EFFECTS OF BREEDING INTERVALS ON GROWTH AND REPRODUCTIVE INDICES OF HYLA RABBIT IN SOUTH-WEST, NIGERIA

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ABSTRACT
A study was conducted to evaluate the effects of breeding intervals on growth and reproductive performance of Hyla rabbit in South-west of Nigeria. A total of twenty four adult rabbits (sixteen females and eight males) of average 2500 g were used in the study. Does were randomly allotted into the four experimental treatments: T_1 (two weeks), T_2 (four weeks), T_3 (six weeks) and T_4 (eight weeks) breeding intervals with four rabbits per treatment in a Completely Randomized Design with a doe serving as a replicate. Does in each treatment have four parities and the experiment lasted for 15 months. Number of mating per conception (NMC) was decreasing (P<0.05) as breeding interval and parity were increasing. Body weight at conception (BWC) week 1 and 2 were highest (P<0.05) in does on T_4 and 3rd parity. Litter weight at birth (312g), 5th (2731.50g) and 12th week (5709.44g), average weight at birth (52.48g), 5th (552.94g) and 12th week (1317.06g) including litter size at birth (5.94) were at maximum (P<0.05) in T_3. Average weight at birth (53.32g), 5th (536.63g) and 12th week (1336.00g), were highest (P<0.05) in Parity 1. However, litter weight at birth (335.50g), 5th week (2687.43g) and 12th week (5676.65g), litter size at birth (6.07), 5th (5.02) and 12th week (4.26) were peak (P<0.05) at the Parity 4. Stillbirth was not affected by parity. It was concluded that a doe requires a week rest after weaning at 5th week for optimum growth and reproduction of both kit and the doe. Therefore, six weeks breeding interval was recommended to rabbit breeders for most favorable production.

Key words: **Hyla rabbit, breeding intervals, parity, litter weight, litter size**

INTRODUCTION

Rabbit production holds promise for relieving widespread micronutrient and protein malnutrition, while making positive contributions to the sustainable intensification of smallholder agriculture. Rabbit breeding for meat production is a strategic activity and is well suited to the molds of economic, social and environmental sustainability. Although, it is not widespread in Nigeria, the expectations of maintenance and growth are good. 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 and breeding interval.

Reducing the breeding interval in rabbit production is one of the viable methods of increasing the output of weaned kittens (Khan *et al*., 2014). Rabbits could be mated 24 hours after kiddling since rabbits are induced ovulators (Oseni, 2012). However, intensive breeding programs may increase the number of does culled annually due to "burn out". Despite considerable potential of early re-mating, prenatal mortality remains one of the major factors limiting productivity in rabbit (Khan *et al*., 2014).

Therefore, problem in the management of domestic rabbits is the selection and adoption of a suitable time of mating after parturition especially under an intensive system of production. A suitable re-mating interval of rabbits may offer an opportunity for increasing the output of rabbit farming.

In order to indicate the best time to mate rabbit after parturition, this study is designed to evaluate the effects of different breeding intervals on growth and reproductive performance of Hyla rabbit kits and does respectively in south-west Nigeria.

MATERIALS AND METHODS

Experimental Site

This study was carried out at the Rabbit Unit of the Teaching and Research Farm of Osun State University, Ejigbo Campus, Ejigbo. The area is located within the Forest Zone of Nigeria on latitude 7^0 54'0 N and longitude $4^0$18'54^{0}E. The average elevation is 426 metres (1,398 ft) (Monga Bay, 2009). It has average annual rainfall is 1,330 mm. Usually, the rainy season lasts from April to October.

Housing

The animals were housed in galvanized battery cage with each hutch measuring 75 X 75 X 75 cm and raised 80 cm from the floor level. The hutches were thoroughly washed and disinfected with morigad disinfectant and allowed to dry for one week before the animals were brought. Water and feed were available always. The rabbits were placed individually in clearly labeled cells.

Experimental Animals, Diets and Design

A total of twenty four (24) adult rabbits with average weight of 2500g were used in this study. Females were sixteen (16) and eight (8) males. Does were randomly allotted into the experimental treatments of four (4) T_1 (two weeks), T_2 (four weeks), T_3 (six weeks) and T_4 (eight weeks) breeding intervals with four (4) rabbits per treatment in a Completely Randomized Design (CRD) with a doe serving as a replicate. Bucks were used to service does. All rabbits were fed the same concentrate feed for eighteen (18) months of the experiment. All recommended managerial practices were dully observed.

