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EFFECT OF BREED AND SEASON ON RABBIT PRODUCTION UNDER SUBTROPICAL CLIMATE

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Abstract: The productive and reproductive performances of New Zealand White and Soviet Chinchilla breeds of rabbit were studied in the sub-tropical climate of Tripura, India. Data from 317 litters were collected and studied. The only significant differences between the two breeds involved the number of services per conception and the inter-kindling interval which were significantly (P<0.01) higher in the New Zealand White than in the Soviet Chinchilla breed. Neither breed nor gender had any significant effect on individual body weight at weaning (42 d) or at day of slaughter (90 d). The season of kindling exerted a highly significant (P<0.01) effect on the service period, kindling interval, and individual weight at weaning and at slaughtering age. Winter (November – March) was the most favourable season for kindling, whereas summer (April-June) proved to be the most unfavourable season in terms of both productive and reproductive efficiency. The season of kindling did not affect age at the first fertile service, age at first kindling, the gestation period or the litter size at birth.

Key words: New Zealand White, Soviet Chinchilla, rabbit, season, production, reproduction.

INTRODUCTION

North-Eastern India is mostly inhabited by a tribal population and, generally speaking, meat is one of the major protein sources in this part of India. This particularly applies to Tripura. Among the tribal population of this region, social custom imposes a minimum prohibition on meat consumption from meat derived from domesticated or wild animals. Regardless of this there is still a wide gap between meat demand and production in this specific area. Moreover, the cost of feed is very high due to the land-locked situation of the Tripura region and, as such, production costs are also high. In this context, rabbits would provide a new avenue for meat production and could play a major role in augmenting the supply of animal protein. This is mainly due to their small size, low space requirement, rapid growth rate, high reproductive efficiency and their capacity to utilize feed non-competitively with other farm animals and humans. In addition, one of the major advantages of rabbit farming in this area is that forage and agricultural by-products which are unsuitable for human consumption can be used as animal feed, thus lowering production costs. Rabbit meat is delicious, tender, juicy and high in protein content with little fat, making it suitable for the entire population. To date, no study has been carried out on the adaptability of any rabbit breed for profitable meat production in Tripura. Therefore, the present investigation was

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undertaken to study both the productive and reproductive performances of two rabbit breeds, the Soviet Chinchilla (SC) and the New Zealand White (NZW), in addition to their adaptability to the climatic conditions of this area.

MATERIALS AND METHODS

Data on 317 litters belonging to two breeds of rabbits, viz. SC and NZW, maintained at the ICAR Centre in Tripura, were collected and analysed over the period 1998-2005. Only these two breeds were selected due to their easy availability as a rabbit breed from the nearby region. The place of study was located at $22^0$56' to $24^0$32' north latitude and $91^0$10' to $92^0$21' east longitude, an area characterized by a warm and humid subtropical climate with 3 distinct seasons: summer (April-June), rainy season (July-October) and winter (November-March). Maximum and minimum temperatures generally vary from 24.2 to 35.1^{0}C in summer and from 8.4 to 24.5^{0}C in winter with an average rainfall of 2065 mm. From 42 d of age (following weaning), the rabbits were kept in individual cages constructed from galvanized welded wire (size: 45×55×42 cm). These cages were constructed for single row use in a well-ventilated concrete house. Commercial pellets and green fodder (cauliflower, cabbage, radish, carrot, cow pea, maize, mulberry and spinach leaves) grown at a rabbit farm (25-30: 70-75 as commercial pelleted feed and green fodder) were used for their feed. Three types of commercial rabbit feed were used in this study. For maintenance, adult does and bucks were fed with 60 g of commercial concentrate feed containing 16% crude protein (CP) and 65% total digestible nutrients (TDN), whereas the CP and TDN content of the commercial concentrate feed for lactating does (140-150 g per doe daily) was 17 and 70%, respectively. Growing rabbits were fed with 40-60 g of concentrate containing 17% CP and 70% TDN. Feeding and management practices were uniform throughout this period. Females and males were allowed to be used for mating from the age of six and seven months, respectively. The female was taken to the male's cage for breeding purposes. Where unsuccessful mating occurred, the same procedure was repeated after 4 d. Pregnancy diagnosis was performed between the 15th and 17th d following mating. If pregnant, the doe was managed and fed accordingly or otherwise immediately mated. Females were allowed to rebreed immediately after weaning (42 d).

