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Average daily gain and Kleiber Ratio in Deccani Sheep

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Abstract

The present investigation was undertaken to study the effect of non-genetic factors on average daily gain and Kleiber ratio in Deccani flock comprising records of 301 animals maintained at Livestock Research Station, Mahabubnagar, Telangana State for three years. The least-squares mean ADG1, ADG2 and ADG3 recorded were 97.22 ± 1.71 , 45.28 ± 0.85 and 70.27 ± 1.50 g, whereas KR1, KR2 and KR3 were 15.44 ± 0.14 , 9.07 ± 0.04 and 15.67 ± 0.08 respectively. The least-squares analysis of variance revealed highly significant influence of sex on ADG2, KR2 and KR3 ($P \leq 0.01$) and season on ADG1, ADG3, KR1 ($P \leq 0.01$) and KR2 ($P \leq 0.05$). The effect of weight of dam and parity of ewe on ADG and KR was non-significant.

Keywords: Average Daily Gain, Deccani, Sheep, Kleiber Ratio

Introduction

Deccani is a dual purpose sheep breed of Deccan peninsula reared mainly for meat production and also for coarse wool. The breed is hardy and thrives well with reasonably good growth rate and mature body weights, under poor pastoral conditions. Average Daily Gain (ADG) growth indicator. Kleiber ratio (KR) is the ratio of ADG and metabolic body weight and indicates the growth rate in a more precise way. Kleiber ratio can be determined under field conditions and is positively correlated with ADG (Badenhorst, 2011) [3]. Kleiber ratio and ADG play an important role in improving the production performance and thereby profitability of sheep enterprise. Thus, the present study was conducted to investigate the effect of genetic and non-genetic factors on ADG and KR during pre- and post- weaning periods in Deccani sheep.

Material and Methods

Data on growth parameters were recorded on 301 purebred Deccani lambs sired by fourteen sires. The lambs were weaned at the age of 3 months and were grazed for 8 hours a day and supplemented with green fodder @ 3 kg and concentrate mixture (CP 18%) @ 300 gm/animal. The ADG was calculated as gain in body weight during a period divided by the number of days during that period for three periods - ADG1 (0-3 months), ADG2 (3-6 months) and ADG3 (0-6 months). The Kleiber ratio was calculated by dividing the ADG with the animal's metabolic body weight for three periods - KR1 (ADG1/MW at 3 m), KR2 (ADG2/MW at 6m) and KR3 (ADG3/MW at 6 m). The data were subjected to least-squares analysis (Harvey, 1966) to assess the influence of non-genetic factors such as season of birth, sex of the lamb, ewe weight at lambing and parity of the ewe. Year was divided in to two season of birth Viz. Season I (Jan. to June) and Season II (July to Dec.), ewe weight at lambing was divided in to three classes Viz. Class I (< 25kg), Class II (25-30kg) and Class III (>30kg) while the ewes belonged to four parities ranging from 1 to 4 parities. Differences between the means were tested for significance by DMRT (Kramer, 1957) [18].

Results and Discussion

The present investigation revealed highly significant effect of sex on ADG2, KR2 and KR3 wherein the male lambs had higher values than female lambs (Table 1). Significant influence of sex on ADG at different age periods was also reported in various sheep breeds such as Madras Red, Marwari and Nali (Dey and Poonia, 2005, Singh *et al.*, 2013, Albial *et al.*, 2014 and Ganesan *et al.*, 2015) [9, 22, 2, 10]. On the contrary, Sivakumar *et al.* (2009) [23] reported non-significant influence of sex on ADG. Published literature revealed significant influence of sex on KR at different age periods in few Indian breeds and many Iranian breeds (Sima *et al.*, 2011; Mokhtari *et al.*, 2013; Hossein *et al.*, 2013; Hedayatollah *et al.*, 2014 and Jeichitra and Rajendran, 2014) [21, 19, 14, 13, 16].

