
**REPRODUCTIVE PERFORMANCE AND SURVIVABILITY OF KITTINGS OF
THREE POPULAR BREEDS OF RABBITS (*Oryctolagus Cuniculus*) IN ABAKALIKI,
NIGERIA.**

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ABSTRACT

Investigations on the Reproductive Performance and Survivability of Kittings of three popular breeds of rabbits (*Oryctolagus Cuniculus*) in Abakaliki, Nigeria were conducted using seventy two homogenous breeds of rabbits viz- chinchilla (CHI), Newzealand white (NZW) and dutch (DCH). The breakdown showed that there were Eighteen does and Six bucks of each breed at the mating ratio of 1:3 as a replicate group. Eighteen Does were mated to Six bucks in a hierarchical or nested design having Six replicates in each group. The objectives of the study were to evaluate the reproductive performances of the three popular breeds predominant in the area and determine the survivability variations among the genotypes and probably discover if there are phenotypic correlations between body weight and other reproductive traits among the genotypic groups. The does and bucks were fed concentrates at the rate of 255 grammes per doe or buck per day in addition to the constant supplementation of fresh forage and clean water that were provided ad libitum. Abdominal palpation was employed, fourteen days after service for pregnancy diagnosis and the does that failed to become pregnant were returned to the same buck until pregnancy was achieved. The parameters studied were: receptivity, conception rate, gestation length, stillbirth, litter size at birth, litter size at weaning, litter birth weight, mortalities of the punnies, kindling rate as well as body weight of the does at mating, kindling and weaning their kits. Results were affected by many factors including thermal conditions in the rabbit hutches, season, amount of light, conditions of the rabbits as well as the genetic worth of the rabbits among others. There were high percentages of deaths among the Newzealand white and chinchilla breeds, however, the result of the reproductive performance showed that the chinchilla breed was the best whereas the dutch does was the poorest. Nevertheless, the rate of conception was highest among the does of the chinchilla and Dutch breeds. Similarly, litter size at birth, litter weight at birth did not show any significant ($P>0.05$) differences among the breeds. Result also indicated positive and high phenotypic correlation coefficients among the three breeds except in the body weight at weaning, which showed non-additive genes at work. Generally, the chinchilla displayed the highest fertility and survivability, lower rate of kit deaths, during rearing. The result of this study showed that chinchilla breed recorded 4.65 litters and was the highest among the breeds and could be recommended for mass adoption among rabbit producers in the humid tropical environment of Abakaliki, Ebonyi State of Nigeria..

Keywords: Reproductive performance, Survivability, Does, Bucks and Kittings

1. INTRODUCTION

Commercial rabbit production in Nigeria has been maintained through the use of imported exotic breeds. Consequently, the availability of breeds differing in their growth and reproductive characteristics is an important source of flexibility that can allow more rapid adjustments to changing economic conditions in the Country. However, a sound knowledge of this important aspect of animal production and its interaction with the environment is essential for a maximum rational utilization of the breeding stock.

In animal breeding, crossbreeding allows the exploitation of breed qualities from genetic and biological point of view (Bosch et al, 1992). It also enables breed discrimination arising from the analysis of genetic resources. The genetic and environmental causes of phenotypic variations in economic attributes need to be decomposed into direct and maternal effect (Maliki and Singh, 2006).

Characterization of genetic and maternal effects attributable to each or breed combinations enable producers to choose among breeds and assign appropriate roles to selected breed or breeding schemes. One major advantage of cross breeding is breed complementarity. This exercise will help to expose the potentials of crossbreeding in helping to tap the non-additive genes for possible improvement in the reproductive performance. The productive efficiency of the rabbit is measured by the number of young raised to weaning or slaughter per unit time (Isaac et al, 2010).

Litter traits such as weight, litter size and mortality rate are not affected greatly by additive action. These traits could be improved by a good management decision among which is the age at which rabbits are mated. Characteristics such as litter size at birth and at weaning; litter weight at birth and weaning are some of the traits of economic importance that need to be studied before any management system can be considered profitable to the industry (Akanno et al, 2004). Litter traits are an indication of good nursing and mothering abilities.

Thus, rabbits with good litter traits will certainly have a large number of young ones that will be available as animal proteins and other products. Breeds of rabbits are considered as one of the major factors which can alter their reproduction. Different breeds of rabbit offers advantage to increase the adoptability of commercial performance through crossing (Piles, 2004). To improve the protein supply situation in Nigeria, there should be room for improvement, management and selection. As production directly depends on reproduction, the reproductive performance of rabbits becomes an important aspect in determining the profitability of commercial rabbit breeding.

