programas de mejoramiento genético en las regiones tropicales húmedas. Sin embargo, la inseminación artificial no debería ser promovida excepto cuando exista interés en el peso al destete.

Palabras clave: Raza; sistema de crianza; comportamiento reproductivo; conejos; trópico húmedo.

INTRODUCTION

Nigerian breeds of livestock are characterized by poor growth, low fertility, poor feed utilization, small mature size and poor yield of meat, milk and egg (Tewe, 1992). The reason for these characteristics is that most of the indigenous livestock in Nigeria and rabbits in particular have been subjected to little or no genetic improvement, owing to dependence on obsolete breeding systems (Weller, 1994). Genetic improvement remains a veritable option for the development of livestock in Nigeria. Ibe (1998) opined that genetic improvement of animal require a good understanding of basic concept of animal breeding. Breeding system determines the system of exchange of genetic material among parents to produce offspring. Research has shown that irrespective of the breed of an animal, variations in mating systems produce variation in reproductive performance (Kumar *et al*, 2001). The commonest breeds in Nigeria are Newzealand white,

Chinchilla and Dutch. The major essence of deliberate selection of breeding **stock is to improve the quantitative traits. There is lack of adequate information on the effect of** improved mating system on the reproductive performance of different breeds of rabbits in Nigeria. Of note is the absence of live bucks to be used as breeding sires, often pose great problems and had interfered with many rabbit breeding programmes. Where oestrus is to be synchronised in large farms, inadequate availability of proven bucks to efficiently sire all the does within the required space of time becomes a great problem.

In addition, bucks with desirable traits which are old or have temporary defects and as a result could not mate naturally were often excluded as breeding sires. The study was, therefore, to determine the effect of natural and artificial mating on reproductive traits of two breeds of rabbits.

MATERIALS AND METHODS

The experiment was conducted at the Rabbit Unit, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. The location lies on latitude 05^{o} 29!N and longitude 07^{o} 33$^{!}$E with an altitude of 122m above sea level.

A total of 52 grower rabbit (Chinchilla and Newzealand white) within the age of 4-5 months comprising 36 does and 16 bucks obtained from the Rabbit unit, Teaching and Research farm was used for the study. Four bucks were randomly selected from each of the two breeds for natural mating and the other four from each of the breeds for artificial insemination. The does were divided into two groups of 18 does per group based on their breeds. Does in each group were randomly divided into two sub group with 3 replicate of 3 does each and subjected to natural mating or artificial insemination. All animal were kept in individual hutches and fed *ad-libitum* with concentrates, forage supplement and water. Identification tags were placed on the ears of the animal and hutches. The process of semen collection was carried out with an artificial vagina (Herbert and Adejumo 1950) and insemination with the aid of an insemination syringe. Each ejaculate of a buck was used to inseminate one doe of the same breed which was simulated by a buck with taped external genitalia for about 10 minutes prior to insemination. The introduction of the semen was done by a rotatory anti-clockwise insertion of the tube which was gently and carefully done.

Natural mating and artificial insemination were all carried out during the evening hours at an interval of two days. Pregnancy was detected by abdominal palpation at 14th and 21st days and nest boxes were provided for expectant does at the 28th day. Does were closely monitored to take note of stillbirth and immediate mortalities at kindling.

Measurement were taken on percent conception (PC) which was taken as the ratio of pregnant does to non-pregnant does multiplied by 100. Gestation length (GL) was read as the difference between date of last mating and kindling date. Litter size at birth (LSB) was measured by direct counting of kits immediately after kindling. It included number of still birth. To measure litter weight at birth (LWB) kits in a litter were carefully transferred with gloved hand into adjusted (zero) weighing pan and their weight were read off from the scale. Average individual kit weight (AKW) at birth was calculated as the ratio of the weight of litter at birth to litter size, while litter size at weaning (LSW) was the number of fryers in each litter at 6th week. Litter weight at weaning (LWW) was measured by weighing all the fryers (weaners) in a litter individually and summing up their weight. Average kit weight at weaning (AKW) was calculated as the litter weight at weaning divided by the litter size at weaning.

