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The Effect of Different Re-Breeding Intervals on the Reproductive Performance of Rabbit

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Abstract
The research was carried out to study the effect of different re-breeding intervals on the reproductive performance of rabbits. Twenty mature does were randomly assigned to five bucks for mating. Five re-breeding intervals of 2,3,4,5, and 6weeks were used with 6weeks re-breeding interval serving as control. Reproductive parameters evaluated were: average gestation length, conception rate, number of still birth, average number of live birth, average litter size at birth, average kit mortality before weaning, average litter size at weaning and does body weight at re-mating. The results showed that average gestation length, conception rate, number of still birth, average litter size at birth, average kit mortality before weaning, average litter size at weaning were not significantly different (P>0.05) among the treatment groups. There were however, significant differences (P<0.05) among treatments on the mean number of kits born alive. Does that were rebred after 5weeks of parturition had significantly (P<0.05) more kits born alive (5.10 kits) than does in the 4weeks rebreeding interval which had a mean value of 2.80 kits. There was however no significant difference between does rebred at 2, 3 and 6weeks intervals in the number of live births. Does rebred after 4weeks of parturition had superior body weight of 1.86kg at re-mating, which was however not different from the values obtained for does rebred at 3, 5 and 6weeks which were 1.68kg. 1.78kg and 1.60kg respectively. These values were however, significantly different (P<0.05) from does rebred at 2weeks. It was therefore concluded that under good management practices, re-breeding interval of 3weeks will ensure optimum use of doe for breeding with increased number of kits per doe per year.

Keywords: *Does; Re-breeding interval; Reproductive performance; Rabbits*

INTRODUCTION

The inadequate supply of animal protein from the traditional livestock-cattle, sheep, goats, pigs and chicken is responsible for the decline in animal protein consumption in many developing countries of the world. The minimum protein requirement of an adult human as estimated by FAO (2014) is 75g/person/day out of which 40g should be from animal protein. However, the present protein consumption of average Nigerian is about 7g. Rabbit production is one of the fastest ways of meeting up the demand for animal protein in the diets of over increasing Nigerian people. This is because of high prolificacy and litter bearing attributes of rabbits. These attributes are to be considered in order to determine the best time to re-breed the animal after kindling without compromising the health of the doe and the survival of the litter. Several studies had established the profitability of rabbit enterprise and its pathway to creation of wealth among the youth in Nigeria (Ominikari 2023, Mukaila 2022; Aminu, Fasugba and Ogoloyinbo 2020)

Rabbit is an induced ovulator and can be rebred 24 hours after kindling (Oseni, 2012). However, they are usually re-mated 6-8 weeks after parturition. This long re-breeding interval reduces the number of kits per doe per year. Reducing the breeding interval in rabbit production becomes necessary in order to increase the output of weaned kittens (Khan *et al.*, 2014). In most tropical countries, different post-partum re-breeding intervals of rabbits have been examined in an attempt to find the best re-breeding interval for optimum performance. Addass *et al*, (2011) studied re-breeding intervals at 7, 14 and 21 days postpartum breeding. lyeghe-Erakpotobor *et al*, (2005) studied re-mating at 14, 21 and 28 days post-partum. However, Oguike and Okocha (2019) indicated that re-mating Does after 4weeks post-partum did not have adverse effects on the productivity of does. Determination of appropriate re-breeding interval of the rabbit in the tropics will ensure maximum and effective use of the doe for increased and improved rabbit production.

This research work was aimed at investigating the appropriate period to re-breed rabbit Does following parturition in the tropic environments. The specific objectives of the study were: (i) To evaluate the effects of different re-breeding intervals on the reproductive performance of rabbits in terms of number of kits born, number weaned, pre-weaning mortality etc. (ii) to assess the body weight of Does re-bred at different intervals.

Efficient reproduction is one of the main factors that assure high productivity in rabbit farms. To achieve this, farmers need to take into consideration, management practices that will promote physiology, behaviour and the general well-being of the animal. Adopting appropriate re-breeding period will achieve high productivity per Doe per year without negative effects on the litters and the Dam. This ultimately will help to achieve sustainable animal protein supply to consumers.

MATERIALS AND METHODS

The study was conducted at the Grasscutter and Rabbit Unit of the Department of Animal Science, University of Nigeria, Nsukka. Twenty-five rabbits of mixed breeds were used, comprising twenty Does of about six months of age and five mature Bucks of about six to seven months of age.

These rabbits were raised under clean and hygienic environment. They were fed *ad-libitum with* commercial poultry feed (grower diet) throughout the experimental period. Grass/legume supplement comprising of *Panicum maximum, Centrosema pubescence* and potato leaves were used as forage materials in their feeding. Fresh clean water was provided for the rabbits every day.

Experimental Procedure

The experiment was designed to test five rebreeding intervals with a view to identifying the optimum breeding interval. The five re-breeding intervals of 2,3,4,5 and 6weeks were used with 6weeks rebreeding interval used as control. Twenty Does were randomly assigned to the five treatments with four does per treatment. The Does were housed individually in separate cages and fed generously. Five Bucks were kept in separate cages in vicinity of the does and used to randomly bred the does at a mating ratio of 1:5 (Buck: Does).

