Vet.Med.J.,Giza. Vol.46, No.4 B (1998):673 -679 .

EFFECT OF MATING SYSTEM ON SOME PRODUCTIVE TRAITS OF NEW ZEALAND WHITE RABBITS

By

A. I. El-Sheikh

Dept. of Animal Husbandry Alexandria University

SUMMARY

Fifty-four primiparous New Zealand White rabbit does were used in the experiment. They were randomly assigned into two groups, to study the effect of breeding system (remating interval after kindling) on some productive traits and economic aspects of rabbits.

Does which were bred 10 days after parturition (semi-intensive breeding system) had average litter size at birth lower (7.70 ± 0.60) than those bred 28 days after kindling (9.67 ± 0.35). The litters produced under the extensive system of mating (28 days after kindling) had higher weights at birth and at 21 days of age (529.48±20.00 and 2493.51±683.86 g, respectively) than those produced under the semi-intensive system (426.52±38.32 and 2217.82±186.63 g, for the two traits, respectively). The mating system also affected litter size at 21 and 28 days of age as well as the litter weight at weaning. The results indicated that the traits under study, in general, were impaired when does are simultaneously pregnant and lactating. The extensive system showed higher economic efficiency measures than the semi-intensive system.

INTRODUCTION

The development of the rabbit industry is strongly associated with regular and dependable production, which requires knowledge of the factors that influence the productivity of these animals. When the female is pregnant during lactation she must supply the nutrients necessary for growth of both foeti and young, and a situation of competition can occur. This can influence the reproductive performance of the does and the growth rate of the young, because energetic requirements for fetal growth and milk production are very high (Chilliard, 1986). Previous investigations have shown that ovulation rate (Harned and Casida, 1969; Lamb et al. 1991) and fertilization of ova (Torres et al., 1977) are lower in lactating than in non-lactating does.

Effects of nursing on embryonic and fetal mortality are controversial. A higher mortality was observed in some experiments (Selme and Prudhon, 1977; Garcia et al., 1983; Garcia and Perez, 1989), whereas no effect was observed in others (Harned and Casida, 1969; Torres et al., 1977; Partridge et al., 1984; Lamb et al., 1988). However, Fortun et al., (1993) have shown that ovulation rate and early mortality were similar in lactating and non-lactating females,. Moreover, fetal weight was reduced by nearly 20% in nursing does compared with non-lactating dams. Recently, Karousa (1998) reported that litter size and litter weight at birth and at weaning were found to be higher in does bred 28 days after kindling than in does bred one day post-kindling.

The objective of this study was to compare between two different systems of mating commonly used in practice:

(a) Semi-intensive breeding system: in which rabbit does were mated 10 days after kindling while they still nursing their young.

(b) Extensive breeding system: in which the does were mated after weaning their young (28 days post-kindling), on some productive traits and economic aspects of New Zealand White rabbits.

MATERIAL AND METHODS

Fifty-four primiparous New Zealand White rabbit does were used in the experiment. Does were assigned randomly at kindling to one of two experimental groups.

Females in the first group were mated 10 days after kindling and were pregnant during nursing their young (Semi-intensive breeding system), whereas females in the second group were allowed to wean their newborn at the age of 28 days and then were mated.

Rabbits were kept in wire cages provided with fresh drinking water available continuously via automatic nipples. All does had ad-libitum access to a commercial pelleted diet containing 17.5% crude protein. Abdominal palpation was carried out 10 days after successful mating for pregnancy diagnosis. After kindling the following productive traits were recorded for each doe:

1- Litter size at birth.
2- Litter size alive at birth.
3- The number of stillbirths per litter.
4- Litter weight alive at birth.
5- Litter size at 21 days of age.
6- Litter weight at 21 days of age.
7- Litter size at weaning.
8- Litter weight at weaning.

The data obtained were statistically analyzed according to Statistical Analysis System (SAS, 1987).

-Economic parameters and efficiency measures:

The following economic parameters were evaluated:

1- Total returns.
2- Total costs = Fixed costs + Variable costs.
3- Net profit = Total returns – Total costs.

- Efficiency measures: The following efficiency measures were studied:-

1- Percentage of total returns / Total costs.

2- Percentage of net profit / Total costs.

