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GROWTH PERFORMANCE OF MEAT RABBITS IN SEMI ARID TROPICAL CONDITIONS IN INDIA

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Abstract

Growth performance of rabbits comprising of four broiler breeds viz. White Giant, Grey Giant and Soviet Chinchilla from USSR origin and New Zealand White from the UK origin was studied under the semi arid tropical desert of Rajasthan.The data on body weights at birth,3 ,4,6,8,12,18 and 24 weeks of age was recored from January 1985 and December 1986 was utilised for this study.Growth data was divided as per the period of birth i.e from January to April months (period-1) and from September to December (Period-2). The average daily gain in body weight was worked out during the different ages both before and after weaning at six weeks of age.The data was analysed using two way interaction model in order to know the efects of breed, period of birth and interaction between breed and period of birth.

The growth performance during two periods of birth varied significantly and the youngs born during period-2 were significantly heavier than that born in period-1 (P<Ø.Ø1). Amongst the period -1 born youngs , the breed differences were not apparent as all the breeds suffered equally due to environmental heat during their pre weaning and post weaning growth.However the differences among different breeds were significant among the rabbits born during September to December months only.In semi arid and tropical conditions of Rajasthan,the optimal breeding season could be after the monsoon till peak winters, so that the rabbit youngs get proper environmental conditions for efficient utilization of feed and fodder and produce meat economically .

Introduction

Domestic rabbit (Oryctolagus cuniculus) is known to have good potential for economic meat production mainly due to its prolificacy and faster growth rate. The growth potential and feed conversion efficiency of rabbit have often been compared to that of fowl(Reddy et al,1977 and Hunt,198Ø).Lang (1981) pointed out that the growth rate in rabbit though reduced considerably after birth but is still very good upto 8 to 1Ø weeks of age. Therefore, the attainment of desired market weight during or soon after the phase of rapid growth is of paramount importance for economic meat production.

Postnatal growth in rabbit is influenced by a variety of environmental factors.Matheron and Martial(1981) reported that at 3Ø°C, the average feed consumption was decreased by 3Ø per cent and the growth was also affected.Lebas(1983) held that the above 25-28 °C ,rabbits decrease their feed consumption more than is strictly necessary to provide for an intake of digestible energy required to maintain the body heat and production. In India, more than 5Ø per cent of its geographical area comes in semi arid tropical region where high ambient temperature (27-44 °C) persists with low moisture contents in air during 6-7 months of the year (Gupta,1986).The rabbit raising for meat production has become very popular in these areas but no

information are available on growth performance of rabbits under these agroclimatic conditions.In this study, the postnatal growth performance of rabbits of four broiler breeds has been described in special reference to their period of birth.

Materials and methods

This work was carried out at the Rabbit Unit,Division of Animal Genetics and Breeding, Central Sheep and Wool Research Institute, Avikanagar (Rajasthan),India .The data on 279 rabbit youngs born during January to April and 694 during September through December months recorded from January 1985 to December,1986 was included in this study. The different breeds studied were White Giant,Grey Giant and Soviet Chinchilla of USSR and New Zealand White of UK origin. The rabbits were kept in well ventilated house and kept individually in G.I. wiremesh cages and fed 6 mm thick and 8-9mm long concentrate pellets and cow pea /lucerne roughage.

The environmental conditions,housing and management of rabbits have been reported earlier(Gupta,1986).The rabbit youngs were weaned at 6 weeks of age .The body weights of youngs were recorded at birth,3,4,6,8,12,18 and 24 weeks of age.The growth data was divided in to two groups of each breed with respect to period of birth,i.e period-1(January to April) and period-2 (September to December).Data of male and female animals was pooled as the differences between sexes were not significant.

The effects of breed , period of birth and breed x period interaction on growth of rabbits were studied according to the following two way interaction model of analysis of variance (Snedecor and Cochran,1968).

$$Yijk = \mu + bi + pj + bipj + eijk$$

whereas,

Yijk is the observed value for any growth character of the kth animal born in the jth period in the ith breed

bi is the effect due to ith breed

pj is the effect due to jth period of birth

bipj is the effect due to interaction of ith breed with jth period of birth

eijk is the random error,NID ($\emptyset, \sigma^2$).

