EFFECTS OF ENVIRONMENTAL FACTORS ON PRE-WEANING GROWTH TRAITS IN CHOKLA SHEEP IN ARID REGION OF RAJASTHAN

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ABSTRACT

Data on 4109 Chokla animals maintained at Central Sheep and Wool Research Institute (CSWRI), Avikanagar, Rajasthan were collected to assess the effect of non-genetic factors on preweaning growth performance. The least-squares means for body weight at birth and 3 months of ages and average daily gain during birth to 3 months of ages were 2.81 ± 0.010 kg, 12.90 ± 0.062 kg, and 111.88 ± 0.657 g/day, respectively. The least-squares analysis of variance revealed highly significant (P< 0.01) effect of sex of lamb, period and season of birth on all the pre-weaning traits. The fixed effect of age of dam at lambing was highly significant on all the pre-weaning traits except on average daily gain from birth to 3 months of ages. Effect of dam's weight at lambing had highly significant source of variation for all the pre-weaning traits. Thus, there is need of giving proper attention to the significant factors to achieve optimum productivity.

Key words: Chokla, pre-weaning growth traits, non-genetic factors

Introduction

Chokla sheep produce fine carpet wool compared to all the other Rajasthan breeds. It is also known as "Rajasthani Merino". Chokla sheep, one of the important breed distributed in Churu, Jhunjhunu, Sikar and bordering areas of Bikaner, Jaipur and Nagaur districts of Rajasthan. The animals are light to medium size. The face, generally devoid of wool, is reddish brown or dark brown, and the colour may extend up to the middle of the neck; the skin is pink. The economics of sheep production is greatly affected by the growth performance as heavier lambs with high growth rate would fetch relatively more economic returns in lesser time span compared to weaker lambs. Faster growth rate is an important component of flock productivity. Growth profile traits are good indicators of adaptability of an animal to the existing environmental conditions. Thus, better growth is essential for appropriate reproduction, production and survivability in sheep. Pre-weaning is an important phase in the life of the animals which are largely affected by both genetic and non genetic factors, which must be evaluated before planning and implementing a sheep breeding plan.

Materials and Methods

The data for the present investigation were obtained from records of Chokla Sheep for improvement of carpet wool production, maintained at the Arid Region Campus of the Central Sheep and Wool Research Institute, Avikanagar-located at 26° 12' N Latitude and 75° 45' E Longitude at 320 metres above mean sea level.

All the sheep were maintained on natural pastures and allowed free range grazing. The grazing area consisted of forestland with natural fodder trees like Khejri (*Prosopis cineraria*), Ardu (*Ailanthus* spp.) and Neem (*Azadiracta indica*). Bushes and surface vegetation, including the improved pastures of *Cenchrus ciliaris* were also available. Due to scarce grazing resources, the sheep were supplemented with hay of Cenchrus, Cowpea and Dolichos. Additionally pala leaves (*Zizyphus*) and fodder tree lopping was provided. The sheep were housed during night in sheds covered with asbestos sheets with open sides during winter and in open corrals made by chain link fencing during summer months.

The prophylactic measures such as vaccination, deworming, dipping and hygienic measures like dusting, spraying, disinfection of sheds, watering channels, feeding troughs and protection of lambs against inclement weather conditions and prophylactic antibiotic treatment of lambs were implemented.

The data on 4109 Chokla animals were divided into five periods of five years each viz. P1 (1988-1992), P2 (1993-1997), P3 (1998-2002), P4 (2003-2007) and P5 (2008-2011). Performance traits included in the study were body weight at birth and 3 months of ages and average daily gain during birth to 3 months of ages. Average daily gain was calculated by formula [(Final weight of the period-Initial weight of the period)/ (final age-initial age)]. Least-square analysis method was used with software LSMLMW (Harvey, 1990) for calculating least squares means of all the traits (birth weight, 3 months weight and average daily gain). Level of significance for genetic and non-genetic factors was tested using LSMLMW programme. The statistical model included sex, period of birth and season of birth, dam's age at lambing as fixed effects and dam's weight at lambing as a covariate. Differences among sub group means were estimated by Duncan's multiple range test (Kramer, 1957).

Results and Discussion

Overall least-squares means for body weight at birth, weaning and average daily gain from birth to weaning 3 (ADG) months of ages were found to be 2.81 ± 0.010 kg, 12.90 ± 0.062 kg, and 111.88 ± 0.657 g/day, respectively (Table 1).

