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Full Length Research Paper

Reproductive performance of rabbits re-mated at different intervals post-partum

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Investigations on post-partum re-mating intervals were conducted using 27 primiparous Dutch and Chinchilla crosses. Three treatments comprising re-mating intervals at 3, 4 and 5 weeks designated Ta, Tb, and Tc, respectively were used for the investigations. Nine does were randomly assigned to each of the treatments. The does were fed concentrate at the rate of 210 g doe^{-1} day^{-1}, fresh forage and clean water were supplied *ad libitum.* Parameters studied were: Receptivity, Conception rate, Gestation length, Stillbirth, Litter size at birth, Litter size at weaning, Litter birth weight, Litter weight at weaning. Body weight of doe at mating, kindling and weaning were recorded. Results of the study showed that receptivity was higher in Ta and Tb than Tc. Conception rate was significantly higher (P<0.05) for Ta (100.00%), than Tb (56.17%) and Tc (44.53%). Stillbirth recorded significantly higher (P<0.01) value for does re-mated at 3 week intervals (Ta, 3.70%) while Tb and Tc recorded 0.00 and 0.33%, respectively. Litter birth weight of Ta (45.21 g) was significantly lower (P<0.05) than those of Tb (65.53 g) and Tc (63.19 g). Also litter weaning weights of Tb (152.22 g) and Tc (147.22 g) were significantly higher (P<0.05) than that of Ta (101.66 g) In conclusion, although week 3 re-mating interval has higher conception rate than the rest of the treatments, re-mating does at week 4 post- partum appeared better because it recorded no stillbirth and higher litter weights at birth and weaning all of which are indicative of higher reproductive efficiency.

Key words: Rabbit does, re-mating interval, early weaning, reproductive performance.

INTRODUCTION

The interaction between re-mating interval and the reproductive performance has a significant effect on several traits such as conception rate, gestation length, recaptivity, stillbirth, litter size, weaning weight, litter weight, body weight of doe, mortality, growth rate and milk production (Smith and Somade, 1994). If early re-mating is successful, there is a possibility of increasing reproductive rate and improving the reproductive performance of rabbits without negative effects on litter and doe performances. It was shown by Cheeke (1983) that rabbits could be mated 24 hours after kindling since rabbits are induced ovulators. Mc Nitt et al. (1996) also reported that does are fertile 24 h after kindling and can be rebred at this time. Post-partum re-mating intervals at 1 and 9 days (Mendez et al., 1986), 9 days (Rebollar et al., 1992), 1, 5 and 10 days (Yamani et al., 1992;) 4 and 11 days (Nicodemus et al., 2002) have been reported in the temperate regions. On the other hand, Xiccato (1996) observed that 10 days rebreeding can be used to maximize production and this is also close to the peak receptivity at 9 days post-partum as observed by Diaz et al. (1987). However, short re-mating intervals such as 1, 4, 9 and 10 days after kindling may not allow for adequate recovery of the body reserve of the does. As a consequence there may be a decrease of fertility, milk production, litter weight at weaning and an increase in kit mortality. Moreover, the practice of rebreeding 24 h (1day) after kindling was condemned by animal welfare group (Harkness, 1988). In the United States, majority of producers re-breed at 14 days or 35 days post-partum (Harris et al., 1982). Re-mating interval most commonly adopted by Spanish farmers is 11 days post-partum (Rafel, 2001). Also Partridge et al. (1984) reported that in

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United Kingdom, does in large scale production units were usually re-mated 14 to 21 days after kindling, given an optimal output of 7 to 8 litters per doe per year. Performance levels obtained in developed countries for rabbits are reported to be 45 to 60 kits reared per doe per year from approximately six to eleven litters (Lebas, 1983; Partridge et al., 1984; Rajadevan et al., 1986). This level of production is not easily achieved under tropical conditions (Rajadevan et al., 1986).

In most tropical and developing countries, the current practice is weaning kits at the age of 6 - 8 weeks and rabbit does are re-mated thereafter. Under tropical conditions, long rebreeding intervals of 30 to 60 days or more are observed to reduce the number of kits raised per doe per year (Iyeghe-Erakpotobor et al., 2005). Also in the tropics, one of the problems in the management of domestic rabbits is the selection and adoption of a suitable time of mating after parturition especially under intensive system of production. Recent advances in most tropical countries have been to find ways of increasing the number of kits per doe per year probably by reducing weaning age. Thus, Iyeghe-Erakpotobor et al. (2005) studied early re-mating at 14, 21 and 28 days post-partum in a tropical environment. A suitable re-mating interval of rabbits may offer the greatest opportunity for increasing the output of rabbits per year.