Results and discussion

Pre weaning growth:

The average body weights at birth,3,4,6 weeks of age and the pre weaning growth rates have been presented in table.2.New Zealand White does gave birth to heaviest youngs and the variation amongst different breeds was significant ($P<\emptyset.\emptyset1$). It was interesting to note that the youngs born during period-1 were significantly heavier than that born in period-2.The seasonal variation in birth weight of White Giant,Grey Giant and Soviet Chinchilla rabbits have been reported by Titarev (1964) , Zaika and Maslenikov (1964) and Bogdan (1974).The three week body weight was highest in White Giant youngs but the breed differences were significant only among the rabbits born in period -2. Zaika and Maslenikov (1964) also reported that the White

Giant rabbits attained the highest body weight at 3 weeks age among the three Russian breeds studied.The pre-weaning growth in rabbits specially upto first three weeks depend mainly on doe's milk yield.In this study the retarded growth in first three weeks among the period -1 born youngs could have been due to reduction in the doe's milk yield by excessive environmental heat.Papp et al(1983) reported that the milk yield of rabbit does was maximum at 15°C ambient temperature and a reduction of 7.7 g was observed with 1°C rise in ambient temperature. The four weeks body weight were again highest in White Giant youngs closely followed by Soviet Chinchilla youngs.However, the breed differences were found significant only among the rabbit youngs born in period-2.The seasonal and the breed variation in the four weeks body weight of rabbits have also been reported by Andreeva(1968).

The weaning weight at six weeks age ranged between 604.78 g to 717.27g in youngs born in period-2 and were significantly higher than the youngs born in period-1 (P <0.01).The White Giant youngs attained the highest weaning weight but the breed diffeences were significant only among the youngs born in later half of the year.The seasonal and breed variation among White Giant,Grey Giant and Soviet Chichilla rabbits in the weaning weights have been reported by Titarev (1964) and Bogdan(1974).

Pre-weaning growth rates:

The growth rate(average daily gain) during first three weeks of age ranged between 8.09 to 8.96 g in youngs born in period-1 which improved to 9.67 to 11.78 g in the rabbits born in period-2. Parillo(1967) and Andreeva (1968) also reported similar growth rates upto 3 weeks of age in White Giant,Grey Giant and Soviet chinchilla breeds.Rao et al (1977) and Spreadbury (1978) reported that young rabbit approximately doubles its weight every week until it reaches 3 weeks of age by gaining 10-20 g per day solely on mother's milk.During 3-6 weeks of age, the rabbit youngs begin to eat some feed and fodder in addition to mother's milk and the growth rate is improved (Aitken and Wilson,1962 and Rao et al,1977). The average daily gain in period-1 born youngs ranged between 14.38 to 16.26 g among different breeds but the variation was not significant. These growth rates were significnatly lower than that of youngs born in period-2 indicating that high ambient temperature in period-1 affected not only the milk yield of does but also the feed intake of youngs before weaning.

Post weaning growth:

The results of post-weaning growth have been summarised in Table.3 The post weaning growth is of great importance for economic production of rabbit meat as the feed conversion ratio deteriorates rapidly from 2:1 at 3 weeks to 5:1 at 12 weeks or later (Chen et al ,1978). In European temperate climate, eight week's age is considered to be an ideal age of slaughter when young rabbits attain 1.5 to 2.0 kg body weight by utilizing 2.5 to 3.0 kg feed per kg gain (Lebas, 1983). Contrarily in semi-arid tropical region of India, the eight week's body weights of period-2 born youngs ranged between 922.66 to 1047.33 g and among January to April born rabbits, the weights were still lower. The breed difference were significant only among period-2 born youngs. It seems that the feed intake was severely affected in all the breeds in season-1,causing retarded growth equally while in little favourable environmental conditions in period-2, the breed differences were clearly visible.