Growth and Reproductive Performance of Rabbit Does and Kits

The rabbits were allowed to adjust to the treatment for four weeks before mating. Does were brought individually to be serviced by the bucks (1 buck: 1doe / treatment). 7th day weight increment and abdominal palpation were used to confirm pregnancy. Doe(s) that was not pregnant was re-mated. Parameters monitored included: weight of doe before mating and doe weight at conception (DWC) for four weeks, number of mating per conception (NMC), gestation period, litter size at birth, weaning at 5th week (Oseni *et al*., 2021) and 12th week, litter (%) at 5th week, 12th week, weight of litter at birth, 5th week and 12th week, average weight of kits at birth, 5th week and 12th week, still birth and mortality (%) of kits at 5th week and 12th week.

Statistical Analysis

Data obtained from the study were subjected to analysis of variance using the general liner model procedure of SAS (2002). Significant differences among treatment means were separated using the pair wise difference ($P<0.05$) in the SAS package.

RESULTS AND DISCUSSION

In Table 1, NMC was decreasing ($P<0.05$) as breeding interval was increasing. This is in line with the result of Tessier *et al*. (2018) who reported that lactation that served as stressor reduced gonadotropin secretion and affect sexual behavior and reproductive efficiency in short breeding interval and increases the NMC as breeding interval decreases but not in accordance with Oguike and Okocha, (2008) who reported that receptivity was higher in 3 weeks breeding interval than 5 weeks. DWC week 1-3 was higher ($P<0.05$) in the does on eight weeks breeding interval because of the does have weaned their kits and rested for weeks hence, they have higher reserves with higher leptin levels, which might have facilitated fertility (Arias-Álvarez *et al*., 2010). Gestation length was not affected by breeding interval ($P>0.05$). Litter weight at birth, 5th, and 12th week, average weight at birth, 5th, and 12th week including litter size at birth were highest ($P<0.05$) in the does on 6 weeks breeding interval (T_3). The concurrent of lactation-gestation period is no more and gonadotropin depression is minor, which allows improving receptivity, ovulation and implantation rate and, consequently, the size of the litter at birth and weaning (Hadid, 2015; Lamothe *et al*., 2015). Mortality (%) at 12th week was greater ($P<0.05$) in does on 2 weeks breeding interval because of long time negative effect on the kits. Bonnano *et al*. (2008) observed that does with poorer conditions because of concurrent of lactation-gestation period raised smaller litters up to 12 weeks. Still birth was higher ($P<0.05$) in does on two weeks breeding interval because of the concurrent of lactation-gestation period and gonadotropin depression is heavy, which does not improve the receptivity, ovulation and implantation rate and, consequently, could cause the still birth (Hadid, 2015; Oguike and Okocha, 2008).

Table 1: Growth and Reproductive Parameters of Does and Kits in Treatments

Parameters	Treatment 1	Treatment 2	Treatment 3	Treatment 4	SEM
NMC	2.88[a]	2.75[b]	2.63[c]	2.38[d]	0.09
DWC (week1) (kg)	2.90[b]	2.63[c]	2.96[b]	3.11[a]	0.01
DWC (week2) (kg)	2.90[c]	2.70[d]	3.05[b]	3.15[a]	0.02
DWC (week3) (kg)	2.99[c]	2.78[d]	3.15[b]	3.25[a]	0.02
DWC (week4) (kg)	3.10	2.96	3.25	3.36	0.02
Gestation length (days)	31.81	32.00	32.00	31.81	0.3
Litter weight at Birth(g)	297.88[b]	269.19[c]	312.00[a]	271.69[c]	9.85
Average weight@ Birth(g)	51.77[b]	51.16[c]	52.48[a]	50.55[d]	1.82
Litter size at Birth	5.75[b]	5.00[d]	5.94[a]	5.44[c]	0.18
Still birth	0.13[a]	0.00[b]	0.00[b]	0.00[b]	0.13
Litter size at 5th week	4.94	4.63	4.94	4.69	0.18
Litter size at 12th week	3.94	4.06	4.25	4.13	0.16
Litter (%)at 5th week	87.47[b]	92.17[a]	84.11[c]	86.65[b]	2.06
Litter (%) at 12th week	69.21[d]	83.13[a]	72.68[c]	75.82[b]	2.15
Average weight at 5th week	487.75[b]	421.63[d]	552.94[a]	465.88[c]	7.62
Average weight at 12th week	1145.19[c]	1226.31[b]	1317.06[a]	1202.94[b]	12.76
Litter weight at 5th week	2412.00[b]	1975.19[d]	2731.50[a]	2175.81[c]	87.54
Litter weight at 12th week	4502.94[d]	5180.00[b]	5709.44[a]	4923.50[c]	241.04
Mortality(%) at 5th week	13.42[b]	6.67[c]	15.89[a]	13.35[b]	1.99
Mortality(%) at 12th week	27.87[a]	16.87[c]	27.33[a]	23.29[b]	2.17

Means within rows with different superscripts are significantly different: P<=0.05, **DWC** means doe weight at conception, **NMC** means number of mating per conception, SEM = standard error of mean.