The improvement and sustainability of rabbit production in this part of Nigeria will depend on how best selection is made as regards choice of genotypes and how well the breeding programme is planned. Breeders need to extract the genetic make ups of most available rabbit traits which are unknown. Characterization of genetic and maternal effects attributable to each breed or breeds combination enables farmers to make their choices. The variations in growth rate or weight gain

of rabbits within same or different species are highly influenced by environmental factors such as nutrition, diseases, hormones and general management (Asuquo, 1996).

Given the fact that different breeds tend to perform differently due to differences in their genetic make-up as well as variations in the environmental conditions in which they are found., Breeders need to exploit the preponderance of additive genes in the rabbit population to bring about improvement in the growth rates. The impact on the animal protein production and consumption of the citizenry will justify the effort. This research was designed to evaluate the growth performance and survival of kittens from three popular breeds of rabbits predominant in Abakaliki, South Eastern Nigeria.

1.1 OBJECTIVES OF THE STUDY: - The objectives of the study are to;

- (i) Evaluate the reproductive performance of three popular breeds of rabbits viz:- Chinchilla, Newzealand white and Dutch breeds.
- (ii) Determine the survivability variations among the genotypes.
- (iii) Determine the phenotypic correlation of bodyweight of the rabbits with other reproductive traits.

2.0 MATERIALS AND METHODS:

2.1 EXPERIMENTAL SITE:- The research work was carried out at the Department of Animal Science, Ebonyi State University Teaching and Research Farm, Rabbitry Unit, Abakaliki, Ebonyi State. Ebonyi State is situated between latitudes $5^{\circ} 40'$ and $6^{\circ} 45'$ North of the equator and longitude $7^{\circ} 30'$ and $8^{\circ} 46'$ East of the green which meridian. It occupies an area of 5,935 km² and the population of the State was 2,176,947 persons as at 2006 with an annual growth rate of three percent (National Bureau of Statistics, 2012). The State is bordered with Cross River State in the East, Abia State in the South, Enugu State in the West and Benue State in the North.

Ebonyi State has three agricultural zones viz:- Abakaliki, Onueke and Afikpo zones and thirteen Local Government Areas. Ebonyi State is located in the tropical rainforest zone and agriculture is the main means of livelihood of the people. Crops like rice, yams, potatoes, cassava, maize, plantain, banana, fruits, vegetables, oil palm and other tree crops are cultivated in the area. Rice, yam and cassava are the predominant crops cultivated by people of the area (Onyeneke, 2010).

2.2 EXPERIMENTAL ANIMALS AND MANAGEMENT: Seventy two homogenous breeds of rabbits viz:- Chinchilla (CHI), Newzealand White (NZW) and Dutch (DCH) were used for the experiment. The breakdown showed that, there were eighteen does and six bucks in each breed at the mating ratio of one is to three. The animals were housed in separate cages, where feeder and drinkers were provided in each cage. Prior to the experiment, each animal was dewormed using ivermectin P outside the occasional administration of antibiotics as the need arose. Coccidiosis was routinely controlled using vita-cox and dusted with antihelminth to clear any load of helminth and mange that may have infected the animals.

The rabbit house was naturally oxygenated and the rabbits were raised under clean environmental conditions. The rabbits were fed concentrate diet and had free access to locally available green grasses like calapogonium, phaseloides, centrosema pubescens, gamba grass and panicum maximum. The Does were provided with nesting boxes for kindling and nursing. Mating was carried out by transferring each Doe to the buck cage, then returned to its cage after mating. Abdominal palpation was employed fourteen days after service for pregnancy diagnosis and returned to the same buck until pregnancy was achieved. Consecutive parities were recorded per dam and the kits born were subjected to a bi-weekly weighing until they were weaned at Eight weeks of age. All rabbits were kept under the same managerial and hygienic conditions. The Does and her litters were kept together in cages and managed together.

2.3 MATING PROCEDURES:- Six Bucks were mated to Eighteen Does in a hierarchical or nested design according to Akanno and Ibe (2005). One buck was mated to three Does as a replicate group and there were Six replicates in each breed. Mating was carried out in the morning and in the evening hours by taking the Does to the Buck assigned to it. Served Does were palpated fourteen days after successful service to ascertain the authenticity of pregnancy. Non-pregnant Does were put up for re-mating until conception occurred.