The optimal slaughter age in semi-arid and tropical conditions is 12 week when rabbit youngs attain 1.5 to 2.Ø kg weight (Gupta, 1987). In this study, young born in January to April months weighed between 1165.Ø g to 1473.87 g. The Soviet Chinchilla rabbits weighed heaviest and the differences among various breeds were significant ($P < Ø.Ø1$). The youngs born in September to December months attained markedly higher weight at 12 weeks of age and Soviet Chinchilla rabbits were again heaviest. Firsova (1974) reported that Soviet Chinchilla rabbits attained 1.85 kg body weight at 3 months of age, which is comparable to the weight of Soviet Chinchilla rabbits attained in period-2 in the study. Gupta and Patnayak (1986) reported that the feed consumption and body weights were significantly higher in Soviet Chinchilla rabbits than Grey Giant upto 12 weeks of age.Growth beyond 12 weeks of age is relatively less important for rabbit meat production, except for the breeding stock because the feed conversion ratio becomes uneconomical. In Semi-arid conditions, 2.5 to 3.Ø kg weight is considered as an ideal weight for doe at first breeding. Rabbits born in January to April months atttained these weights at 24 or more weeks of age while September to December born attained breeding weights at 18 weeks of age.

Post-weaning Growth Rate:

The average daily gain in weight during 7-8 weeks age was significantly higher in Soviet Chinchilla youngs whereas the differences among other breeds were not significant. The growth rates of September-December born youngs were significantly higher than that of January-April born.The maximum average daily gain in weight was observed during 9-12 weeks ranging from 14.25 to 23.85 g among period-1 born youngs and 23.81 and 25.69 g in period - 2 born youngs. The variation among the breeds and periods of birth were significant. Soviet Chinchilla rabbits had faster growth rates for both the periods of birth and Grey Giants had the slowest.Similar observations have been reported by Bogdan(1974)and Firsova (1974) in White Giant, Soviet Chinchilla and Grey Giant rabbits.

During 13 - 18 weeks of age , the growth rates decreased significantly. The effects of breed and season of birth were significant on average daily gain in weight during this age. It was pertinent to note that the growth rates during 18-24 weeks of age were significantly lower in September to December born rabbits than January to April born ones. This could be due to the attainment of sexual maturity at 18 weeks of age. Furthur,rabbits born in period-1 got favourable cooler climate of winter during this age and compensated their earlier slow growth.It appears from the above study that in semi arid tropical regions, breeding of does soon after the monsoon may be more useful for economic meat production especially for small scale rabbit rearing under natural environmental condition. Among the four breeds studied, Soviet Chinchilla and White Giant rabbits performed optimally in terms of growth rate for economic meat production than other breeds studied.

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References

Aitken.F.C. and Wilson, W.K.(1962) Rabbit breeding for meat and fur,Second Edition,Technical Communication No.12, Commonwealth Agric. Bureaux London.

Andreeva ,V.S .(1968) The effect of season of birth of female and male rabbits of the Soviet Chinchilla breed on the production traits of their progeny,Zverovo.Krolikov.,7:204-218 (cited by Anim.Breed.Abstr.,37:4041).

Bogdan, S.D. (1974) Comparison of growth rate of some rabbit breeds, Krolivnitstvo,9:309.(Cited by Anim.Breed.Abstr.,43:3423.)

Chen, C.P,Rao,D.R., Sunki, G.R. and Johnson, W.M.(1978) Effect of weaning and slaughter ages upon rabbit meat production .1 Body weight, feed efficiency and mortality,J.Anim. Sci., 24:601-624.

Firsova, N .M. (1974) Microclimate of closed sheds and performance of breeding rabbits, Krolivnitstvo , 4 : 38-45 (cited by Anim.Breed. Abstr.45:3454).

Gupta,S.C. (1987) Performance of broiler rabbits in semi arid and tropical regions in India, In Proc. of Short Course on Advances in Rabbit Production June,29-July,7,Garsa,India.

Gupta,S.C. and Patnayak,B.C.(1986) Growth and feed consumption of broiler rabbits,In Proceedings of National Symposium on Fur Animal Production and Management, April,9-11, Manali,India.