In general, male lambs had higher average daily gains when compared to female lambs. Sexual dimorphism in favour of males was also reported by Devendran *et al.* (2009) [8] and Devendran *et al.* (2010) [7] in Madras Red; Dey and Poonia (2005) [9] and Albial Abed *et al.* (2014) [2] in Nali sheep. Significant influence of sex was recorded on KR2 and KR3 which is in agreement with the findings of Sima *et al.* (2011) [21], Ghavi (2013) [11], Hossein *et al.* (2013) [14], Hedayatollah *et al.* (2014) [13] and Jeichitra and Rajendran. (2014) [16] in Moghani, Shal, Arabi and Mecheri sheep.

Season of birth significantly influenced ADG1, ADG3, KR1 and KR2 in the present investigation wherein the lambs born during season I recorded higher values (Table 1). Published literature also revealed significant influence of season of birth on ADG (Dey and Poonia, 2005; Singh *et al.*, 2013; Albial *et al.*, 2014 and Ganesan *et al.*, 2015) [9, 22, 2, 10] in Madras Red, Marwari and Nali breeds and on KR in Irani Moghani lambs (Sima *et al.*, 2011) [21] and in Mecheri sheep (Jeichitra and Rajendran, 2014) [16]. On the contrary, Chopra *et al.* (2010) [6] found non-significant influence of season of birth on ADG1 in Bharat Merino sheep. Season of birth will influence the growth of sheep through climatic conditions which in turn would influence the fodder availability and ambient temperatures etc.

Lambs born during season I had higher average daily gains when compared to those born during season II as was also reported by Devendran *et al.* (2009) [7] and Devendran *et al.* (2010) [8] in Madras Red sheep. Whereas, Albial Abed *et al.* (2014) [2] reported that major season lambs had higher ADG1 and ADG2 in Nali sheep. This might be due to regional differences in climatic conditions and availability of pasture during different seasons and the classification followed for season.

Effect of weight of ewe at lambing was non-significant on ADG and KR in the present study. Contrary to the present findings, significant effect of ewe weight was observed on ADG3 in Madras Red sheep (Ganesan *et al.*, 2015) [10] and on ADG1 in Marwari sheep (Singh *et al.*, 2013) [22]. Devendran *et al.* (2009) [7] also reported significant influence of ewe weight at lambing on average daily gains during birth to 3 months and 3-6 months in Madras Red sheep.

In the present study, the effect of parity was non-significant on average daily gains and Kleiber ratios. Similar non-

significant influence of parity on ADG was reported by Singh *et al.* (2013) [22] in Marwari breed. However, Albial Abed *et al.* (2014) [2] observed significant influence of parity on ADG1 in Nali sheep while Jeichitra and Rajendran (2014) [16] reported significant effect of parity on KR1 but not on KR2 in Mecheri sheep.

The overall least squares mean ADG1, ADG2 and ADG3, recorded were 97.22 ± 1.71, 45.28 ± 0.85 and 70.27 ± 1.50 g, respectively (Table 2). Published literature revealed that the ADG1 and ADG2 ranged between 60.00 to 133.59 and 39.57 to 68.00 g, respectively in Madras Red, Sonadi and Mecheri sheep (Devendran *et al.*, 2009; Balasubramanyam *et al.*, 2010; Tailor and Yadav., 2010; Balasubramanyam and Kumarasamy., 2011; Singh *et al.*, 2013 and Jeichitra *et al.*, 2015) [7, 5, 24, 4 22, 17]. In exotic sheep, Talebi (2012) [25] reported ADG1 and ADG2 to be 136 and 114g in Karakul sheep whereas Razzaque and Samira (2010) reported a higher range of 221 to 231g for ADG1 in Kuwait sheep. The variation in average daily gains might be mainly due to the breed differences and environmental variations. As the lambs advanced in age, growth rates over the later age intervals declined. This decline in ADG could be attributed to the reason of advancing maturity. Growth rates beyond weaning age were lowered by one to two-thirds of pre-weaning growth rate.

