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Genetic and non-genetic factors affecting 1 month of body weight of Sangamneri goat kid at organized farm

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Abstract

This study investigated the factors affecting the one-month body weight of Sangamneri goat kids raised on an organized farm. Both genetic and non-genetic factors were considered. The influence of birth period, season, village cluster, and sire were analyzed. The average one-month body weight was 4.98 ± 0.025 kg. Village cluster, birth period, season, and sire all had significant effects on kid weight. Kids from cluster C1, born in winter, and sired by certain males had the highest weights. These findings provide valuable insights for optimizing breeding and management practices to improve the health and growth of Sangamneri goat kids.

Keywords: Growth traits, one month body weight, Sangamneri, genetic and non-genetic factors

Introduction

Goats were among the first farm animals to be domesticated. Goats disseminated all over the world because of their great adaptability to varying environmental conditions and the different nutritional regimes under which they are evolved and subsequently maintained. A goat substantially contributes to the rural economy, particularly in the arid, semi-arid and mountainous regions of the country and provide livelihood to the poor sections. They proved useful to man throughout the ages due to their productivity, small size and non-competiveness for food. According to the Livestock Census (2019) [2] India having 148.88 million goat population with rank second in world. Total goat population has been increased by 10.14 per cent over previous Livestock Census (2012) [10]. About 27.8 per cent of the total livestock is contributed by goats. In Maharashtra total goat population is 10.60 million.

Goat is a versatile animal. It is believed that goat was the first animal after dog to be domesticated by man. Goats survive better under extreme agro-climatic conditions therefore, goat keeping is an insurance against the drought, famine disaster's and other natural calamities. The main aim of breeding programme is improve the profitability through production of superior animals which can transmit the economic characters of there progeny. Body weight gives the fair idea about future performance of kids. It also helps goat growers in computing ration, medicine doses, deciding proper age of breeding, marketable slaughter weight, evaluation of animal at particular age. The reproduction performance governs the level of profitability of the goat enterprise.

Materials and Methods

In this comprehensive study, birth records of 1596 Sangamneri goats from 28 villages within the breeding tract, including Ahmednagar, part of Nashik, and Pune districts, were meticulously maintained by the All India Co-ordinated Research Project on Goat Improvement (Sangamneri field unit) at the Department of Animal Husbandry and Dairy Science, M.P.K.V., Rahuri, Dist. Ahmednagar (M.S.). The goats were subjected to a feeding management system allowing grazing on various terrains for 6-8 hours daily, supplemented with feeds such as bhusa, turchuni, dry grasses, jowar straw, groundnut leaves, and husk. Green fodder, including Lucerne and Maize, was provided based on availability, while top feeds like Acacia spp., Ber, Shevari, Neem, etc., were offered during scarcity periods and the summer season. Housing comprised kutcha floor permanent goat sheds covered with asbestos cement sheets, regularly disinfected and cleaned. Data spanning 16 years (2005-

2021) on growth traits one month of body weight records categorized by non-genetic factors i.e. season, periods, village clusters, and sire, were collected at the All India Coordinated Research Project on Goat Improvement (Sangamneri field unit), MPKV, Rahuri. The 12-month data were further stratified into three kidding seasons (Winter, Summer, Rainy). Genetic effects were evaluated using Sire = S1.....Sn, and statistical analyses followed the procedures recommended by Harvey (1990)^[7], with significance testing conducted through Duncan's multiple range and F Test.

Statistical Methods

The data on growth trait was analyzed through mixed model least-squares. To study the effect of various genetic and non-genetic factors on body weight the statistical model used was as under:

Model used for growth traits

$$Y_{ijklm} = \mu + A_i + B_j + D_l + e_{ijklm}$$

Where,

Y_{ijklm} = Observation of mth individual under ith year, jth

Season birth/kidding, kth sex and lth cluster of village

μ = Population mean

A_i = Effect of ith period of birth/kidding ($i = 1 \dots 5$)

B_j = Effect of jth season of birth/kidding ($j = 1, 2$ and 3)

D_l = Effect of lth cluster of village ($l = 1 \dots 4$)

e_{ijklm} = Random error NID ($\partial 2 e$)

Results and Discussion

The analysis of variance indicating the significant effects on body weight at 1 month of age of Sangamneri goats are presented below. The least squares means for body weight at the age of one month are presented.

Data of 1596 one month Sangamneri kids were recorded over the different periods and four clusters. The overall mean for body weight of Sangamneri kids at one month of age under field condition was 4.98 ± 0.025 kg.

Similar body weights were reported by Patil *et al.* (2013)^[19], Mandakmale *et al.* (2015)^[15] and Anonymous (2016)^[1] in Sangamneri goat and Ibelbachyr *et al.* (2014)^[8] in Draa goats. Comparatively higher body weight at 1 month age was reported by Mishra *et al.* (1985)^[17] in Sirohi goat. On the contrary lower body weights were recorded by Mishra and Ghej (1990)^[16] in Sikkim Local, Rathod (2010)^[20] in Osmanabadi and Malik and Kanaujia (1992)^[12] in crossbreds of Black Bengal goats. Higher body weights were reported by Dixit *et al.* (2013)^[5] in Sangamneri goat. Comparatively higher body weight at one month of age were reported by Mishra *et al.* (1985)^[17] in Sirohi, Mandakmale *et al.* (2009)^[14] in Sangamneri, Patil (2013)^[19] in Sangamneri goat.

Effect of village cluster

The analyses of variance indicated significant effect of village cluster on body weight at one month of age in Sangamneri goat (Table 4). The mean for body weight of

Sangamneri kids at 1 month age belong to cluster C_1 (5.00 ± 0.02 kg) were higher than cluster C_2 , C_4 and C_3 , while weights of kids belonging to cluster C_2 (4.98 ± 0.02), C_4 (4.975 ± 0.08) and C_3 (4.95 ± 0.02 kg) were at par with each other.