A total of 190 litters of the SC breed and 127 litters of the NZW breed were studied throughout the whole period. Data were recorded from 71, 164 and 82 litters during summer, winter and rainy seasons, respectively. The productive and reproductive traits included in this study were age at first fertile service, age at first kindling, gestation period, litter size at birth and weaning, litter weight at birth, and individual weight at weaning (42 d) and at slaughter (90 d). The pre-weaning (0-41 d) and post-weaning (42-90 d) mortality of both breeds were also studied. To analyse the effect of the kindling season on the productive and reproductive traits, a least-squares analysis was carried out (Harvey, 1975). For comparisons among pairs of means, Duncan's multiple range test (DMRT), as modified by Kramer (1957), was used.

RESULTS AND DISCUSSION

Age at first kindling for both SC and NZW breeds did not differ significantly (Table 1). Bujarbaruah *et al*. (1989) reported a significantly younger age at first kindling in the NZW breed as opposed to that found in the SC breed. This was probably due to the different enviromental conditions. Furthermore, in contrast to previous findings (Bujarbaruah *et al*., 1989), the NZW breed required a greater number (P<0.01) of services per conception and showed a greater (P<0.01) inter kindling intervals than the SC breed (Table 1). Once again, this discrepancy could be due to environmental effects on the breeds as that study was conducted under cold and dry climatic conditions.

Table 1: Effect of breed (New Zealand White and Soviet Chinchilla) on some performance traits (sample size in brackets).

Characters		Breeds (mean ± standard error)	
		New Zealand White	Soviet Chinchilla
Age at first kindling (d)		224.2 ± 5.7 (50)	220.1 ±7.3 (58)
Gestation length (d)		30.4 ± 0.6 (127)	30.2 ± 0.4 (190)
Kits born alive		6.1 ± 0.6 (127)	6.6 ± 0.7 (190)
Litter weight at birth (g)		321.2 ± 14.7 (127)	357.4 ±12.0 (190)
Services per conception rate		2.1 ± 0.1[a] (127)	1.8 ± 0.2[b] (190)
Inter kindling interval (d)		98.7 ± 3.3[a] (109)	86.6 ± 2.2[b] (190)
Number of weaned rabbit		596	986
Mortality rate:	Pre weaning	23.1	20.9
	Post weaning	08.7	07.6
Individual weight at weaning (kg)	Male	0.69 ± 0.06	0.72 ± 0.08
	Female	0.70 ± 0.10	0.70 ± 0.13
Individual weight at 90 d (kg)	Male	1.94 ± 0.10	1.99 ± 0.07
	Female	1.89 ± 0.02	1.89 ± 0.06

Means within a row with different superscripts differ $P< 0.01$.

Other performance traits such as gestation length, litter size at birth and litter weight at birth did not differ between the two breeds. Pre- and post-weaning mortality were 23.1 and 8.7% for the NZW and 20.9 and 7.6% for the SC. These results are comparable to those reported from the sub-temperate region of India (ANON, 2003-04). Litter size at birth and weaning are important economic traits, which actually determine the number of kits for future breeding programmes and lifetime productivity. In this study, neither breed nor gender had any effect on individual body weight at weaning (42 d) or at day of slaughter (90 d). This concurs with the observations of Damodar and Jatkar (1985) in a sub-tropical climate, Kumar *et al*. (2001) in semiarid areas, and Biswas and Somvanshi (1993), Deb and Gaur (1996) in a sub-temperate hill region of India. Contrary to this, Kulkarni *et al*. (1995) reported a higher body weight in the NZW than in the SC breed at week 6 (weaning age) and at week 14 (slaughtering age).

The number of kidding per doe was 2.54 and 3.28 in NZW and SC respectively. This was low due to the lower number of cages available for this trial. As such, a culling strategy was adopted to continue the breeding programme for these breeds.

The prolonged hot and humid climate typical of this region is another factor which can limit the reproductive performance of rabbits in this part of India (Table 2). In this study, both breeds attained adequate individual body weights at 42 d and 90 d, these being comparatively higher than those reported from other regions of India with different agro-climates (Biswas and Somvanshi, 1993; Kumar *et al*., 2001; Gupta *et al*., 2002).