Stud mating was adopted for the study where females were randomly carried to a Buck for breeding convenience. Mating was done 7-8 am in the morning and 5-6 pm in the evening by which times temperature were low.

At day 14^{th} post-breeding, mated Does were diagnosed for pregnancy by palpation of the lower abdominal region. Does that were pregnant were observed to have a kernel shaped object moving between the fingers during palpation. Does that failed to conceived by day 14^{th} were taken back for re-mating to achieve 100% pregnancy. At about twenty-five days of gestation, nest boxes were introduced into the Does cages. After the first kindling, the does in all treatments were on the same parity. Thereafter, the Does were rebred at 2,3,4,5, and 6 weeks post-partum designated Treatments as T1, T2. T3. T4. and T5 respectively. The kits kindled were weaned at appropriate intervals to allow for the first and second rebreeding trials.

Data on the reproductive parameters evaluated were collected on individual does in each of the five treatment groups.

Experimental Design

A Completely Randomized Design (CRD) was used. The data generated were analyzed using one-way Analysis of Variance (ANOVA), SAS (1995). Differences between means were separated using Duncan's New Multiple Range Test (DMRT) by Steel & Torrie (1980). The model for the design is as followed:

$Xij = \mu + Ti + eij$

where: Xij = the i^{th} observation (weight, litter size, litter weight etc)

μ = over all estimate of the population mean

Ti = the effect of the i^{th} rebreeding interval

Eij = random error associated with experimentation.

Data collection

Data on the parameters studied were collected on individual does in each of the re-mating interval treatment groups T1 (2 weeks), T2 (3 weeks), T3 (4weeks), T4, (5 weeks) and T5 (6 weeks). The reproductive parameters measured were defined and expressed as follows:

Gestation rate: this is recorded as the number of days between the day the does are mated and kindled

Conception rate (CR**):** Conception rate was calculated as a ratio of the number of does conceived to the total number of does mated multiplied by 100.

$CR = \frac{\text{Number of Does that conceived}}{} \times 100$

Total number of Does mated
Still birth**:** number of kits born dead
No of live birth**:** number of kits born alive
Litter size at birth**:** number of kits born alive and dead were counted and recorded
Kit mortality before weaning: number of kit born alive and die before weaning
Litter size at weaning**:** number of kit alive at weaning
Doe body weight at re-mating**:** The Does were weighed in kg at mating and re-mating using sensitive weighing balance.

RESULTS

Results of this study from Table 1 showed that there were no significant differences ($p>0.05$) in gestation length and conception rate of Does among the different rebreeding groups. Still birth and litter size at weaning were also not significantly differed ($p>0.05$) among the different rebreeding intervals.

Table 1: Reproductive performance of Does at different re-breeding intervals

	Re-breeding interval (weeks)				
Reproductive Parameters	**2**	**3**	**4**	**5**	**6**
Ave. gestation length (d)	30.22±0.32	30.78±0.22	30.70±0.15	30.40±0.22	30.25±0.16
Conception rate (%)	66.66±0.23	72.73±0.33	75.00±0.42	75.00±0.11	72.73±0.33
Number of still birth	1.00±0.10	0.33±0.26	0.50±0.31	0.00±0.00	0.00±0.00
Ave. No of live birth	$3.22±0.57^{ab}$	$4.00±0.83^{ab}$	$2.80±0.79^{b}$	$5.10±0.59^{a}$	$4.50±0.54^{ab}$
Litter size at birth	4.22±0.28	4.33±0.90	3.30±0.67	5.10±0.59	4.50±0.54
Kit mortality before weaning	2.50±0.56	2.17±0.41	1.60±0.40	2.33±0.33	2.40±0.51
Ave. litter size at weaning	1.56±0.65	2.56±0.58	2.00±0.58	3.00±0.67	3.00±0.42
Doe body weight at re-mating	$1.39±0.05^{c}$	$1.68±0.05^{ab}$	$1.86±0.05^{a}$	$1.78±0.11^{ab}$	$1.60±0.06^{b}$

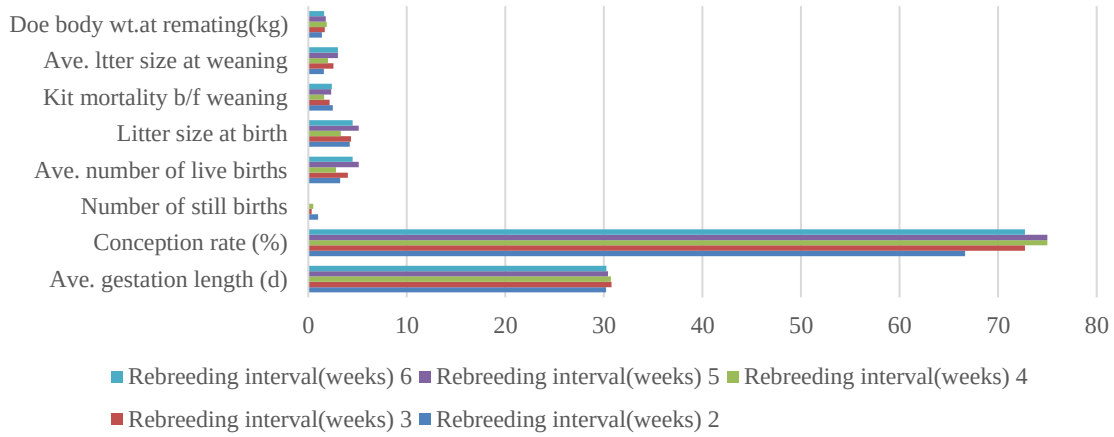
a, ab, b, c = Means on the same rows but with different superscripts are statistically ($P\leq0.05$) significant.