The overall least squares mean KR1, KR2 and KR3 recorded were 15.44 ± 0.14, 9.07 ± 0.04 and 15.67 ± 0.08, respectively (Table 2). Published literature revealed a range of 6.8 to 22.8 for KR1 and 6.1 to 18.0 for KR2 in Karakul, Moghani, Makooei, Shal, Arabi, Horro and Arman Iranian sheep breeds and in Mecheri sheep (Abegaz *et al.*, 2005; Sima *et al.*, 2011; Talebi, 2012; Ghavi, 2013; Hossein *et al.*, 2013; Mokhtari *et al.*, 2013; Jafari *et al.*, 2014; Hedayatollah *et al.*, 2014 and Jeichitra and Rajendran, 2014) [1, 21, 25, 11, 14, 19, 15 13, 16]. The differences in ADG and KR may be due to genetic makeup and environment in which the genotypes were expressing. Sheep with higher Kleiber ratios are considered to be efficient converters of feed. Kleiber ratio does not have a negative effect on fertility or longevity. It can indeed be used as a reliable indication of efficiency, especially under feedlot conditions. It is accepted that the Kleiber ratio is also accurate in predicting the efficiency of feed consumption of young, growing animals under field conditions.

Table 1: Least-squares mean average daily gains (g) in Deccani lambs

	ADG1 (0-3m)			ADG2 (3-6m)			ADG3 (0-6m)		
	n	Mean	SE	n	Mean	SE	n	Mean	SE
Overall	301	97.22	1.71	286	45.28	0.85	301	70.27	1.50
Sex of lamb									
Male	153	97.71	2.06	140	49.76 ^a	1.04	153	70.28	1.81
Female	148	96.74	2.09	146	40.79 ^b	1.05	148	70.27	1.84
Season of birth									
I (Jan-June)	112	101.14 ^a	2.33	112	44.62	1.17	112	74.35 ^a	2.05
II (Jul-Dec)	189	93.31 ^b	1.84	174	45.94	0.93	189	66.19 ^b	1.62
Ewe weight									
<25 kg	140	98.34	1.86	134	46.72	0.94	140	71.26	1.63
25 to 30 kg	133	96.04	1.92	124	45.44	0.98	133	67.76	1.69
>30 kg	28	97.28	3.96	28	43.67	1.97	28	71.80	3.47
Parity									
1	96	94.95	2.39	88	46.19	1.23	96	66.68	2.10
2	71	97.65	2.62	67	44.55	1.33	71	68.98	2.30
3	105	99.04	2.17	102	44.81	1.09	105	71.39	1.91
4	29	97.28	3.98	29	45.55	1.99	29	74.04	3.50

Means with similar superscripts in a column within the effect do not differ significantly ($P \geq 0.01$)

Table 2: Least-squares mean Kleiber ratios in Deccani lambs

	KR1 (0-3m)			KR2 (3-6m)			KR3 (0-6m)		
	n	Mean	SE	n	Mean	SE	n	Mean	SE
Overall	301	15.44	0.14	301	9.07	0.04	286	15.67	0.08
Sex of lamb									
Male	153	15.49	0.16	153	9.18 ^a	0.35	140	16.06 ^a	0.09
Female	148	15.40	0.17	148	8.97 ^b	0.05	146	15.29 ^a	0.09
Season of birth									
I (Jan-June)	112	15.76 ^a	0.18	112	9.15 ^a	0.06	112	15.60	0.11
II (Jul-Dec)	189	15.13 ^b	0.15	189	8.99 ^b	0.05	174	15.74	0.09
Ewe weight									
<25 kg	140	15.57	0.15	140	9.17	0.05	134	15.84	0.09
25 to 30 kg	133	15.36	0.15	133	9.05	0.05	124	15.70	0.09
>30 kg	28	15.40	0.31	28	9.01	0.10	28	15.49	0.18
Parity									
1	96	15.37	0.19	96	9.10	0.06	88	15.76	0.11
2	71	15.50	0.21	71	9.08	0.07	67	15.59	0.12
3	105	15.59	0.17	105	9.11	0.06	102	15.64	0.10
4	29	15.31	0.31	29	9.00	0.10	29	15.71	0.18

Means with similar superscripts in a column within the effect do not differ significantly ($P \geq 0.05$)

Conclusion

Significant effect of season on growth traits indicates the possibility of capitalizing the favourable agro-climatic conditions for higher growth rates. The growth performance of Deccani sheep is also comparable with other native breeds indicating its adaptation to the harsh climatic conditions of Deccan plateau. In view of this, the breed need to be supported by scientifically managing the flocks under organized farms.

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