Similar significant effect of village cluster on body weight of kids was reported by Jitkar (2013)^[9] and Anonymous (2016)^[1] in Sangamneri goat. However, Patil (2009), Patil *et al.* (2013)^[19] and Mandakmale *et al.* (2015)^[15] observed it as non-significant in Sangamneri kids

Effect of period of birth

The body weight at 1 month of age were significantly ($p < 0.01$) influenced by period of birth in Sangamneri goat (Table 5). The least squares mean for body weight in different periods at one month age ranged from 5.01 ± 0.03 to 4.21 ± 0.03 kg respectively. DMRT indicated that the significantly ($p < 0.01$) highest body weight at 1 month of age was obtained in kids born during period 2017-2021 (P_4) (5.01 ± 0.03 kg) and lowest (4.62 ± 0.03 kg) for year 2013-2017 (P_3).

The significant effect of period of birth on body weight was reported by Malik *et al.* (1986)^[13] in Beetal, Black Bengal and their crosses, Singh *et al.* (2009)^[22] in Jamunapari kids, Ibelbachyr *et al.* (2014)^[8] in Draa goats and Anonymous (2016)^[1] in Sangamneri goat. The significant ($p < 0.01$) effect of period of birth on body weight was reported by Mandakmale *et al.* (2015)^[15] and Patil *et al.* (2013)^[19] in Sangamneri goat.

Table: Analysis of variance of Sangamneri goats at 1 months of age as affected by non-genetic and genetic factors

Sources of variation	d.f.	M. S.S	F CAL
Village cluster	3	0.173	0.693*
Period of birth	3	0.178	0.712**
Season of birth	2	0.637	2.548*
Error	1585	0.250	
Total	1594		

* = $p < 0.05$ ** = $p < 0.01$

Effect of season of birth

Season of birth significant influence on body weight at 1 months of age in Sangamneri goat. DMRT indicated that the higher body weights were observed in kids born during winter (5.02 ± 0.03 kg) than kids born in rainy (4.96 ± 0.02 kg) and summer season (4.95 ± 0.03 kg). While kids born in winter and summer season perform at par with each other.

The significant effect of season of birth on body weight at 1 months of age was confirmed with the results reported by Malik and Kanaujia (1991)^[11] in Beetal kids, Singh *et al.* (2009)^[22] in Mehsana goats, Sharma *et al.* (2010)^[21] in Sirohi goats, Ibelbachyr *et al.* (2014)^[8] in Draa goats and Anonymous (2016)^[1] in Sangamneri kids.

Significant ($p < 0.01$) effect of season of birth on 1 month's body weight was observed by Patil *et al.* (2013)^[19], Mandakmale *et al.* (2015)^[15] and Das *et al.* (1989)^[3] observed significant effect of season of birth on body weight in Sangamneri and Barbari goat at 1 months age.

Table: Least squares means for body weight at 1 months of age in Sangamneri goats as affected by non-genetic and genetic factors

Effects	N	Body weight (kg)	
		Mean	SE
Village cluster			
Sangamner (C ₁)	478	5.007 ^b	0.026
Shrirampur (C ₂)	403	4.986 ^b	0.028
Rahuri (C ₃)	679	4.954 ^a	0.024
Belha (C ₄)	34	4.978 ^a	0.088
Period of birth			
2005-2009 (P ₁)	279	4.947 ^b	0.035
2009-2013 (P ₂)	354	4.210 ^a	0.035
2013-2017 (P ₃)	503	4.628 ^b	0.032
2017-2021 (P ₄)	458	5.010 ^b	0.038
Season of birth			
Winter (S ₁)	877	5.029 ^b	0.026
Summer (S ₂)	346	4.954 ^a	0.034
Rainy (S ₃)	371	4.960 ^a	0.035

Means under each class in the same column with different superscripts differ significantly

Effect of sire

Differences associated due to sire for 1 month body weight were highly significant (Table 6). The overall least squares means for body weight at 1 months of age were 4.89 ± 0.21 kg, respectively.

Significant effect of sire on body weight and body weight was reported by Patil (2009)^[19] and Anonymous (2016)^[1] in Sangamneri goat. Dudhe *et al.* (2015)^[6]

Table: Analysis of variance at 1 months of age affected by sire in Sangamneri goats

Source of variation	d.f	M.S.S	F CAL
Sire	73	534.100	2133.895**
Error	1522	0.250	
Total	1596		

* = $p < 0.05$ ** = $p < 0.01$

Conclusion

The summary provided highlights some interesting findings about factors influencing the one-month body weight of Sangamneri goat kids in an organized farm setting. Here's a breakdown of the key points: Overall average one-month body weight: 4.98 ± 0.025 kg. Village cluster had a significant effect: Cluster C₃ kids had the highest average weight (2.75 ± 0.02 kg). Birth period had a significant effect: Period P₃ had the highest average weight (2.80 ± 0.034 kg), followed by P₄, P₂, and P₁. Sire had a highly significant effect ($p < 0.01$): This suggests a link between the sire's genetics and the kid's weight, potentially influenced by the quality of food available during breeding and pregnancy.

Implications: Understanding these factors can help improve breeding and management practices for Sangamneri goats. Focusing on sires with a positive influence on weight and ensuring good quality feed during breeding seasons could be beneficial. Further research might explore the reasons behind the village cluster effect (e.g., differences in feed availability, climate). Overall, this study provides valuable insights for optimizing the growth and health of Sangamneri goat kids.

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