Rebreeding at 4weeks produced Does with significantly ($p<0.05$) higher body weight (1.86kg) at re-mating. The weight obtained were not however different from those of 3, 5 and 6weeks (1.68, 1.78, 1.60) kg respectively. These values were however significantly ($p<0.05$) different from does rebred at 2weeks.

The bar chart in Figure1 revealed the performance of these reproductive parameters when compared within each rebreeding interval studied. Amongst the 8 reproductive parameters that were investigated; 5 of these-conception rate, average number of live births, litter size at birth,

average litter size at weaning and Doe body weight at re-mating were seen to be consistent better at rebreeding at 4 weeks.

Figure1: Does reproductive parameters at varying breeding intervals



DISCUSSION

Gestation length observed in this study which averaged 30.48 days was not significantly difference ($p>0.05$) in all groups. This is in agreement with the result of Oguike and Okocha (2019) who observed gestation length of 30.83, 30.90 and 30.86 for re-mating interval of 3, 4 and 5 weeks respectively. Gestation length in animal is species specific. This result shows that gestation length in rabbit is not affected significantly by variation in re-breeding intervals. The conception rates observed in this study show that conception rates increased with increase in re-breeding interval. The high conception rate observed at 4^{th} week re-breeding intervals might be connected to the reduced physiological stress of suckling as kittens show adaptation to solid feed from 21days. This is in accordance with the observation of Yamani *et al.*, (1992) that conception rates increased as re-mating interval increased. This is in disagreement with Iyeghe-Erakpotobor et al. (2005) who observed decrease in conception rate with increase in re-mating interval, reported 85% conception rate in Does re-mated 14 days, 65 and 50% for re-mating at 21 and 28 days respectively. Oguike and Okocha (2019) also reported decrease conception rate as the rebreeding interval increases.

Still births observed in this study show that re-breeding intervals had no significant effect ($p>0.05$) on the number of kits that were dead at birth. However, the number of still birth (1.00 ± 0.10) was high in the T1 (2 weeks rebreeding interval) compared with other treatments. This agreed with what was observed by Oguike and Okocha (2019). The high number of stillbirth recorded in this study when Does were re-mated at 2 weeks post-partum might be due to the effect of physiological stress associated with pregnancy running simultaneously with lactation, as enough time was not given for the rabbit to regain its lost body condition occasioned by the previous gestation and lactation. The higher number of live births obtained in 5weeks re-breeding interval may be as a

result of non-overlap of pregnancy and lactation for Does in that group and therefore had little or no physiological stress affecting the development and survival of the foetus. Litter size at birth was not significantly affected by various re-breeding intervals. This observation is in conformity with the finding of Rastogi (1998) and Oguike and Okocha (2019) that average litter size at birth of 4.6 kittens is common among different breeds of rabbits in the tropics. This current study indicated that re-breeding intervals used did not significantly ($p>0.05$) influenced kit mortality before weaning. Nonetheless, kit mortality was high in 2 week rebreeding (2.50±0.56). This agrees with earlier findings by Oguike *et al.*, (2019). Average litter size at weaning was not significantly influenced ($p>0.05$) by the re-breeding intervals used in this study, though the litter size at weaning is significantly high in rebreeding at 5 and 6 weeks (3.00). The values obtained in this study are however low compared to the result of Koehi (1995) in the temperate climate. This may be due to the effects of environmental stress such as temperature and relative humidity on pre and post natal survivability of the kittens which seem to reduce the litter size at birth and at weaning. Does in 4weeks re-breeding interval have highest body weight at re-mating with the value of 1.86±0.05kg. This may be connected with the kittens less dependence on the Doe`s milk for survival. This then would allow the Does to mobilize body reserve and utilize nutrient intake to compensate for the loss of nutrients during pregnancy and lactation. The value obtained at the 4weeks re-breeding interval is however similar to the 3, 5 and 6weeks re-breeding intervals.

CONCLUSION AND RECOMMENDATION

The results of this study indicate that even though live births, litter size at birth, litter size at weaning were better at 5weeks re-breeding interval, these however were not significantly different from the values obtained when Does were rebred at 3 and 4week interval after parturition. It is therefore recommended that 3 weeks re-breeding interval could be adopted by farmers who are ready to employ improved or good management practices in their production system. However, where this cannot be guaranteed, re-breeding Does at 4 weeks post-partum may be a preferred option.

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