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Full Length Research Paper

Effect of genetic and non-genetic factors on post-weaning body weight in rabbits

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A complete 3 x 3 diallel cross was performed involving White Giant (WG), Soviet Chinchilla (SC) and Grey Giant (GG) breeds of rabbits at the University rabbit farm under the Centre for Advanced Studies in Animal Genetics and Breeding, College of Veterinary and Animal Sciences, Kerala, India to study the growth performance of rabbits with respect to different genetic and non-genetic factors. Growth records of F_1 progeny were taken at fortnightly interval from four to twelfth weeks of age. The results revealed that among purebreds, the highest post-weaning body weights at fourth, sixth, tenth and twelfth week were recorded in White Giant (WG). Among crossbreds, progenies of WG male crossed to GG female (WGxGG) recorded the highest post-weaning weight from fourth to twelfth week. Season of birth had an influence on fourth and sixth week body weights.

Key words: Diallel, litter size at birth, weight and age of dam at kindling, season of birth, sex of kit.

INTRODUCTION

Rabbit industry is gaining its momentum in State like Kerala, India where majority of the farmers are marginal and landless who cannot afford a high initial investment for farming. Rabbit, compared to other livestock species requires low investment at the same time are highly prolific, attains maturity at an early age, grows rapidly and efficient in conversion of feed into meat. In addition, the rabbit meat is white in color, easily digestible, low in cholesterol and sodium content. These potential of rabbits can be well utilized at a commercial or small scale level to address the problems of food scarcity of the country. Only limited studies have been conducted on the performance of rabbits in tropical countries, where climate, diet, management and stock resources can differ markedly from those in temperate countries. It is evident that the body weight and growth rate of weaned rabbits depend on various factors viz., age and weight of dam at kindling, litter size at birth, season of kindling, sex of litters etc (McReynolds, 1974; Bhasin *et al.,* 1996). Keeping these in view, this study was undertaken to estimate genetic and different non-genetic factors affecting growth traits in broiler rabbits.

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MATERIALS AND METHODS

Animals and data

The experiment was carried out at the University rabbit farm under the Centre for Advanced Studies in Animal Genetics and Breeding, College of Veterinary and Animal Sciences, Thrissur, Kerala India. White Giant (WG), Soviet Chinchilla (SC) and Grey Giant (GG) breeds of rabbits formed the foundation stocks in this program. A complete 3 x 3 diallel cross was performed with a total of 44 does (12 WG, 17 SC and 15 GG does) and nine bucks (three bucks from each breed) of three parental purebreds of WG, SC and GG in two different seasons. The data were generated from first filial generation kits produced by crossing in all possible combinations of the three parental groups with minimum of four full sib groups in each set of crosses. Daily ration consisted of *ad libtum* green fodder and 50 to 200g of concentrates consisting of 15 to 20 percent crude protein depending on the age and size. The animals had access to drinking water round the clock. Body weight of each animal was record-

Table 1. Least squares means of body weights (g) according to weight and age of dam at kindling, season of birth and sex.

Source	4th week weight	6th week weight	8th week weight	10th week weight	12th week weight	14th week weight
Litter size						
1 to 4	437.42±12.10[a] (90)	679.18±19.99[a] (90)	839.40±25.95[a] (87)	953.51±31.52[a] (78)	1107.77±34.37 (68)	1319.18±36.63 (61)
5 to 8	373.11±14.18[b] (128)	570.76±23.48[b] (114)	741.23±31.44[b] (85)	871.98±39.09[b] (75)	1105.79±42.16 (61)	1291.49±43.87 (60)
9 to 11	315.61±23.65[c] (15)	494.29±42.12[c] (12)	673.97±55.24[b] (11)	836.69±84.57[b] (6)	996.86±93.06 (5)	1326.27±119.34 (3)
Weight of dam at kindling						
2 to 2.5 kg	399.61±18.91[a] (40)	599.36±31.52[a] (40)	787.31±41.70[a] (37)	883.36±54.11 (36)	1082.35±58.05 (34)	1309.32±66.99 (32)
2.5 to 3 kg	344.28±13.22[b] (133)	546.57±22.61[b] (120)	697.55±29.28[b] (102)	853.17±38.60 (87)	1040.56±42.34 (69)	1288.37±49.44 (64)
Above 3 kg	382.25±15.30[a] (60)	598.31±25.62[a] (56)	769.73±34.70[a] (44)	925.65±48.40 (36)	1087.50±52.36 (31)	1339.25±62.20 (28)
Age of dam at kindling						
Below 1000 days	343.16±9.26[a] (187)	529.84±16.26[a] (171)	689.44±21.46[a] (144)	840.14±31.73 (125)	1006.38±35.29 (106)	1255.16±41.47 (101)
1000 to 2000 days	353.68±14.41[a] (39)	529.21±24.19[a] (38)	731.54±33.52[b] (32)	891.74±46.38 (27)	1106.15±50.54 (22)	1384.11±63.67 (18)
Above 2000 days	429.30±30.88[b] (7)	685.18±50.96[b] (7)	833.61±64.92[b] (7)	930.29±80.29 (7)	1097.89±87.60 (6)	1297.67±96.52 (5)
Season of birth						
Cold	394.17±16.25[a] (56)	610.24±27.16[a] (56)	759.15±35.98 (51)	889.39±48.71 (45)	1061.00±51.84 (39)	1293.78±60.69 (37)
Hot	356.59±13.21[b] (177)	552.58±22.23[b] (160)	743.91±28.72 (132)	885.40±38.89 (114)	1079.27±42.70 (95)	1330.85±52.02 (87)
Sex						
Male	372.03±14.60 (105)	574.86±24.72 (98)	739.82±32.44 (83)	868.62±44.85 (71)	1046.83±48.06 (61)	1303.45±57.23 (54)
Female	378.73±14.12 (128)	587.97±23.65 (118)	763.24±31.32 (100)	906.16±41.80 (88)	1093.45±45.60 (73)	1321.18±54.82 (70)