Table 2 shows that in parity followed the trend of treatment to have least NMC in 4th parity. This is not in line with Oseni *et al*. (2021) who reported that higher NMC was obtained in second parity. It could be as a result of environmental effect. The higher litter size at birth of 6.07 kits obtained in this study was not too

Table 2: Growth and Reproductive Parameters of Does and Kits in Parities

Parameters	Parity 1	Parity 2	Parity 3	Parity 4	SEM
NMC	3.44[a]	2.87[b]	2.31[c]	2.00[d]	0.85
DWC (week1) (kg)	2.89[b]	2.91[b]	2.94[a]	2.88[b]	0.12
DWC (week2) (kg)	2.94[b]	2.95[b]	2.99[a]	2.92[b]	0.14
DWC (week3) (kg)	3.04	3.04	3.07	3.02	0,18
DWC (week4) (kg)	3.16	3.18	3.20	3.14	0.16
Gestation length (days)	31.64	32.30	31.91	31.77	0.25
Litter weight at Birth(g)	324.55[b]	307.94[c]	282.76[d]	235.50[a]	9.52
Average weight at Birth(g)	53.32[a]	51.06[b]	50.26[c]	49.89[d]	1.79
Litter size at Birth	4.60[c]	5.39[b]	6.06[a]	6.07[a]	0.17
Still birth	0.05	0.06	0.01	0.048	0.04
Litter size at 5th week	4.35[c]	4.81[b]	5.02[a]	5.05[a]	0.74
Litter size at 12th week	3.84[c]	4.06[b]	4.22[a]	4.26[a]	0.16
Litter (%) at 5th week	82.94[d]	80.49[c]	92.21[b]	94.76[a]	1.99
Litter (%) at 12th week	70.50[c]	67.04[d]	78.56[b]	84.74[a]	2.09
Average weight at 5th week	536.63[a]	489.23[b]	458.84[c]	443.49[d]	7.38
Average weight at 12th week	1336.00[a]	1236.84[b]	1137.86[d]	1181.00[c]	12.33
Litter weight at 5th week	1937.54[d]	2306.20[c]	2363.84[b]	2687.43[a]	84.79
Litter weight at 12th week	4520.49[d]	4785.12[c]	5333.62[b]	5676.65[a]	233.47
Mortality(%) at 5th week	17.13[b]	20.43[a]	6.64[c]	5.14[d]	1.93
Mortality(%) at 12th week	28.65[b]	32.94[a]	19.66[c]	14.11[d]	2.10

Means within rows with different superscripts are significantly different: P<=0.05, **DWC** means doe weight at conception, **NMC** means number of mating per conception, SEM means standard error of mean.

differ to 5.00 reported by Oseni and Ajayi (2010) and 5.70 kits reported by Oseni *et al*. (2016) for New Zealand rabbits but lower than 6.74 kits reported by Iraqi. (2008). The highest value of litter size at birth obtained in the Parity 4 was in accordance with the findings of Das and Yadav (2007) who reported that litter size at birth was significantly higher in the later parities compared to the earlier ones. This indicated that prolificacy and litter traits improved with doe age and parity. Average weight at birth (53.32g), 5th (536.63g) and 12th week (1336.00g), were highest ($P<0.05$) in Parity 1. However, litter weight at birth (335.50g), 5th week (2687.43g) and 12th week (5676.65g), litter size at birth (6.07), 5th (5.02) and 12th week (4.26) were peak ($P<0.05$) at the Parity 4. Litter (%) at 5th week and 12th week were also utmost in parity 4. This is because of the increased in size and favorable conditions of uterus which allowed more fetus (Oseni and Ajayi, 2010). Stillbirth was not affected by parity.

CONCLUSION

It was concluded that, NMC was decreasing as breeding interval was increasing. Average weight, litter weight and litter size at birth were highest in breeding interval of 6 weeks post partum. Average weight at weaning, 12th week, litter weight at weaning and 12th week were also highest in the does under six weeks breeding interval. Stillbirth occurred in the does of two weeks breeding interval but not observed in the does of other breeding intervals (4, 6 and 8 weeks). Gestation length was not affected by both breeding interval and parity. Litter (%) at 5th week and 12th week were highest in parity 4. Based on the following observations, six (6) weeks breeding interval performed better than the rest and could be recommended for adoption by rabbit producers or breeders in the tropical environment.

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