

Factors influencing pre-weaning growth of rabbits under farm condition

Karu. Pasupathi*, M. Sakthivel, H. Gopi, D. Balasubramanyam and M. Babu

Assistant professor, Institute of Animal Nutrition, Kattupakkam – 603 203, Kancheepuram District

Abstract— The study was carried out to evaluate the effect of various factors influencing economic traits of rabbits under farm conditions. The traits included were litter size at birth, litter size at weaning, litter weight at birth, litter weight at weaning, birth weight and weaning weight of individual kit and the factors were breed, year, season, sex of the offspring and litter size at birth. The average litter size at birth and weaning were 5.00, 5.06, 5.28 and 4.15, 4.17, 4.82 for New Zealand White, Soviet Chinchilla and White Giant breeds, respectively. The litter weight at birth as well as weaning was significantly influenced by the breed. The year and season effects were not significant on traits like litter size and weight at birth as well as weaning. The year had significant effect on birth and weaning weights whereas the season had significant effect on birth weight. The effect of litter size on birth and weaning weight was significantly different among different litter sizes. The birth weight and weaning weight significantly decreased with the increasing litter size and the possible causes were also discussed.

Keywords- rabbit, non-genetic factors, litter traits, growth traits

I. INTRODUCTION

Rabbit farming is gaining momentum in India due to its high production potentials, high mothering ability, adaptability to a wide range of conditions, high genetic variability, high roughage utilization and low cost of production. Rabbit production appears as an attractive proposition for the supply of high quality meat especially in India. The increased livestock production in India can be achieved by rearing animals of short generation interval like rabbits by small scale farmers. In rabbit farming, litter size and litter weight are the important economic traits which are to be genetically improved for obtaining maximum productivity ultimately, increased profit. Litter size at birth had been identified as one of the main traits affecting the profit functioning of rabbit farm [1].

Before weaning, the kits are highly dependent on the output of their mother's milk and the number of suckling kits affects their individual milk intake and body growth. Until 21st day of age the kits are solely dependent on mother's milk and the intake of milk by the individual is affected by litter size at birth [2]. The litter size at birth significantly influence the post-birth body weight of rabbit kits due to the fact that the relative share of milk per kit decreases as the litter size increases. Litter weight at birth, weaning and other ages as its affect dam reproductive traits has been studied by many authors [3], [4], & [5]. Reference [6] observed that pre-weaning performance traits such as weight gain up to weaning, weaning percentage and weaning weight influence the herd productivity.

In India, the study on rabbits is limited and particularly the pre-weaning performance in rabbits is scanty. Hence, the present study is to evaluate the effect of litter size on birth weight and weaning weight in rabbits.

II. MATERIAL AND METHODS

A. Animals and study place

The animals for the study were taken from Rabbit Breeding Unit of Post Graduate Research Institute in Animal Sciences, Kattupakkam, Tamilnadu. Three breeds of rabbit viz., New Zealand White, Soviet Chinchilla and White Giant were studied for their performance based on their litter size at birth and weaning and body weight at birth and weaning.

B. Management Practices

The rabbits were maintained in cage system of rearing. The male and females were housed in individual Galvanised Iron cages with the dimension of 2' x 1.5' X 1.5' kept above 3 feet from the ground level. The side walls were constructed up to 1' height and above that 1" weld mesh were placed. Fresh air was circulated in the rabbit house by using exhaust fans. Before kindling, the nest boxes were provided for the pregnant does. After kindling, nest boxes were checked every day for any dead kits. The data on birth weight and weaning weight with along with litter sizes were recorded in the morning before feeding. The weaning was practised on 42nd day. The rabbits were fed with concentrate mash feed (16% CP and 2500 kcal DE) every morning and in the evening, *Desmanthus virgatus* was offered. Clean portable water was supplied for drinking and the water availability was ensured all the time.