Gupta, S. C., Mehta, B. S., GopiKrishna, G., Arora, A.L.,Bohra,S.D.J.,and Srivastava, C.P. (1986) Adaptability and management of rabbits in semi-arid climate,In Proceeding of National Symposium on Fur Animal Production and Management,April,9-11,Manali.India.

Hunt ,R.W.T. (1980) Rabbit production in Scotland : a potential growth industry ,Bulletin West of Scotland Agricutural College No 96.

Lang,J.(1981) The nutrition of the commercial rabbit , Part-2, Feeding and General aspects of nutrition,Nut. Abstr. and Rev.,Series B,51(5):287-302.

Lebas,F.(1983) Small scale rabbit rearing in developing countries, World Rev.,46:10-17.

Martheron , G.and Martial,J.P.(1981) Growth and feed consumption of rabbit does from weaning to 4- months of age in different ambient temperatures and humidities (unpublished) (Cited by Lebas,F.,1983)

Papp,Z.,Karvao,F. and Rafai,P.(1983) Effect of microclimate in large scale rabbit farming , Magyar. Allatorovosk. Lapja , 38 (2) 115-120 (Cited by Anim.Breed.Abstr.,51(9):5733)

Parillo,L .E .(1967)Rearing broiler rabbits , Krolikov .Zverov, 10(6):19-20 (Cited by Anim.Breed. Abstr. 36:1885)

Rao, D.R.,Sunki,G.R.,Johnson,W.M.and Chen, C.P.(1977) Postnatal growth of the New Zealand White rabbits,J.Anim.Sci.,44:1021.

Reddy,N.V.,Rao,D.R. and Chen,C.P.(1977) Comparative performance of broilers and rabbits,Nutrition Reports,16:133-137.

Snedecor , W .G. and Cochran , G.W. (1986) Statistical Methods Interstate Publishers, London

Spreadbury, D. (1978) A study of the protein and amino acid requirements of the growing New Zealand White rabbits, Journal of Science of Food and Agriculture,29:640-648 .

Titarev,L. A. (1964) Evaluation of rabbits of various breeds by milk production ,Krolikov. production Zverov.,7(9):5-7.(Cited by Anim.Breed Abstr.,33:668).

Zaika, I.E. and Maslennikov,V. N.(1964) Rabbit breeding a profitable line ,Krolikov. Zverov. ,7 (10):19-21(Cited by Anim.Breed.Abstr., 33:669).

Table - 1
Analysis of Variance

Source of variation	Mean sum of Square							
	Birth wt.	3-Wk.wt.	4-Wk.wt.	6-Wk.wt.	8-Wk.wt.	12-Wk.wt.	18-Wk.wt.	24-Wk.wt
Between Breeds	972.42** (3)	11804.00** (3)	40202.67* (3)	169610.70** (3)	534912.00** (3)	1801728.00** (3)	474666.70** (3)	333824.00** (3)
Between Periods within breed	1052.00 (1)	348836.00** (1)	1032272.00** (1)	1777344.00** (1)	6380224.00** (1)	1.7514E+07** (1)	2.8532E+07** (1)	2880256.00** (1)
Breed x period interaction	214.90* (3)	53608.07** (3)	41094.00* (3)	162840.10** (3)	39004.17 (3)	150664.00* (3)	21710.67 (3)	160894.10* (3)
Error	98.82 (965)	5720.344 (965)	11226.08 (965)	21722.12 (965)	34137.01 (903)	74549.81 (837)	62575.56 (492)	38961.68 (324)

Figures in the parenthesis indicate the degree of freedom.
* Significant (P< 0.05)
** Significant (P<0.01).

Table - 2

Average body weights (g) and pre-weaning growth rates in different rabbit breeds.