The objective of the study was to determine the suitable time of re-mating does in a tropical environment, whereby appropriate re-mating interval of does after kindling could be ascertained.

MATERIALS AND METHODS

Location of the experiment

This research was conducted in the Rabbitry Unit of the Teaching and Research Farm and the laboratories of the College of Animal Science and Animal Health, Michael Okpara University of Agriculture Umudike Abia State. Nigeria. Umudike is geographical located at latitude 5 ^{o} 29 ^{1} N and Longitude 07 ^{o} 33 ^{1} E. It is within the zone characterized by an annual rainfall of about 2177 mm, over a period of 149 to 155 days, relative humidity of 50 to 90%, and temperature range of 22 to 36^{o}C. The light and dark hours (L:D) ratio is 12:12. The meteorological data were collected from the Meteorological Station of the National Root Crop Research Institute Umudike, Abia state Nigeria.

Management of animals

A total of 27 growers from Dutch and chinchilla crosses rabbit does aged 5 months and 4 mature Dutch and Chinchilla crosses of rabbit bucks aged 8 to 10 months weighing between 1.80 to 2.13 kg were used for this study. The rabbits were brought from the Rabbitry Unit of the Research Farm of the Ministry of Agriculture Akwa- Ibom State, Nigeria. The rabbits were quarantined for 2 weeks before they were used for the study. During the quarantine period, they were de-wormed with piperazine phosphate at the dose of 30 mg/ kg body weight and dusted with bactricine powder to clear any load of helminth and mange that may infect the animals. This was to ensure good health conditions before and during the experimental period. The rabbit house was naturally ventilated and the rabbits were reared under clean environmental condition. The rabbits were fed concentrate diet containing approximately 15.00% crude protein, 2.5% fat and 14.0% crude fiber, 2.5 g premix composed of minerals and vitamins added to the concentrate ration to provide balanced nutrient requirement. The animals received 210 g doe $^{-1}$ day $^{-1}$ of concentrate diet during the course of the study. They were provided grass/legume forage *ad libitum*. Forage consisted of *Calopogonium phaseloides, Centrosema pubescens, Gamba grass and Panicum maxima*

Experimental procedures

The experiment was a completely randomized design (CRD) with three re-mating interval 3, 4 and 5 weeks as treatments. The re-mating intervals were represented as Ta, Tb and Tc respectively. Nine (9) does were assigned to each treatment. The does were tagged and housed individually in rabbit cages that were kept in a rabbit house. The does were managed for 2.5 months after quarantine to allow them to attain a mature age at 8 months before they were bred. The bucks were kept in separate cages in the same rabbit house but away from the does. The 4 bucks used in the study helped in maintaining a mating ratio of approximately 1: 7 (buck: does) since it would be stressful for 1 buck to serve 27 does. The bucks were randomly selected for breeding the does. Mating was done by taking each of the does to a buck at random. However, does that were not diagnosed pregnant after 10 days were taken back for another mating. Eventually all the does became pregnant. Towards the end of gestation (26 days after conception), nest boxes were brought into the rabbit doe cages.

After the first kindling the does in all treatments were of the same parity (first parity). Thereafter, the does in all treatments were allowed to nurse and wean their kits at 21 days. The does in Ta group (week 3 re-mating interval) were rebred immediately following the weaning of their kits. The Tb and Tc groups were re-mated 1 and 2 weeks later in other to correspond to 4 and 5 weeks re-mating intervals, respectively, from the time of kindling. The kits kindled after re-mating were weaned at 6 weeks.

Data collection

Data on the parameters studied were collected on individual does in each of the re-mating interval groups Ta, Tb and Tc.

Receptivity: This was determined by the willingness of the doe to mate combined with signs of estrus such as; swelling of the vulva, exposition of the rear quarters and lordosis. Receptivity was scored on the scale of 1 to 3.

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.

$$CR = \frac{\text{Number of Does that conceived}}{\text{Total number of Does mated}} X \frac{100}{1}$$

Gestation length: This was recorded as the interval between conception and kindling.

Stillbirth litter size at birth: Kits born dead were recorded as stillbirth while number of kits born alive were counted and recorded as litter size at birth.

Table 1. Performance of does at different re-mating intervals.