The experimental design used for the study was a 2X2 factorial in completely randomised design (CRD). The model for the design is shown below

$$Y_{ijk} = \mu + M_i + B_j + (MB)_{ij} + e_{ijk}$$

Where
Y_{ijk} = single observation
μ = overall mean
M_i = Main effect of breed
B_i = Main effect of breeding system
$(MB)_{ij}$ = effect of interaction between both factors
E_{ijk} = Random error (*iind*, 0, σ2)

Data collected were subjected to analysis of variance (Steel and Torrie, 1980) and treatment means were separated using least significant difference test (LSD).

RESULTS AND DISCUSSION

Data on the effect of breed on reproductive performance are presented in Table 1. All reproductive traits measured showed non-significant difference ($p>0.05$) between the two breeds, Newzealand white and Chinchilla respectively. However, percent conception, gestation length, litter size at birth and litter weight at birth were higher ($p>0.05$) in Chinchilla rabbits. The statistical similarity between both strains of rabbits may be attributed to indiscriminate breeding of rabbits in the humid tropical environment and the resultant lack of pure breeds. Litter size at birth of 4.08±1.3 (NZ) and 5.75±0.9 (CH) noted in this study varied from the findings of Liang (1996) who reported a mean higher litter size at birth in Newzealand rabbits (7.5 kits) and Zajac (2007), 7.2±0.9 kits. However the value 5.20

kits obtained in this study, compares favourably with the report by Rastogi (1996) for Chinchilla rabbits.

Table 2 shows the effect of breeding system on reproductive performance. It was found that apart from percent conception rate which was significantly ($p<0.05$) different when natural mating was practised, all other reproductive traits measured were non-significantly ($p>0.05$) different for both breeds. Percent conception of 79.9% for natural mating as seen in the table compares favourably with 80% reported by Gupta *et al* (2002) and falls within the range of 60% and 90% reported by Patridge *et al* (1981). Post-partum litter traits in Newzealand white and Chinchilla rabbits are shown in Table 3. There was a significant effect ($p<0.05$) of breed on litter size at weaning and average kit weight at 8 weeks (56 days). Chinchilla rabbits based on this findings were superior to Newzealand white rabbits in terms of litter size at weaning and this agree with the report of Rastogi (1996) in Trinidad who reported a litter size at weaning 4.30 kits in Newzealand and 5.80 kits in chinchilla rabbits. However, it was contrary to the findings of Das *et al* (2006) and Das and Yader (2007) who reported significant ($p<0.05$) higher litter size at weaning in the Newzealand white than Soviet Chinchilla. The different is probably attributed to different in genotype and management.

Table 1. Effect breed on reproductive performance of rabbits (Mean ± SEM)

Traits	**BREED**		
	NZ	**CH**	**Remarks**
% conception	87.3	88.1	NS
Gestation length (days)	30.9±0.1	31.2±0.5	NS
Litter size at birth (kits)	4.08±1.3	5.75±0.9	NS
Litter weight at birth (g)	232.8±55	292.0±53	NS
Average kit weight at birth (g)	58.2±5.6	50.7±0.7	NS

NS = Non significantly different means ($p>0.05$)
NZ = Newzealand White
CH = Chinchilla
SEM= Standard error of mean

Table 2. Effect of breeding system on reproductive performance of rabbits

	BREEDS				
	Newzealand White		**Chinchilla**		
Breeding system	**NM**	**AI**	**NM**	**AI**	**Remark**
Traits					
% conception	79.9[a]	58.14[b]	68[a]	56.4[b]	S
Gestation length (d)	31.2±0.3	32.0±0.9	31.15±0.4	31.35±0.9	NS
Litter size at birth (kit)	5.6±0.5	5.0±0.4	4.3±0.4	4.14±0.5	NS
Litter weight at birth (g)	295±21.3	296±20.1	229.8±23	231±21	NS
Average kit weight at birth (g)	53.7±2.1	54.5±2.2	55.2±2.3	57.2±2.0	NS

a-b Means on the same row with different superscripts are significantly different ($p<0.05$)
S = Significantly different means ($p<0.05$)
NS = Non-significantly different ($p>0.05$)
NM = Natural mating
AI = Artificial insemination

Table 3. The Effect of Breed on post-partum litter traits of rabbits (mean ± SEM)