Breeds	Period of birth	Birth wt. (g)	3-Weekly wt. (g)	4-Weekly wt.(g)	6-Weekly wt.(g)	Average daily gain in weight(g)	
						0-21 day age	22-42 day age
White Giant	P1	57.8 ±2.7 (53)	243.1±6.5 (53)	368.7±8.2 (53)	584.5±13.4 (53)	8.9±0.4 (53)	17.7±0.7 (53)
	P2	56.6±0.7 (153)	292.1±6.7 (153)	456.7±8.5 (153)	717.3±12.4 (153)	11.2±0.2 (153)	23.5±0.2 (153)
Grey Giant	P1	54.4±1.4 (54)	242.5±10.8 (54)	358.7±16.0 (54)	582.7±19.9 (54)	8.9±0.4 (54)	16.6±0.5 (54)
	P2	50.9±0.5 (149)	253.9±5.2 (149)	399.7±7.9 (149)	604.8±11.2 (149)	9.7±0.2 (149)	20.8±0.2 (149)
New Zealand White	P1	60.8±1.1 (64)	239.4±9.7 (64)	350.8±13.3 (64)	541.5±18.9 (64)	8.5±0.3 (64)	15.9±0.5 (64)
	P2	56.1±0.6 (165)	268.9±5.7 (165)	414.1±8.2 (165)	626.8±11.2 (165)	10.1±0.02 (165)	20.7±0.2 (165)
Soviet Chinchilla	P1	56.0±1.2 (108)	219.6±5.0 (108)	345.9±8.8 (108)	553.3±13.3 (108)	7.8±0.2 (108)	18.0±0.3 (108)
	P2	55.7±0.6 (226)	303.2±6.0 (226)	451.5±8.4 (226)	705.9±10.8 (226)	11.8±0.1 (226)	21.2±0.2 (226)

Figures in the parenthesis indicate the number of observations.

Table - 3

Average body weights (g) and post-weaning growth rates in dirrerent rabbit breeds.

Breed	Period of Birth	8-Weekly weight (g)	12-Weekly weight (g)	18-Weekly weight (g)	24-Weekly weight (g)	Average daily gain in weight (g)			
						43-56 days	57-84 days	85-126 days	127-168 days
White Giant	P1	824.4±23.21 (43)	1372.9±42.8 (42)	1840.2±34.1 (41)	2407.3±23.9 (42)	16.3±1.4 (42)	24.1±1.4 (41)	11.3±0.9 (41)	13.5±0.6 (41)
	P2	1040.8±12.7 (147)	1716.8±16.8 (141)	2358.9±28.2 (63)	2576.8±26.4 (34)	23.1±0.3 (147)	27.3±0.3 (141)	15.3±0.2 (63)	5.2±0.3 (34)
Grey Giant	P1	777.9±34.4 (43)	1165.0±52.2 (38)	1760.9±45.4 (32)	2256.2±29.4 (32)	13.9±1.1 (41)	15.2±1.2 (38)	14.2±0.9 (32)	11.8±0.7 (32)
	P2	934.6±15.0 (147)	1601.3±22.5 (135)	2242.5±45.1 (59)	2425.0±43.1 (30)	23.6±0.3 (147)	25.5±0.4 (135)	15.4±0.5 (59)	4.3±0.7 (30)
New Zealand White	P1	725.9±30.9 (56)	1304.2±65.6 (47)	1890.6±34.4 (46)	2323.6±32.6 (44)	13.2±0.9 (54)	21.9±0.7 (47)	13.9±1.1 (46)	10.3±0.8 (44)
	P2	922.7±16.5 (154)	1610.1±21.5 (143)	2434.1±27.0 (76)	2651.8±50.7 (35)	21.1±0.2 (154)	24.9±0.3 (143)	19.6±0.4 (76)	5.2±0.5 (33)
Soviet Chinchilla	P1	820.2±16.4 (95)	1473.9±24.0 (93)	1890.4±19.5 (92)	2365.9±17.9 (87)	19.1±0.3 (93)	26.9±0.5 (93)	9.9±0.3 (92)	11.3±0.3 (87)
	P2	1047.3±12.4 (219)	1766.3±20.2 (206)	2382.3±25.4 (91)	2486.8±37.7 (31)	24.4±0.2 (219)	26.1±0.2 (206)	14.7±0.3 (91)	2.5±0.6 (31)

Figures in the parenthesis indicate the no.of observations.