3- Capital return rate = $\frac{\text{Net profit}}{\text{Investment costs}} \times 100$

4- Capital cycle = $\frac{\text{Investment costs}}{\text{Net profit}}$

RESULTS AND DISCUSSIONS

I-Productive performance:

The performance results of the rabbit does under the two systems of mating are shown in Table 1.

Productive traits including litter size at birth, litter size alive at birth, number of stillbirths per litter, litter weight alive at birth, litter size and litter weight at 21 days of age and at weaning (at 28 days) were found to be significantly better in females bred 28 days after kindling (extensive breeding system) than those bred 10 days after kindling (Semi-intensive breeding system). The average litter size at birth increased from 7.70 ± 0.60 in semi-intensive system to 9.67± 0.35 in the extensive system. However, the average number of stillbirths per litter was decreased from 0.57 ± 0.33 to 0.32 ± 0.12 in the two systems, respectively.

The higher litter size at birth for the does bred under the extensive system, where the remating interval was longer, might be due to the increased

Table 1. Means ± Standard errors of different productive traits under the two mating systems.

System of mating	No of does	Litter size at birth	Litter size alive at birth	No. of still-births per litter	Litter weight alive at birth	Litter size at 21 days of age	Litter weight at 21 days of age (g)	Litter size at at weaning (g)	Litter weight at weaning (g)
Semi-intensive. Mating System (10 days post-kindling	23	7.70±0.60 b	7.13±0.7 b	0.57±0.33 a	426.52±38.3 b	5.96±0.54 b	2217.3±186.6 b	5.79±0.42 b	3464±64 b
Extens. Mating system (28 days post-kindling	31	9.67±0.35a	9.35±0.3 a	0.32±0.12 b	529.5±20.0 a	7.84±0.24 a	2493.5±683.9 a	7.71±0.26 a	4059±41 a
Overall mean	54	8.68±0.47	8.24±0.51	0.44±0.24	478.0±29.16	6.9±0.39	2355.6±435.24	8.75±0.34	5262±53

Means within the same column not having the same superscript letter are significantly different at (P< 0.01).

ovulation rate in the females that had a longer remating interval for rebuilding body reserves and their ability to balance their energetic requirements. It has been shown previously that the energy balance of rabbit does is negative during the second half of gestation (Jean-Blain and Durix, 1985 and Parig-Bini et al., 1990) and the energy deficit is certainly very high in does that are pregnant and lactating simultaneously (Fortun et al., 1993).. The observed results agree with those reported by Harned and Casida, (1969); Lamb et al., (1991) who stated that ovulation rate in rabbits was lower in lactating does. Moreover, Lopez et al., (1994) and Karausa, (1998) concluded that the increased litter size at birth in non-lacating does could be due to higher ovulation rate than in lactating females. Concerning the number of stillbirths per litter which was higher in does that were bred under the semi-intensive system, Fortun et al., (1993) indicated that fetal survival can be impaired when does are pregnant and lactating simultaneously and early mortality of the young is higher.

The weight of litters alive at birth was found to be higher (529.48 ± 20.00 g) for the kits born under the extensive breeding system than those born under the semi-intensive system (426.52±38.32 g). Fortun et al. (1993) and Tawfeek (1997) attributed this situation to the competition milk production and pregnancy .

Table 2: Means ± Standard errors of different economic parameters and efficiency measures for the two mating systems.

System of mating	No of dam	Total returns/rabbit/ year $\bar{X}$ ± SE	Total costs $\bar{X}$ ± SE	Net profit $\bar{X}$ ± SE	Returns/costs % $\bar{X}$ ± SE	Net profit/total costs % $\bar{X}$ ± SE	Capital retune rate $\bar{X}$ ± SE	Capital cycle $\bar{X}$ ± SE
Semi-intensive system (10 days post-kindling	23	364.26±20.22 a	73.35±0.74 a	290.60±20.0 a	496.60±5.64 b	396.18±5.58 b	968.66±13.97 a	1.2±0.14 a
Extensive system (28 days post-kindling	31	247.00±12.49 b	42.26±0.45b	205.31±12.6 b	584.47±4.93 a	485.82±4.96 a	971.65±9.97 a	1.2±0.003 a
Overall mean	54	305.63±16.35	57.80±0.59	247.95±16.28	540.53±5.28	441.00±10.54	970.15±11.97	1.2±0.071