C. Data collection and statistical analysis

The data were collected for a period of three years (2006 to 2008).. The data comprised of litter size at birth, litter size at weaning, litter weight at birth, litter weight at weaning, birth weight and weaning weight of individual kit. The effects of various factors considered to be influencing the traits under study were breed, year, season, sex of the offspring and litter size at birth. The primiparous and multiparous animal data were pooled and analyzed. Each animal three to four parities within the period was analyzed. According to the agro-climatic condition prevailing in the study area, the year was divided into three seasons namely summer (March to June), autumn (July to October) and winter (November to February). The effects of breed (3 breeds), year (3 years) and season (3 seasons) on litter size and litter weight both at birth and weaning were studied. In addition, the effects of sex of the offspring, breed, year, season and litter size on birth weight and weaning weight of the individual kit were also studied. The records with at least two kits in the litter size were considered for the analysis. The data size was 137 individual records. The data were analyzed using statistical software package SPSS¹⁷.

III. RESULTS AND DISCUSSION

The results based on the analysis were summarized in the Tables I and II. The average litter size at birth were 5.00, 5.06 and 5.28 for New Zealand White, Soviet Chinchilla and White

Giant breeds, respectively whereas the average litter size at weaning for the three breeds were 4.15, 4.17 and 4.82. The statistical analysis revealed that the breed effect on these two traits was not significant. However, the effect of breed was significant on litter weight at birth and litter weight at weaning. This observation agrees with the reports of [3], [7], [8] & [9].

TABLE I. LEAST SQUARE MEANS (\pm STANDARD ERROR) OF BREED, YEAR AND SEASON FOR LITTER SIZE AND LITTER WEIGHT AT BIRTH AND WEANING

| Parameters | Litter size at birth | Litter weight at birth | Litter size at weaning | Litter weight at weaning |
|-------------------|----------------------|---------------------------------|------------------------|-----------------------------------|
| Breed | | | | |
| New Zealand White | 5.00 \pm 0.18 | 236.70 \pm 8.01 ^a | 4.15 \pm 0.19 | 2148.37 \pm 98.15 ^a |
| Soviet Chinchilla | 5.06 \pm 0.31 | 271.18 \pm 13.50 ^b | 4.17 \pm 0.33 | 2842.09 \pm 170.10 ^b |
| White Giant | 5.28 \pm 0.32 | 214.77 \pm 13.88 ^a | 4.82 \pm 0.34 | 2249.54 \pm 165.51 ^a |
| Year | | | | |
| 2006 | 5.52 \pm 0.34 | 250.68 \pm 15.17 | 4.40 \pm 0.37 | 2225.93 \pm 185.29 |
| 2007 | 4.96 \pm 0.26 | 251.04 \pm 11.18 | 4.14 \pm 0.27 | 2466.56 \pm 137.07 |
| 2008 | 4.86 \pm 0.20 | 240.93 \pm 8.87 | 4.60 \pm 0.22 | 2547.51 \pm 108.72 |
| Season | | | | |
| Jul – Oct. | 5.25 \pm 0.31 | 242.22 \pm 13.64 | 4.32 \pm 0.34 | 2345.88 \pm 167.18 |
| Nov – Feb | 5.02 \pm 0.25 | 235.88 \pm 10.87 | 4.41 \pm 0.27 | 2513.38 \pm 133.29 |
| Mar – Jun | 5.08 \pm 0.22 | 244.55 \pm 9.63 | 4.41 \pm 0.24 | 2380.74 \pm 118.09 |

^{a, b} Means with different superscripts are significantly different ($P < 0.05$)

In this study, the Soviet Chinchilla breed (litter weight at weaning as 2.8 kg) was highly significantly ($P < 0.01$) different from the other two breeds in litter weight at birth and litter weight at weaning. The Soviet Chinchilla breed showed 12.7% and 24.4% more litter weight at birth and at weaning than New Zealand White breed; and 21.03% and 20.8% and more than White Giant

TABLE II. LEAST SQUARE MEANS (\pm STANDARD ERROR) OF BREED, YEAR, SEASON AND LITTER SIZE FOR INDIVIDUAL WEIGHT AT BIRTH AND AT WEANING

