

# EFFECTS OF DIFFERENT INTENSITIES ON REPRODUCTIVE PERFORMANCE OF FEMALE MEAT RABBITS UNDER THE CHINESE NATURAL CONDITIONS

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**Abstract** - 60 yearling New Zealand White pure-bred does on a straight-breeding stud farm and 100 yearling hybrid does on 10 family warrens were selected to examine the reproductive performances under the Chinese conditions and then to evaluate effects of different reproductive intensities on litter characteristics and offspring weaning traits. The result showed that the reproductive ability of does was 5.84 litters on straight-breeding stud farm and 6.74 litters on family warrens. Effects of different reproductive intensities on litter characteristics were not significant ( $P>0.05$ ). Weaning litter weight, individual weaning weight and offspring viability rate decreased with increasing reproductive intensity, although there were no statistical differences ( $P>0.05$ ) on straight-breeding stud farm, differences were observed significantly ( $P<0.01$ ) on family warrens. Considering Chinese natural conditions and technico-economic levels, it was suggested that 5 or 6 litters on straight-breeding stud farm and 6 or 7 litters on family warrens one doe bred per annum were optimum for female meat rabbits.

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## INTRODUCTION

Doe breeding system utilising an optimum intensity is one of the ways improving ability to produce meat per doe and per annum. However, in China, owing to the traditional way and method of mating and feeding, some does reproduced 2 or 3 litters only per year and the reproductive potentialities hadn't been developed entirely (YANG, 1981), whereas, some bred 8 or more litters, but for the higher mortality and losses of the progenies (dead at birth, suckling mortality, etc.), the way ran counter to breeder's wishes.

The objective of the present study was to examine the reproductive performances in female meat rabbits under the regional ecological characteristics of Shandong, China, and to evaluate effects of different intensities for straight-breeding stud farm and family warrens respectively.

## MATERIAL AND METHODS

This experiment was conducted using 60 yearling New Zealand White pure-bred does and 100 yearling hybrid does, respectively, on a 200-doe, New Zealand White straight-breeding stud farm, and 10 family warrens at Tengzhou Country in Shandong province. Female rabbits used in the experiment were serviced and bred between August 1989 and August 1990.

Mating system was considered with mating seasons, breeding environments, rearing techniques, economic conditions, nutritional level, etc. Specially, it would be permitted to revise according to the changes of physiologic status of does, weaned days of litters and possible interaction with various breeding environments. In general, does were bred with natural mating or hand mating and the litters were weaned at 4-5 weeks. Flushing and hormone treatment with GTH (HCG, LRH- A<sub>3</sub>) were used on the does which were hard to settle on account of anoestrus or unobvious symptom of oestrus (SHUO, 1985).

On the straight-breeding stud farm, experimental rabbits were fed *ad libitum* with balanced diets (Table 1), whereas, only 75-100 g daily allowance of supplement diet were fed with to a doe beside fresh forage from May to October or hay from November to April fed to appetite on the family warrens. During the winter and early spring, from November to April, does and bucks were introduced some green fodder.

Performance traits collected from does were : mating date, kindling date, weaning date, number of the sire of each litter, number of mating for the n<sup>th</sup> litter, birth litter size, dead born, number of young rabbits kept alive at birth, birth litter weight, individual birth weight, weaning litter size, weaning litter weight, individual weaning weight, survival rate from birth to weaning.

**Table 1 : Percentage composition and nutritional density of diet**

Ingredient	pregnant does feed	suckler does feed	bucks feed	prestarter feed
Corn meal %	18.0	23.5	18.5	30.0
Soybean meal %	17.5	15.0	18.0	25.0
Wheat bran %	20.0	16.5	21.5	15.0
Barley ground %	12.5	10.5	12.5	18.0
Stir-fried soya %		5.0		
Peanut Vine meal %	30.0	27.0	27.0	5.0
Fish meal %	1.5	2.0	2.0	2.3
Common salt %	0.5	0.5	0.5	0.5
Dicalcium phosphate %				1.6
Stone meal %				1.10
Vitamin complex %				0.30
DL-Metionine %				0.28
L-Lysine %				0.12
Digestible energy (Mj/Kg dry matter)	11.37	11.77	11.53	13.16
Crude protein %	17.61	18.38	18.06	19.08
crude fiber %	12.55	11.15	11.85	5.43
Ether extract %	2.50	2.53	2.54	2.71
Calcium %	0.99	0.94	0.94	1.12
Phosphous %	0.34	0.34	0.41	0.69
Metionine and cystine %	0.37	0.39	0.39	0.68
Lysine %	0.75	0.80	0.77	0.86
Arginine %	1.09	1.16	1.13	1.30

## RESULTS

### Litter characteristics at birth

Litter characteristics for experimental does on the straight-breeding stud farm and family warrens are presented in table 2 and table 3, respectively.