Letters with different superscript within a specific source in a column differ significantly (P≤0.05).

ed from fourth to twelfth week of age at fortnightly intervals. The experiment was scheduled in two seasons *viz.* cold season and hot season. In the course of the experiment, the period from May to September was considered as cold season (Average Relative Humidity – 82.28%, Rainfall – 594.67mm, Temperature – 26^{o}C) and the remaining period as hot season (Average Relative Humidity – 66.25%, Rainfall – 97.36mm, Temperature – 30^{o}C). Body weight of dam was recorded in kilograms within 24 hours of kindling. The dams were divided into three groups based on their body weights as 2 to 2.5, 2.5 to 3 and above 3 kg.

Statistical analysis

The data on body weights were analysed by least squares technique with the help of Statistical Package for Animal Breeding 2 (Sethi, 2002) using Harvey's (1960) algorithm to study the influence of genetic and non-genetic factors.

The random errors were assumed to be normally and independently distributed with mean zero and variance of σ^2_e. Duncan's multiple range test as modified by Kramer (1957) was used to compare means.

RESULTS AND DISCUSSION

Effect of different genetic groups on body weight

Body weights of rabbits from fourth to twelfth week of age were significantly (P≤0.01) influenced by genetic group.

Among the purebreds, highest post-weaning body weights at fourth, sixth, tenth and twelfth week were recorded in WG. Among crossbreds, progenies of WG male crossed to GG female recorded the highest post-weaning weights from fourth to twelfth week. The result is in agreement with the findings of Bokade *et al*. (1993), who reported highest body weight at three months for WG x GG breed (1579.55g) among crossbreds and for WG (1412.00g) among purebreds. Kasiviswanathan (2000) reported significant effect of breed on fourth, sixth, eighth, tenth and twelfth week weight.

Effect of non-genetic factors on body weight

The effect of litter size on body weight of kits was significant only up to tenth week of age indicating that increased litter size does not affect body weight beyond ten weeks.

The individual body weight of kits declined gradually as the litter size at birth increased. Choudhury *et al.* (2002), Gupta *et al.* (2002) and Reddy *et al.* (2003) have also made similar observations in their experiments. The reason to this finding could be the competition among the individual fetuses in the uterus and the limited capacity of the doe to provide nutrients to the large number of kits in the wombs during pregnancy as explained by Gupta *et al*. (2002)

Highest least squares means were noticed at tenth and twelfth week body weights in kits born out of dams weighing three kilograms or more. Similar observations were recorded by Kumar *et al.* (2001) who reported significant effect of doe weight at kindling on weight of kits up to 11th week of age. Studies conducted at Andhra Pradesh Agricultural University (APAU,1989) has also reported that the dam weight at kindling had significant effect on the body weight of kits, much in accordance with the findings of the present study.

The adult body weights recorded was the highest for kits born in the season from October to April. Similar results have been reported by APAU (1989); Choudhury *et al.* (2002) and Poornima *et al.* (2002)

Even though higher means were observed for females at all ages, the sex of the kit was found to have no significant influence on any of the post weaning weights. This observation is in accordance with the findings of Choudhury *et al.* (2002), who reported no significant sex effect on post weaning body weights from sixth week to twenty four weeks. Poornima *et al.* (2002) also reported non significant effect of sex on all post weaning body weights up to twelve weeks of age. Gupta *et al.* (2002) observed that there was no differential effect of male and female sex hormones on the post weaning body weights.

The results of the study revealed that the post-weaning weight from fourth to twelfth week for progenies of WG male crossed to GG female (WGxGG) was highest. Highest least squares means were noticed at tenth and twelfth week body weights in kits born out of dams weighing three kilograms or more. It was concluded that the effect of litter size on body weight of kits was significant only up to tenth week of age indicating that increased litter size does not affect body weight beyond ten weeks. The cross between WG male and GG female was recommended for efficient meat production in rabbits.

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