| | Birth weight | Weaning weight |
|------------------------------|--------------------------------|---------------------------------|
| Sex | | |
| Male | 46.17 \pm 0.57 | 557.99 \pm 7.63 |
| Female | 47.54 \pm 0.61 | 567.39 \pm 8.17 |
| Breed | | |
| New Zealand White | 42.07 \pm 0.76 ^a | 533.29 \pm 7.24 ^a |
| Soviet Chinchilla | 50.77 \pm 0.80 ^c | 601.29 \pm 10.61 ^b |
| White Giant | 47.80 \pm 0.54 ^b | 553.50 \pm 10.05 ^a |
| Season | | |
| Jul – Oct | 46.43 \pm 0.77 ^a | 580.57 \pm 10.33 |
| Nov – Feb | 46.26 \pm 0.69 ^b | 547.69 \pm 9.21 |
| Mar – Jun | 47.94 \pm 0.55 ^b | 559.81 \pm 7.35 |
| Year | | |
| 2006 | 45.92 \pm 0.88 ^a | 536.66 \pm 10.82 ^a |
| 2007 | 49.35 \pm 0.67 ^b | 606.81 \pm 8.88 ^b |
| 2008 | 45.39 \pm 0.55 ^a | 544.60 \pm 7.37 ^a |
| Litter size (numbers) | | |
| 2 | 51.39 \pm 2.05 ^c | 717.04 \pm 27.37 ^d |
| 3 | 49.88 \pm 0.93 ^d | 598.16 \pm 12.35 ^c |
| 4 | 48.45 \pm 0.72 ^{cd} | 577.12 \pm 9.65 ^{bc} |
| 5 | 47.28 \pm 0.66 ^{bc} | 575.04 \pm 8.81 ^{bc} |
| 6 | 45.61 \pm 0.49 ^{ab} | 530.77 \pm 6.56 ^{ab} |
| 7 | 47.63 \pm 0.85 ^{ab} | 510.23 \pm 11.37 ^a |

^{a, b, c, d, e} Means with different superscripts are significantly different ($P < 0.05$)

Season: Change by summer, autumn, winter.

The statistical analysis revealed that the year effect was not significant on all the four traits *viz.*, litter size at birth, litter size at weaning, litter weight at birth and litter weight at weaning. Similarly, the effect of season was also not significantly affecting the traits. These results agree with the earlier findings of [10] although contradictory to the findings of [11] that the month of birth had significant effect on average birth weight of kits and the kits born in winter months were observed to have heavier birth weights. Reference [12] also observed heavier birth weight in winter kindlings.

The effect of sex of the kits on birth weight and weaning weight revealed that the female kits had slightly higher weight than the males. However, the statistical analysis revealed that the effect of sex was not significantly affecting the weight at birth as well as weaning. The breed effect was significant among the three breeds for birth weight, being the highest body weight of kits recorded from the Soviet Chinchilla breed and the lowest from New Zealand White. Similarly, the effect of breed on weaning weight was significantly different in Soviet Chinchilla from the other two breeds.

The season effect on birth weight was significantly different in autumn from the other two seasons whereas the effect of season on weaning weight was not significantly different among the three seasons. The year effect was significantly different in the second year *i.e.*, 2007 compared to other two years in affecting both the traits *viz.*, birth weight and weaning weight of individuals. This can be attributed to the factor that the availability of good quality roughage feed during the year.

The analysis revealed that the effect of litter size on birth weight and weaning weight was significantly different among different litter sizes. The weights were maximum when the litter size was two being the average birth weight and weaning weight as 51.39 g and 717.04 g, respectively. The mean weaning weight was minimum (510.23 g) when the litter size was seven in the study. Being negatively correlated, the litter size and birth weight has strong impact on future growth performance of the kits. The results indicated that the litter size had strong influence on birth weight, in turn the weaning weight. It is also observed that the weaning weight significantly decreased with the increasing litter size. These finding on weaning weight agree with the reports of [13] that the kits weaned in litter of 2 or 3 were heavier than those weaned in larger litter. He also reported that litter size at birth significantly influenced the weaning weight of rabbits due to the relative share of milk which was decreased as the litter size increased. Reference [14] reported that the birth weight and litter size exerted a marked joint effect on average daily gain which in turn reflected in weaning weight. He also reported that the intra-uterine localization of fetuses also affects the birth weight of kits, being situated closer to ovary were larger than those closer to the cervix.

IV. CONCLUSION

The study revealed that litter weight at birth as well as weaning was significantly influenced by the breed. The breed and litter size had great influence on birth weight and weaning weight of individual kits. The season of birth had significant influence on birth weight and the year of birth had considerable effect both on birth weight and weaning weight. In the present

study, the Soviet Chinchilla breed showed higher litter weight at birth as well as weaning and maximum weight at birth and weaning. Future genetic and nutritional studies are required to add further information on successful rabbit farming.

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