The season of birth had a highly significant ($P<0.01$) effect on the individual body weight at weaning as well as at the day of slaughter. A rabbit born during the winter and rainy seasons attained a significantly ($P<0.01$) higher body weight than an animal born during the summer season (Table 2). The seasonal effect upon the early growth performance of rabbits was also reported by Khalil *et al*. (1987) and Kumar *et al*. (2001). The difference associated with the kindling season can be attributed to the prevalent environmental conditions and to stress factors affecting feed intake (Eberhart, 1980). The higher growth

Table 2: Effect of season (summer, winter and rainy) on some performance traits (sample size in brackets).

		Kindling season (mean±standard error)[1]		
	Overall	Summer	Winter	Rainy
Age at first fertile service (d)	191.1 ± 6.3 (118)	201.2 ± 7.6 (27)	186.0 ± 5.3 (63)	186.3 ± 6.3 (28)
Age at first kindiling (d)	221.1 ± 6.5 (118)	231.4 ± 8.2 (25)	217.8 ± 5.1 (62)	217.3 ± 6.2 (31)
Gestation length (d)	30.3 ± 0.5(317)	30.4 ± 0.5 (71)	30.2 ± 0.6 (164)	30.3 ± 0.5 (82)
Service period (d)	62.9 ± 2.3 (299)	69.2 ± 2.3^{a} (64)	56.9 ± 2.1^{b} (158)	62.7 ± 2.3^{b} (77)
Kindling interval (d)	93.2 ± 2.7 (299)	99.6 ± 2.3^{a} (64)	87.0 ± 2.2^{b} (158)	93.1 ± 3.3^{b} (77)
Kits born alive	6.4 ± 0.6 (317)	6.0 ± 0.6 (71)	6.6 ± 0.3 (164)	6.4 ± 0.5 (82)
Number of weaned rabbits	5.4 ± 0.6 (292)	5.0 ± 0.6 (62)	5.7 ± 0.4 (156)	5.5 ± 0.5 (74)
Litter weight at birth (g)	338.62 ± 9.65 (317)	322.22 ± 17.42 (71)	349.31 ± 9.48 (164)	342.82 ± 10.26 (82)
Individual weight at weaning (42 d)	0.702 ± 0.06 (1582)	0.682 ± 0.08^{a} (306)	0.717 ± 0. 04^{b} (875)	0.706 ± 0.05^{b} (401)
Individual weight at slaughter (90 d)	1.93 ± 0.06 (1455)	1.82 ± 0.07^{a} (276)	2.01 ± 0.03^{b} (812)	1.95 ± 0.04^{b} (367)

[1]Means with at least one superscript in common do not differ significantly (P<0.01).

rate could also be due to the availability of abundant supplies of green forage in winter as well as during the rainy season.

The overall mean age at first fertile service, age at first kindling and the gestation length of rabbits under study were 191±6, 221±7, and 30±0.5 d, respectively (Table 2). Any variations in these traits due to the kindling season were not significant. The mean age at first fertile service was comparable to that reported by Das and Nayak (1991) and Choudhary *et al*. (2001) under hot and humid climatic conditions. The service period and kindling interval were significantly affected (P<0.01) by the kindling season. The winter season was found to be the best season for kindling with the shortest reported service period and kindling interval. The seasonal influence on the service period and kindling interval was also reported by Hoffman *et al*. (1989) and Choudhary *et al*. (2001). Season had no significant effect on litter size at birth (mean: 6.35±0.62) or at weaning (mean: 5.39±0.58). Season had no influence on the litter weight at birth. It has also been observed that the maximum kindling took place during the winter season (164) followed by the rainy season (82) and summer (71), illustrating that winter is the most favourable season for the conception, kindling and after birth care of newborns (Table 2).

From the results of the present study it is possible to conclude that both breeds, under observation for early growth and reproduction, performed equally well in the Tripura climate and could be used for profitable meat production. The season of birth affected the individual weight at weaning as well as at marketable age or slaughter age. The winter season presented the most beneficial values for rabbit performance in a subtropical climate, whereas the summer season offered the worst returns.

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