Table 1: Initial Herdsize And Mating Scheme Used

BREED/GROUP	NUMBER OF SIRE	NUMBER OF DAMS	NUMBER OF PROGEIES (SURVIVORS)
(Chinchilla x Chinchilla)	6	18	250
(Newzealand white x Newzealand white)	6	18	258
(Dutch x Dutch)	6	18	248

2.4: DATA COLLECTION:- Data on the parameters were collected as follows:-

- (i) Conception Rate:- This was calculated as a ratio of the number of Does conceived to the total number of Does and multiplied by 100.
- (ii) Gestation period were recorded as well as the mortalities of the punnies, stillbirth, kindling rates.
- (iii) Litter sizes at birth and at weaning as well as
- (iv) Bodyweight of Does at mating, kindling and weaning of their kits.
- (v) Litter weight at birth and at bi-weekly interval after parturition were monitored using sensitive weighing balance.

2.5: STATISTICAL ANALYSIS:- Data collected were subjected to analysis using mixed model, Restricted Maximum Likelihood (REML) computer soft ware. The statistical model is as follows:-

$X_{ijkl} = U + S_i + D_j + P_k + E_{ijkl}$ where;

X_{ijkl} = Observation on the i^{th} progeny of the j^{th} dam mated to the i^{th} sire for the k^{th} parity.

M = Overall mean

S_i = Random effect of the i^{th} Sire

D_j = Random effect of the j^{th} dam

P_k = Fixed effect of the k^{th} parity

E_{ijkl} = Residual term assumed to be identical, independent and normally distributed with zero expectation and variance (σ^2). Comparison among parities within breeds was done using the general linear model multivariate analysis of variance (GLM ANOVA) and significantly different means were separated using the Duncan's New Multiple Range test (Duncan, 1955). Phenotypic correlation (rp) was estimated using pearson correlation analysis (Spss, 2007).

RESULTS

Table 2:- Results Of The Reproductive Performance And Survivability Of Three Popular Rabbit Breeds In Abakaliki, Nigeria.

BREEDS OF RABBIT				
PARAMETERS IN (% OR KG)	CHINCHILLA	NEWZEALAND WHITE	DUTCH	S.E.M
Litter Size at Birth (LSB)	4.65 ^a	4.50 ^a	3.10 ^b	0.44
Litter Size at Weaning (LSW)	2.85 ^b	3.92	2.60 ^b	0.2
Litter Weight at Birth (LWB)	235.40	238.59	247.05	10.65
Litter Weaning Weight (LWW)	2168.57 ^a	1719 ^b	1913.99 ^a	72.37
Still Birth (%)	0.22 ^b	1.33 ^a	0.11 ^b	0.27

Kindling Rate (%)	98.89 ^a	89.67 ^b	81.10 ^c	0.99
Pre-weaning Mortality (PWM)	0.50	0.31	0.70	0.30
Post-weaning Mortality (PWM)	18.01 ^b	19.07 ^b	20.21 ^a	2.67
Gestation Length (Days)	32.67	33.33	32.22	0.25
Receptivity	4.10 ^a	3.0 ^b	1.50 ^c	0.35
Conception Rate (%)	99.78 ^a	82.33 ^b	99.11 ^a	1.05
Kit Mortality (KM) (%)	17.43 ^a	15.19 ^b	16.67 ^c	0.58
Litter Birth Weight (KG)	43.50 ^a	48.30 ^a	35.70 ^b	3.50

a, b, c:- means on the same row not followed by same superscript are significantly (P < 0.05) different.

S.E.M. = Standard Error of Means.

Table 3: Phenotypic Correction Of The Bodyweight And Litter Size At Birth And Weaning Of The Three Popular Rabbit Breeds.

PARAMETERS BREEDS OF RABBIT									
	Chinchilla (CHI)			Newzealand white (NZW)			Dutch (DCH)		
Litter Size at Birth (LSB)	LSB BWW	LSW	BWB	LSB BWW	LSB	BWB	LSB BWW	LSW	BWB
	- 0.164 ^{ns}	0.747	0.251	- 0.344 ^{**}	0.661 ^{**}	0.109	- 0.129	0.276 ^{**}	0.367
Litter Size At Weaning (LSW)	- 0.329 ^{**}	-	-	- 0.329 ^{**}	-	-	- 0.051	-	-
Bodyweight at Birth (BWB)	- 0.171 ^{ns}	0.343 ^{**}	-	- 0.171 ^{ns}	0.127	-	- 0.269	0.253 ^{**}	-
Body Weight at weaning (BWW)	-	-	-	-	-	-	-	-	-

4.0 DISCUSSION:-

The profitability of production of rabbits depends on the reproduction intensity and the number of kits being weaned from one litter (Castellini et al; 2010, Gacek, 2010). The decisive issue is the efficiency of mating and litter size. Rabbits are characterized by high production traits such as high growth rate of young, good feed efficiency, high dressing percentage and meat quality (Kowalska 2006; Zotte, 2002). The breed with the best reproductive parameters providing the possibility to complement the basic livestock husbandry practice easily should be chosen for production depending on the target. The results of this study portrays the usefulness of the analyzed breeds in rabbit production.