**Table 2 : Litter characteristics for experimental does on the straight-breeding stud farm**

Litters one doe bred per year	Observed number and proportion (%)	Litter size	Live litter size	Birth litter weight (g)	Individual birth weight (g)
4	4 6.90	7.25 ± 1.13	7.25 ± 1.13	366.38 ± 48.32	50.54
5	16 27.59	7.48 ± 1.39	7.38 ± 1.50	378.37 ± 57.27	50.58
6	25 43.10	7.41 ± 1.26	7.33 ± 1.34	376.97 ± 51.36	50.87
7	11 18.97	7.51 ± 1.62	7.48 ± 1.68	377.47 ± 66.68	50.26
8	2 3.45	7.25 ± 1.78	7.19 ± 1.68	322.31 ± 112.37	45.84

**Table 3 : Litter characteristics for experimental does on family warrens**

Litters one doe bred per year	Observed number and proportion (%)	Litter size	Live litter size	Birth litter weight (g)	Individual birth weight (g)
4	5 5.75	7.30 ± 1.89	7.15 ± 1.81	352.00 ± 89.07	48.22
5	8 9.20	7.55 ± 1.93	7.00 ± 2.52	359.00 ± 86.52	47.55
6	22 25.29	8.05 ± 2.83	7.70 ± 2.54	381.82 ± 105.33	47.43
7	26 29.89	7.68 ± 2.05	7.14 ± 1.82	362.37 ± 82.88	47.18
8	22 25.29	7.67 ± 1.93	7.20 ± 1.94	369.09 ± 82.72	48.12
9	4 4.60	8.11 ± 2.05	7.56 ± 1.63	380.00 ± 74.30	46.86

In table 1, performance traits collected on 2 does were not included because of their death after breeding 3 litters. During the trial, 58 does which were taken statistics actually bred 339 litters in all, 2520 young rabbits were born and 2497 were alive at birth. Litters one doe bred per annum distributed 5-7 mostly, and the proportion of does breeding 5-7 litters to the whole sum were 89.99 %, prominently 43.1 % of does produced

6 litters. By comparison, the proportion of does breeding 4 and 8 litters to the whole sum were only 6.90 % and 3.45 % respectively. In general, the reproductive ability of a yearling New Zealand White doe bred per annum on the straight-breeding stud farm under a favourable kept environment, accordingly average birth litter size and number of rabbits born alive per litter were 7.43 and 7.37 separately.

Results from analyses of variance showed that effects of reproductive intensities on the birth litter size, number of rabbits born alive, birth litter weight, individual birth weight weren't significant differences ( $P>0.05$ ), although birth litter weight and individual birth weight were 10.25-13.86 % and about 10 % lower in does bred 8 litters than in those bred 4-7 litters per annum.

Data collected on 87 does were taken statistics finally on 10 family warrens, deleting that of 13 does which were dead, afflicted breeding disturbance (metritis or mammitis) and stolen unexpectedly. Among 586 litters in which 4550 young rabbits were born and 4278 were alive at birth, litters one doe bred per year distributed 6-8 mostly, which made up 80.47 %. In addition, does that bred 6, 7 and 8 litters had a similar proportion to the whole sum while the proportion of does bred 4, 5 and 9 litters were 5.75 %, 9.20 % and 4.60 % to the whole.

No effects of reproductive intensities on the litter size at birth number of rabbits born alive, birth litter weight, individual birth weight were observed ( $P>0.05$ ). Results indicated that a yearling hybrid doe could bred 6.74 litters per year on the family warrens under a favourable kept environment, accordingly, average birth litter size and number of rabbits born alive per litter were 7.76 and 7.73 respectively.

### Weaning traits

Effects of different reproductive intensities on weaning traits for New Zealand White does on the straight-breeding stud farm and hybrid does on the family warrens are shown in table 4 and table 5, respectively.

**Table 4 : Effects of different reproductive intensities on weaning traits on the straight-breeding stud farm**

Litters one doe bred per year	Weaning litter size	Weaning litter weight (g)	Individual weaning weight (g)	Survival rate from birth to weaning (%)
4	6.50 ± 0.93	3655.75 ± 389.67	541.59	93.10
5	6.94 ± 1.23	3673.36 ± 744.27	529.49	92.78
6	6.75 ± 1.10	3664.13 ± 643.28	542.57	91.09
7	6.90 ± 1.28	3687.64 ± 729.15	534.74	91.88
8	6.63 ± 1.31	3471.75 ± 1085.12	524.04	91.45

**Table 5 : Effects of different reproductive intensities on weaning traits on family warrens**

Litters one doe bred per year	Weaning litter size	Weaning litter weight (g)	Individual weaning weight (g)	Survival rate from birth to weaning (%)
4	6.90 ± 1.74	3285.00 ± 954.23 Bb	476.09	96.50
5	6.80 ± 2.47	3470.50 ± 1275.42 Bb	510.37	97.14
6	7.38 ± 2.43	3932.58 ± 1142.09 Aa	532.87	95.84
7	6.88 ± 1.81	3518.57 ± 935.61 Ab	511.42	96.36
8	7.16 ± 1.96	3573.86 ± 895.12 Ab	499.14	93.35
9	7.22 ± 2.38	3458.33 ± 1146.45 Bb	478.99	95.50

A, B : Means in the same column with no common superscript letter differ ( $P<0.01$ ).

a, b : Means in the same column with no common superscript letter differ ( $P<0.05$ ).

