



Factors affecting post-weaning average daily gain and Kleiber ratios in Malpura sheep

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Mutton has almost replaced wool as the primary product from sheep in India (Karim *et al.* 2007) and therefore need of the day is to study traits related to economic mutton production. Higher average daily gain (ADG) results in faster achievement of market weight. In order to increase the efficiency of feed conversion, use of Kleiber ratio (KR) in selection programs is very essential (Eskandarinasab *et al.* 2011). Malpura is one of the most important sheep breeds of India that is distributed in Jaipur, Tonk, Swai Madhopur, Ajmer, Chittorgarh and Bhilwara districts of Rajasthan. There is no report of study on Kleiber ratio (KR) in Malpura sheep. Hence, we report an investigation on factors that affect post-weaning ADG and KR in Malpura Sheep.

Data were collected from the breeding flock of Malpura sheep maintained at CSWRI, Avikanagar. The flock was maintained under semi-intensive management system. Lambing was restricted mainly to 2 seasons. Data were collected over the years from 1984 to 2009, which were divided into 6 periods. Dam age at lambing was divided in five groups. Dam weight at lambing was taken as covariate. The different economic traits used for the analysis were ADG from weaning to 6 month of age (ADG 1), ADG from 6 month to 12 month of age (ADG 2), KR from weaning to 6 month of age ($KR1=ADG1/6WT^{.75}$) and KR from 6 month to 12 month of age ($KR2=ADG2/12WT^{.75}$). Least squares procedure (General Linear Model SPSS 14) was used to analyze the effect of various factors on different traits.

The overall least squares mean (g) for ADG1, ADG2, KR1 and KR2 was 69.68 ± 0.87 , 32.53 ± 0.86 , 6.98 ± 0.07 and 2.67 ± 0.06 , respectively. The estimate for KR1 was lower as compared to earlier reported estimate of 9.25 g by (Kesbi *et al.* 2011) and 8.10 g by (Mohammadi *et al.* 2011) in Zandi Sheep. The effect of sex was significant for all traits. Variable effect of period, season of birth, dam age at lambing and ewe weight at lambing was observed (Table 1).

Effect of sex: Males had higher ADG1 and ADG2 as

compared to females. The results were in confirmity with earlier estimates in Bharat Merino sheep (Chopra *et al.* 2010) and Avikalin sheep (Prince *et al.* 2010). However, Baneh and Hafezian (2009) in Ghezel sheep showed nonsignificant effect of sex on ADG1. The post-weaning KR differed significantly between males and females, which is in agreement with the findings of Abegaz *et al.* (2005) in Horro sheep, Eskandarinasab *et al.* (2010) in Afsari sheep and Mohammadi *et al.* (2010) in Sanjabi sheep. These differences were mainly due to anabolic effect of androgen which causes higher growth in males. This hormone behaviorally make males more aggressive for feeding and suckling resulting in higher intake of nutrient and consequently higher growth rate and feed conversion efficiency compared to females.

Effect of season: Lambs born during January to April achieved higher growth rate and feed conversion efficiency. Season had significant influence on ADG1 ($P<0.05$) and KR1 ($P<0.01$) but nonsignificant effect on ADG2 and KR2. Chopra *et al.* (2010) in Bharat Merino sheep and Prince *et al.* (2010) in Avikalin sheep also found significant effect of season on ADG1. In agreement with present findings, Prince *et al.* (2010) reported non-significant effect of season on ADG2 in Avikalin sheep.

Effect of period: Period had significant effect on ADG1 ($P<0.01$) but nonsignificant effect on ADG2, KR1 and KR2. Growth rate and KR had no definite trend over different periods. Periodical variations are mainly attributed to the effect of climatic conditions like rate of precipitation, temperature and humidity. Climate and environmental changes cause variation related to nutrient availability. Prince *et al.* (2010) in Avikalin sheep and Chopra *et al.* (2010) in Bharat Merino sheep also reported significant effect of period of lambing on ADG1. In contrast to present findings Eskandarinasab *et al.* (2010) in Afsari sheep and Mohammadi *et al.* (2010) in Sanjabi sheep found significant effect of year of birth on KR1.

Effect of dam age and weight at lambing: Dam age at lambing significantly influenced ADG1 ($P<0.05$) and KR1 ($P<0.01$), but it had nonsignificant effect on ADG2 and KR2.