Means within the same column not having the same superscript letter are significantly different at (P< 0.01)

The trends observed for litter size and litter weight at 21 days of age and at weaning are very similar and thus can be discussed together. Litter size at 21 days of age and at weaning (7.84±0.24 and 7.71 ± 0.26, respectively) tended to be higher in case of does bred under the extensive system than in those bred semi-intensively (5.96±0.54 and 5.79 ± 0.42, for the two traits respectively. Moreover, litter weights at the same ages (21 and 28 days) were found to be 2493.51 ± 683.86 and 4059.55±41.66 g, respectively in case of litters produced extensively. However, the values for the two weights , respectively, were 2217.82 ± 186.63 and 3464.43 ± 64.28g for litters produced under the semi-intensive system.

The lower litter size and litter weight at both 21 and 28 days of age in case of rabbits produced under semi-intensive system could be explained by the reduction in milk production in pregnant lactating does as suggested by Lincoln, (1974); Szendero et al., (1985) and Fraga et al., (1989) who stated that the pregnant lactating does show sharp declines in milk production due to the competition between pregnancy and lactation. Moreover, Hardman et al., (1970) and McNitt and Moody (1988) and Ferraz et al., (1991) postulated that the litter size and litter weight at 21 and 28 days of age are very good indications on milk production and maternal ability, as young rabbits are still dependent on milk from their dams ,although eating some solid food, consequently their survival and weight are due only to the mother's milk and maternal ability. However, Harris (1988) suggested that, for optimal income from fryer production, does should be pregnant while nursing.

II-Economic aspects:

As shown in Table (2), the economic parameters (total returns, total costs and net profit) and the efficiency measures (Return/costs, Netprofit/total costs, Capital return rate and Capital cycle) are significantly different ($P< 0.01$) between the semi-intensive and extensive systems of mating of rabbits. The values for total returns, total costs and net profit were 364.26±20.22, 73.25 ± 0.74 and 290.60 ± 20.00 Egyptian pounds (LE), respectively in case of semi-intensive system . Meanwhile, the same values in case of extensive system were 247.00±12.49, 42.26±0.45 and 205.31±12.60 LE , respectively. These results could be attributed to the higher number of kindlings and litters that could be obtained per year in case of semi-intensive system due to the shorter remating interval.

Concerning the values of economic efficiency measures (Table, 2) including total returns/total costs %, net profit/total cost %, capital return rate and capital cycle, they were higher in case of extensive system than in semi-intensive system. The higher efficiency values of the extensive system could be due to the greater litter size and weight at different periods in this system. These results agree with the findings of Khalil (1987) , Ponsot (1996) and Roca (1996) who attributed the lower efficiency measures in case of semi-intensive of breeding to the limited capacity of the dams to provide nourishment during the

pre- and post-natal growth until weaning, consequently the viability and growth of their young will be impaired.

REFERENCES

Chilliard, Y. (1986): Revue bibliographique: Variations quantitaives et metabolism des lipids dans les tissus adipox et le foie au cours du cycle gestation lactation. Iere partie: Chez La ratte.

Reprod. Nutr. Dev. 26: 1057.

Ferraz, J. B. S, R. K. Johnson and J. P. Eler. (1991): Genetic parameters for reproductive traits of rabbits. J. Applied Rabbit Research, 14: 166-171.

Fortun, L., A. Pruiner, and F. Lebas. (1993): Effects of lactation on fetal survival and development in rabbit does mated shortly after parturition. J. Anim. Sci. 71: 1882-1886.

Fraga, M. J., M. Lorente, R. M. Carabano and J. C. de Blas. (1989): Effect of diet and remating interval on milk production and milk composition of the doe rabbit. Anim. Prod. 48: 459.

Garcia, F., M. Baselga, and M. Pla. (1983): Mortalidades embrionaria Y fetal en las destintas etapas de la gestacion en el conejo de Carne. An. Inst. Nac. Invest. Agrar. 18: 11.

Garcia, F, and A. perez. (1989): Effectos de la lactation Y numero de lactantes sobre la monta, ovulacion Y supervivencia fetal hasta et parto, evaluados por laparoscopia, en conejas multiparas. ITEA. 80: 3.