According to Kowalska (2006), too numerous litters are not desirable due to lower weight of new born kits. A slower growth rate and a high percentage of deaths in addition to weakening of Does, especially in the case of too numerous litters and lactation difficulties.

Even though, Does of these popular breeds of rabbits are good foster mothers, the closer intervention and care of the farmer could help to increase the number of survivors of kittens, especially in the number of survivors of kittens, Castellini et al (2010) had opined that low level of reproductive rates especially in rabbits reared intensively and even semi-intensively could be as a result of poor feeding regimen, energy deficit as well as minerals and vitamin's deficiency. This is the position suspected in this study.

The observed results were affected by many factors including thermal conditions in the rabbit hutches, the season of the year when the Does kindle; amount of light, conditions of the rabbits, genetic worth of the rabbits among others (Tuma, et al; 2010). High percentage of deaths in the breeds occurred and had been earlier reported (Tuma et al; 2010). Similarly, losses experienced during the rearing may also be the result of the young freezing, pulled out from nests by some active Does. Therefore, results lower than the average of these breeds is a pointer towards improving the welfare in the farm or elimination of some hyperactive animals in the herd.

Receptivity:- This was determined by the willingness of the Doe to mate combined with signs of estrus such as swelling of vulva, exposition of the rear quarters, and lordosis. Receptivity was scored in the scale of one to three (Oguike and Okocha, 2008). The results of the reproductive performance as presented in table 2 showed the chinchilla breed as the best whereas Dutch Does were the poorest. Even though, Does of the chinchilla accepted males more readily; however the rate of conception was highest among the Does of the chinchilla and Dutch. Nevertheless, the gestation length of the Does were not statistically ($P>0.05$) different among the three breeds. Similarly, litter size at birth, litter weight at birth also did not show any significant ($P>0.05$) differences among the breeds.

Table 3 shows the phenotypic correlation of the bodyweight and litter size of the Does at birth and weaning. Results indicate positive and high phenotypic correlation coefficients among the three breeds of rabbits except in the body weight at weaning which was non-significantly correlated; an indication of non-additive genes at work.

The chinchilla breed which showed the highest fertility rate and survivability or lower rate of kit deaths during rearing deserves attention. Does with heavier bodyweight should be selected for breeding. The percentage of deaths at the post-weaning stage (20.21 percent) among the Dutch breed occurred in our study. In the case of the Newzealand white, a very similar result to those obtained by (Ayyat et al; 1995) was observed; although significantly lower in the chinchilla and Newzealand white breeds. The environmental condition affected prolificacy probably due to better conditions of the rabbitry housed Does. Moreover, prolificacy is a maternal trait which can be affected by individuals physiological status and sanitary condition. Delivery periods may also have affected pre-weaning mortality. Does that kindled during the rainy seasons recorded higher mortalities as against dry season.

The findings of Mukundan et al (1993) and lukefahr et al (1983a) stated that the average litter size at birth common to most rabbit breeds in the tropics is 4.6 kittens. The result of this study showed that chinchilla breed recorded 4.65 and was the highest among the three breeds. Litter size at birth was also observed by Brah Mantiyo and Raharjo (2008) to be influenced by genetic, breeding season, age of the Doe as well as the number of previous litter and level of nutrition. Increased feeding has been implicated to induce shedding of more ova during ovulation thereby increasing litter size at birth Adukes and Olukosi (1990), Ezekwe et.al, (2002) reported that inadequate nutrition led to ovarian inactivity and consequently low litter size among the Does. The occurrence of high conception rates among the Does and the absence of mummification recorded in this study are clear indications that there was no reproductive problems or infertility on the Does of the breeds. Again, this could be attributed largely to the high sperm production potentials of the bucks resulting in pregnancies.

CONCLUSION

The high conception rate, high receptivity and low mortalities among some of the breeds, high prolificacy, high weaning weight, large litter size are the primary focus of rabbit producers for profitable rabbit production. Chinchilla breed recorded the highest litter weight at weaning and generally performed best and could be recommended for adoption by rabbit producers in the humid tropical environment of Abakaliki, Ebonyi State of Nigeria.

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