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Table 1. Least squares means ($\pm$ SE) of post-weaning average daily gains and Keiber ratios in Malpura sheep

Factors	ADG1	ADG2	KR1	KR2
$\mu \pm$ SE	69.68 $\pm$ 0.87 (2738)	32.53 $\pm$ 0.86 (2035)	6.98 $\pm$ 0.07 (2750)	2.67 $\pm$ 0.06 (2035)
Sex	**	**	**	**
Male	77.00 $\pm$ 0.80 (1252)	35.05 $\pm$ 1.18 (804)	7.62 $\pm$ 0.09 (1256)	2.69 $\pm$ 0.08 (804)
Female	61.56 $\pm$ 1.13 (1487)	30.01 $\pm$ 1.03 (1232)	6.35 $\pm$ 0.08 (1495)	2.66 $\pm$ 0.07 (1232)
Period	**	NS	NS	NS
1984–1988	76.76 $\pm$ 1.88 (203)	31.93 $\pm$ 1.59 (179)	7.40 $\pm$ 0.16 (204)	2.48 $\pm$ 0.10 (179)
1989–1993	57.59 $\pm$ 2.59 (293)	24.28 $\pm$ 3.21 (246)	5.95 $\pm$ 0.21 (293)	2.17 $\pm$ 0.21 (246)
1994–1997	72.43 $\pm$ 2.20 (300)	31.33 $\pm$ 1.98 (224)	7.83 $\pm$ 0.18 (302)	2.72 $\pm$ 0.13 (224)
1998–2001	62.29 $\pm$ 2.72 (463)	38.94 $\pm$ 2.14 (329)	6.31 $\pm$ 0.22 (465)	3.18 $\pm$ 0.14 (329)
2002–2005	70.97 $\pm$ 1.84 (717)	31.79 $\pm$ 1.63 (548)	7.01 $\pm$ 0.15 (718)	2.60 $\pm$ 0.11 (548)
2006–2009	78.05 $\pm$ 1.43 (763)	36.92 $\pm$ 1.57 (510)	7.38 $\pm$ 0.11 (769)	2.86 $\pm$ 0.11 (510)
Season of birth	*	NS	**	NS
Jan-Apr	78.42 $\pm$ 0.66 (2410)	37.00 $\pm$ 0.54 (1821)	7.99 $\pm$ 0.06 (2412)	2.92 $\pm$ 0.04 (1821)
Aug-Oct	60.94 $\pm$ 1.57 (329)	28.06 $\pm$ 1.60 (215)	5.97 $\pm$ 0.13 (339)	2.42 $\pm$ 0.11 (215)
Dam age lambing	*	NS	**	NS
< 2.5 years	68.14 $\pm$ 1.29 (673)	32.81 $\pm$ 1.23 (456)	6.98 $\pm$ 0.10 (675)	2.72 $\pm$ 0.08 (456)
2.5 to 3.5 years	69.25 $\pm$ 1.28 (562)	31.38 $\pm$ 1.16 (438)	6.89 $\pm$ 0.10 (564)	2.59 $\pm$ 0.08 (438)
3.5 to 4.5 years	68.30 $\pm$ 1.34 (511)	31.65 $\pm$ 1.21 (400)	6.82 $\pm$ 0.11 (512)	31.65 $\pm$ 1.21 (400)
4.5 to 5.5 years	70.68 $\pm$ 1.39 (427)	34.06 $\pm$ 1.26 (320)	7.00 $\pm$ 0.11 (428)	34.06 $\pm$ 1.26 (320)
above 5.5 years	72.02 $\pm$ 1.26 (566)	32.75 $\pm$ 1.18 (422)	7.22 $\pm$ 0.10 (572)	32.75 $\pm$ 1.18 (422)
Reg of dam weight at lambing	NS	NS	**	NS

Within parentheses: number of observations; **P d^{0.01}%; *Pd^{0.05}%; NS, nonsignificant; μ overall mean.

Our result for ADG1 is in agreement with the findings of Eskandarinasb *et al.* (2010) in Afsari sheep, Jafaroghli *et al.* (2010) in Moghani sheep, Mohammadi *et al.* (2010) in Sanjabi sheep and Prince *et al.* (2010) in Avikalin sheep. Similar effects of dam age on ADG2 were reported by Prince *et al.* (2010) in Avikalin sheep. The effect of dam's age on KR1 was significant in our study; however, in contrast to present results nonsignificant effect was reported by Abegaz *et al.* (2005) in Horro Sheep, Eskandarinasb *et al.* (2010) in Afsari sheep and Mohammadi *et al.* (2010) in Sanjabi sheep. We could not find any effect of dam's weight at lambing on ADG1 and ADG2, which is in agreement with report by Prince *et al.* (2010) in Avikalin sheep.

SUMMARY

The objective of this study was to determine effect of environmental factors on estimates of post-weaning growth traits. Study suggested that as the age advances growth rate and feed conversion efficiency declines in Malpura sheep. Hence, for higher economic gain selection should be made at earlier age, preferably at 6 month. Rearing male lambs can be more profitable as they achieved higher growth and better feed conversion efficiency. For unbiased estimates of breeding values, correction factors for significant non-genetic factors must be incorporated.

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