Significant difference of reproductive intensities on weaning litter size, weaning litter weight, individual weaning weight and survival rate from birth to weaning were not observed ( $P>0.05$ ) on the straight-breeding stud farm, although weaning traits mentioned above had a decreasing tendency with increasing reproductive intensity. Especially, average weaning litter weight was about 200 g lower in doe bred 8 litters per year than in those bred 6-7 litters.

Result from analyses of variance showed that effects of reproductive intensities on the weaning litter weight were significant differences ( $P<0.01$ ) on family warrens. Average weaning litter weight in does bred 6 litters per year tended to be greater ( $P<0.01$ ) than in those bred 4, 5 and 9 litters, in addition, higher ( $P<0.05$ ) than in those bred 7 and 8 litters.

## DISCUSSION

Shandong province is in warm zone and climate shows off appropriate characteristics in ambient air temperature and humidity, which is favourable for meat rabbit reproduction. Only about two months in a year, from late July to early August, it is not. On account of the summer anoestrus of female and summer sterility of bucks caused by the higher temperature and relative humidity influenced by monsoon (SHU, 1992 ; YAN, 1985 ; DU, 1987). In point of influences in winter, the ambient air temperature in maternity stall can be kept above 5°C and does not affect rabbits' reproduction, provided certain warming treatments. In a word, about 10 months are well-timed and favourable for meat rabbit reproduction.

On the straight-breeding stud farm, the observation that differences in birth litter size, number of young rabbits kept alive at birth, weaning litter size, suckling survival rate under different reproductive intensities were little or no was not surprising. Nevertheless, birth litter weight and individual birth weight, in particular, weaning litter weight and individual weaning weight were lower with increasing reproductive intensity due to the restriction in nutritional value of does diet and keeping techniques, although the effects were not significant ( $P>0.05$ ). Considering the obvious descents of litter and weaning characteristics under a reproductive intensity one doe bred 8 litters per year, also the aim of straight-breeding stud farm which was to produce excellent quality seed rabbits with regard to breeders' requirements, it was suggested that 5 or 6 litters one doe bred per year with litter of 7 or 6 young rabbits were optimum on the straight-breeding stud farm.

On the family warrens, although effects of different reproductive intensities on birth litter weight and individual birth weight were not obvious, differences were testified significantly on weaning litter weight and individual weaning weight, which in does bred 6 litters per year tended to be greater ( $P<0.05$ ) than in those bred 7 and 8 litters, higher ( $P<0.01$ ) than in those bred 9 litters. The particularity of observations that weaning litter weight were lower in does bred 4 and 5 litters than in those bred 6 litters per year was caused by lower proportion of does bred 4 and 5 litters to the whole sum (5.75 %, 9.20 %) and does' individual dissimilarities.

In the present study, the number of weaning rabbits was 27.6, 34.0, 44.3, 48.2, 57.3, 65.0 produced by one doe which bred 4 to 9 litters per annum on family warrens. Whereas, as litters one doe bred 8 or more, weaning weight of rabbits were lower, and then the total rate of offspring viability fell; on the other hand, growing stage would be prolonged, especially when the nutritive and raising conditions were poor. Also, considering the lower proportion of does breeding 8 litters or more to the whole sum (28.29 %), it was very difficult that does bred over 8 litters under Chinese natural conditions and technico-economic management level.

Thus, our study demonstrated that litters one doe bred per year ought to be controlled at 6 or 7 with evening up litter of 7 or 6 on family warrens, and then one doe was able to breed about 42 weaning thrive rabbits per annum.

## IMPLICATION

In summary, our study showed clearly that if a doe utilised an optimum reproductive intensity, then weaning litter weight, individual weaning weight and weaning litter size tended to be greater, also significantly on family warrens under the Chinese natural conditions and technico-economic management level. Thus, considering Chinese conditions, it was suggested that 6 or 7 litters one doe bred per year and 7 or 6 young rabbits evened up per litter on family warrens were optimum, from a breeding stand point, litters one doe bred per year ought to be controlled at 5 or 6 with litter of 7 or 6 on the straight-breeding stud farm.

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