The least-squares analysis of variance revealed highly significant (P<0.01) effect of sex of lamb, period and season of birth on all the pre-weaning traits. Males were significantly heavier than females. This might be due to different physiological processes operating in the two sexes. The

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females have slower growth rate than males because of early maturing body in females and reach to a smaller mature size than male due to effect of oestrogen, which restrict the growth of long bones. Similar results were also reported in the literature by Prince *et al.*(2008) in Chokla, Parihar (2012) in Magra, Singh *et al.* (2013) and Kannojia (2015) in Marwari lambs. Effect of season was also significant and lambs born during season 1 (May to October) had significantly higher weights than lambs born in other season. This differences might be due to lambs born in season 1 were mostly born during August and September month and their pre-weaning growth period fall under favourable environment in semi-arid region when sufficient fodders is available in the field. Similar result was reported by Tomar *et al*. (2000) in Bharat Merino sheep and Chopra *et al*. (2010) in Bharat Merino sheep.

Live weights showed an increasing trend from period P2 to P3 for all the body weight traits under study. However, minimum growth was observed during P2 (1993-1997) for all the body weight traits under study. Differences in the growth during different periods are attributed to variation in different climatic conditions like rate of annual precipitation and rainfall, temperature and humidity, environmental and managemental conditions which influence the quality and accessibility of nutrients in pasture. Similar significant results were also reported by Gohil (2010), Singh *et al*. (2013) Kannojia (2015) in Marwari lambs.

The fixed effect of age of dam at lambing was highly significant on birth weight and three months body weight and found to be non significant on average daily gain from birth to 3 months of ages. The effect of dam's age at lambing was observed to be highly significant ($P \leq 0.01$) on birth weight as dams' age correlates with uterine capacity positively. There was significant increase in the body weight with the advancement of age of dam. Similar results were reported by Dixit *et al.* (2001) and Chopra *et al*. (2010) in Bharat Merino on weaning weight and Gowane *et al.* (2013) at birth in Bharat Merino sheep.

Dam's weight at lambing was a highly significant ($P < 0.01$) source of variation in all the pre-weaning body weights. This revealed that heavier dams during pregnancy and lambing delivered heavier lambs due to better nutrition, good body condition of dams, favourable uterine environment prior to lambing. Singh *et al.* (2013) and Kannojia (2015) also reported similar influence of dam's weight at lambing on pre-weaning body weights in Marwari breed of sheep.

Table 1: Least-squares means (±S.E.) for pre-weaning growth traits in Chokla

Effects	BWT	3WT	ADG (0-3 months)
Over all mean (μ)	2.81 ± 0.010 (4109)	12.90 ± 0.062 (3529)	111.88 ± 0.657 (3505)
Period of birth	**	**	**
P1(1988-1992)	2.88^{c} ±0.029 (284)	13.60^{b} ± 0.174 (249)	118.58^{c}±1.834 (249)
P2(1993-1997)	2.74^{a} ± 0.018 (705)	11.66^{a} ± 0.120 (512)	98.92^{a} ± 1.273 (504)
P3(1998-2002)	2.83^{bc} ± 0.018 (928)	11.79^{a} ± 0.108 (803)	99.68^{b} ± 1.139 (796)
P4(2003-2007)	2.79^{b} ± 0.016 (989)	13.83^{b} ± 0.097 (885)	122.81^{e}±1.026 (878)
P5(2008-2011)	2.83^{bc} ± 0.014 (1203)	13.61^{b} ± 0.083 (1080)	119.41^{d}± 0.877 (1078)
Sex	**	**	**
Male	2.88^{b} ± 0.012 (2062)	13.39^{b} ± 0.077 (1755)	116.53^{b}±0.807 (1746)
Female	2.75^{a} ± 0.012 (2047)	12.41^{a} ± 0.076 (1774)	107.23^{a}± 0.802 (1759)
Season	**	**	**
S1 (May - Oct)	2.84^{b} ± 0.017 (920)	13.55^{b} ± 0.105 (779)	118.78^{b} ± 1.105 (777)
S2 (Nov.- Apr)	2.79^{a} ± 0.009 (3189)	12.25^{a} ± 0.056 (2750)	104.98^{a} ± 0.590 (2728)
Age of dam	**	**	NS
<2 year	2.60^{a} ± 0.023 (486)	12.69^{a} ±0.144 (394)	112.00 ± 1.514 (392)
2-3 year	2.66^{b} ± 0.017 (961)	12.70^{a} ± 0.104 (781)	111.03 ± 1.097 (780)
3-4 year	2.85^{c} ± 0.017 (815)	12.93^{ab} ± 0.105 (705)	112.11 ± 1.113 (699)
4-5 year	2.89^{cd} ± 0.019 (665)	12.71^{a} ± 0.116 (591)	109.29± 1.223 (583)
5-6 year	2.97^{e} ± 0.021 (539)	13.23^{b} ± 0.128 (484)	113.57 ± 1.349 (482)
>6 year	2.92^{de} ± 0.020 (643)	13.13^{b} ± 0.120 (574)	113.29 ± 1.268 (569)
Dam's weight at lambing	**	**	**

No. of observations are given in parenthesis. Figure with different superscripts differ significantly. ** - Highly significant ($P<0.01$); NS - Non-significant; BWT= birth weight; 3WT= 3-month weight; ADG= average daily gain from birth-3 months.

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