Hardman, M. J., D. Hull and J. Oyesiku. (1970):

The influence of birth weight and nutrition on postnatal growth of rabbits. Biol. Neonate 16: 306.

Harned, M. A., and L. E. Casida. (1969): Some postpartum reproductive phenomena in the domestic rabbit. J. Anim. Sci. 28: 785.

Harris, D. J. (1988): Comparison of various breeding schedules for commercial rabbit production. J. Applied rabbit Research 11: 120.

Jean-Blain, C. and A. Durix. (1985): Ketone and body metabolism during pregnancy in rabbit. Reprod Nutr. Dev. 25 (3): 545.

Karousa, M. M. (1998): Effect of breeding systems on reproductive performance and maternal behaviour in rabbits. J. Egypt. Vet. Med. Ass. 58, No. 1: 87-99.

Khalil, M. H.; E. A. afifi and J. B. Owen. (1987): A genetic analysis of body weight traits in young Bouscat and Giza White rabbits. Anim. Prod., 45: 135-144.

Lamb, I. C.; G. G. Partridge, M. F. Fuller, and P. A. Racey. (1988): Fertility of the early post-partum, lactating domestic rabbit. Theriogenology. 30: 79.

Lamb, I. C., W. Stachan, G. Henderson, T. Atkinson, W. Lawson, G. G. Partridge, M. F. Fuller, and P. A. Racey. (1991): Effects of reducing the remating interval after parturition on the fertility and plasma concentrations of luteinizing hormone, Prolactine, oestradiol-17 B and progesterone in lactating domestic rabbits. J. Reprod. Fertil. 92: 281.

Lincoln, D. W. 1974. Suckling: A time-constant in the nursing behavior of the rabbit. Physiol. & Behav. 13: 711.

Lopez, M.; Sierra, I.; Vicente, F. and Conesa, A. (1994): The effects of changing the remating interval according to the previous litter size on the reproductive performance of the doe rabbit. Option Mediterraneanes, Serie Seminaries: 8: 337-345.

McNitt, J. I. And G. L. Moody, Jr. (1988): Milk intake and growth rates of suckling rabbits. J. Applied Rabbit Research 11: 117.

Mendez, J.; DeBlas, J. C. and Fraga, M. J. (1986): The effect of diet and remating interval after parturition on the reproductive performance of the commercial doe rabbit. Animal Sci. 62, 1624-1634.

Parigi-Bini, R., G. Xiccato, and M. Cinetto. (1990): Energy and protein retention and partition in rabbit does during the first pregnancy. Cuni-Sci. 6 (1): 19.

Partridge, G. G., S. J. Allan, M. Findlay, and W. Corrigall. (1984): The effects of reducing the remating interval after parturition on the reproductive performance of the commercial doe rabbit. Anim. Prod. 39: 465.

Ponsot, J. F. (1996): Economic and technical management in 1995. The gloom is lifting. Cuniculture No. 131, 209 -213.

Roca, T. (1996): Calculated cost of reproduction in rabbit breeding. Cuniculture No. 129, 96-98.

SAS. (1987): SAS User's Guide: Statistics. SAS Inst. Inc. Cary., NC.

Selme, M., and M. Prud'hon. (1973): Comparison au cours ddifferentes saisons, des taux d' ovulation d' implantation et de survie embryonnaire chez des lapines allaitantes 'a l oestrus post partum et chez des Lapines temoins. J. Rech. Avic. Cunicole Fr., Comm. No. 2 Paris.

Szendro, Zs, S. Szabo-lacza and Kustos. (1985): Milk production, feed consumption and body mass change of does during the suckling period.

Reports of the Research Centre for Anim. Prod. And Nutr. Godollo. PP. 427-437.

Tawfeek, M. I. (1997): Performance of doe rabbits and their youngs as affected by remating interval, litter size and birth and month of kindling in New Zealand White and Bouscat purebreds under Egyptian conditions. Animal Breeding Abstract. Vol. 65. No.4. PP. 293.

Torres, S., M. Gerard, and T. Thibault. (1977): Fertility factors in lactating rabbits mated 24 hours and 25 days after parturition. Ann. Biol. Anim. Biochem. Biophys. 17 (1): 63.