Traits	**BREEDS**		
	Newzealand White	**Chinchilla**	**Remark**
Litter size at weaning (kits)	2.21±0.0.74[a]	3.06±0.4[b]	S
Litter weight at weaning (g)	1249.3±13.5	1248.6±132	NS
Average kit weight at weaning (g)	289.0±15.6	288.0±17	NS
Litter weight at week 8 (g)	1881.95±119	1795.1±105	NS
Average kit weight at 8 weeks(g)	437.9±17.2[a]	448.3±12[b]	S

a-b Means on the same row with different superscripts are significantly different ($p<0.05$)

Results of effect of breeding system on post-partum litter traits of rabbits are shown in Table 4. The result reveals that average kit weight at weaning was the only parameter that was significantly ($p<0.05$) affected by breeding system. Higher average kit weight at weaning was recorded when artificial insemination was practised. This may be due to lesser litter sizes at birth which was observed with artificial insemination in absolute terms ($p.> 0.5$).

Means of the reproductive parameters for different breed X breeding system combination are presented in Table 5. Interaction result between breed and breeding system showed that reproductive trait such as litter weight at weaning (LWW) and litter weight at week 8 (56 d) were significant ($p<0.05$). The effects of breed on these parameters becomes strong when natural mating was practised. Litter size at weaning (LSW) was significantly affected ($p<0.05$) when breed and breeding system interacted. Breed effect was on this trait (LSW) when artificial insemination was practised. All other parameters were not affected ($p>0.05$) by breeding system.

Table 4. Effect of Breeding System on Post-partum Litter Traits of Rabbits

	BREED			
	Newzealand White		**Chinchilla**	
Breeding system	**NM**	**AI**	**NM**	**AI**
Traits				
Litter size at weaning (kits)	3.6±0.74	3.5±0.8	2.56±0.42	2.0±0.81
Litter weight at weaning (g)	1259.3±13.5	1018.9	1259.6±136	1019.6±
Average kit weight at weaning (g)	299.0±15.6[a]	332.6±0.1[b]	298.0±0.7[a]	334.7±0.1[b]
Litter weight at week 8 (56 days) (g)	1821.95±119	1082.5±102	1833.1±101	1142.6±100
Average kit weight at week 8 (g)	437.9±17.2	466.6±11	438.5±12	475±12

a-b Means within the same row with different superscripts are significantly different ($p<0.05$)
NM = Natural mating
AI = Artificial insemination

Table 5. Effect of Interaction between Breed X Breeding system on Reproductive Performance of Rabbits

Parameter		**Breed X Breeding System**	
		NZ	**CH**
GL	**NM**	30.7±0.33	30.7±0.33
	AI	31.7±0.33	31.3±0.33
LSB	**NM**	4.7±0.53	6.3±0.53
	AI	3.7±0.53	5.3±0.53
LWB	**NM**	27.5±22.	322.7±22.
	AI	213.4±22.	252.3±22.
AKB	**NM**	56.2±2.30	50.9±2.30
	AI	58.5±2.30	50.4±2.30
LSW	**NM**	4.3±0.41	4.3±0.41
	AI	3.0±0.41[a]	5.3±0.41[b]
LWW	**NM**	1408.0±188.23[a]	1296.3±188.23[b]
	AI	805.7±188.23	1605.3±188.23
AKW	**NM**	330.0±14.71	273.7±14.71
	AI	350.2±14.71	322.0±14.71
LW (WK 8)	**NM**	2032.4±114.61	1765.6±114.6
	AI	1519.3±114.61	2116.0±114.6
AKW (WK 8)	**NM**	475.8±16.22[a]	379.7±16.22[b]
	AI	506.5±16.22	423.3±16.22

a-b Means in same row with different superscript are significantly different ($p<0.05$)
NZ = Newzealand white
CH = Chinchilla
GL = Gestation length
LSB = Litter size at birth
LWB = Litter weight at birth
AKB = Average kit weight at birth
LSW = Litter size at weaning
LWW = Litter weight at weaning
AKW = Average kit weight at weaning
LW (wk 8) = Litter weight at week 8
AKW (wk 8) =Average kit weight at week 8

CONCLUSION

Breed had non-significant effect ($p>0.05$) on most of the parameters measured. However, breed may be considered for litter size at weaning and average kit weight at 8 weeks (56 d) respectively. Natural mating which produced significant percent conception (79.9%) relative to 56.4% produced by artificial insemination should be practised on both breeds of rabbits except when interest is on average kit weight at weaning for which artificial insemination is recommended.

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