Parameters	Re-mating intervals (weeks)			
	3	**4**	**5**	**LSD**
Receptivity	3	2	1	0.33
Conception rate (%)	100.00[a]	56.17[b]	44.53[b]	11.66
Gestation length (days)	30.83	30.90	30.86	0.38
Stillbirth (%)	3.67[a]	0.00[b]	0.33[b]	0.50
Pre-weaning mortality (%)	0.78	0.67	0.67	0.41
Litter size at birth	4.11	4.56	3.78	0.30
Litter size at weaning	3.77	3.89	3.00	0.27
Litter birth weight (g)	45.21[b]	65.53[a]	63.19[a]	4.23
Litter weaning weight (g)	101.66[b]	152.22[a]	147.22	12.27
Doe weight at mating (kg)	2.09	2.23	2.56	0.13
Doe weight at kindling (kg)	2.24	2.24	2.46	0.14
Doe weight at weaning (kg)	2.22	2.30	2.59	0.12

a, b, means in row with different superscripts are significantly different (P<0.05) Doe: (n = 9)

Litter size at weaning and at 21 days: The number of kits alive at weaning and at 21 days post-partum were recorded as litter size at weaning and at 21 days, respectively.

Body weight: The does were weighed at mating, kindling and weaning of their kits. Litter weight at birth and weekly litter weight after parturition were measured using a sensitive weighing balance.

Statistical analysis. The data generated were analyzed using Analysis of variance. Significant means will be separated using the least significant difference (LSD).

RESULTS

The results of reproductive performance of the different treatment groups are presented in Table 1. Receptivity decreased with increase in re-mating intervals. Does re-mated 3 weeks post-partum accepted male more readily than does re-mated at 4 and 5 weeks intervals. Week 3 re-mating interval was significantly higher (P<0.05) in conception rate (100.00 %) than weeks 4 (56.17%) and 5 (44.53%). There were no significant differences (P<0.05) in the gestation lengths of the different groups (Table 1). Stillbirth of week 4 (0.00 %) and week 5 (0.33 %) were not significantly different (P>.05) in pre-weaning mortality between the different re-mating intervals. Litter size atbirth and at weaning showed no significant differences. Litter birth weight was significantly lower (P< 0.05) for week 3 re-mating intervals than the other treatments (Table 1). Average litter weaning weight of 3 weeks re-mated group was also significantly lower (P<0.05) than those of weeks 4 and 5 re-mating intervals. The body weight of does was not significant different (P>0.05) at mating, kindling and at weaning (Table 1).

DISCUSSION

The high receptivity for the Ta group observed in the study agreed with the reports of Roca (1986) who associated significant red coloration of the vulva to high receptivity. This could explain the ease with which the does in Ta group accepted the male during mating. On the other hand, the decrease in receptivity with increase in re-mating intervals agreed with the reports of Partridge et al. (1984) and Iyeghe-Erakpotobor et al. (2005) who observed that doe's willingness to mate appeared to decrease as post- partum re-mating interval increased. The decrease in conception rate with increase in re-mating interval observed in this study was in line with results of Iyeghe-Erakpotobor et al. (2005) who reported 85% conception rate in does re-mated 14 days, 65 and 50% for re-mating at 21 and 28 days respectively. On the contrary, Yamani et al. (1992) observed high conception rate with increased re-mating interval with 87.9% for 10 days re-mated does, while 5 days re-mating recorded less 66.4%. Low conception rate noted in Tc (week 5) re-mating interval in the present study could be attributed to low receptivity observed in the does in this group.

The significant high average litter weights at birth and at weaning of weeks 4 and 5 re-mated groups compared to week 3 re-mated group could be due to the (Tb and Tc) being opportune to have their reproductive organs undergo some level of involution and also allowed to regain body reserves probably lost during gestation and kindling before re-mating. Most of the postnatal mortality observed in the study occurred within the first week of birth.

It was observed in this study that re-mating at 4 and 5 weeks post-partum afforded some days rest to the does.

This may have reduced physiological stress of lactation on the does and most likely permit adequate feeding for kits as well as reducing the demand on the body reserves of does. This is in agreement with the reports of Fonteh et al. (2005) who made similar observations.

In conclusion, high conception rate, high receptivity, high prolificacy, high weaning weight, large litter size and little or no mortality are the primary focus of rabbit producers for profitable rabbit production. Week 4 re-mating interval recorded the higher weights at birth and weaning, no stillbirth. Based on the following observations, week 4 re-mating interval performed better than the rest and could be recommended for adoption by rabbit producers in the tropical environment.

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