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Genetic parameters of pre-weaning and post-weaning bodyweights in Deccani lambs

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Abstract
The current investigation was taken up to study the growth performance by evaluating the genetic parameters of growth traits like heritability estimates, genetic correlations and phenotypic correlations pertaining to pre-weaning and post-weaning body weights at different age periods in a flock comprising of 300 Deccani lambs which were maintained at Livestock Research Station, Mahabubnagar in the state of Telangana. The heritability estimates obtained for pre-weaning body weights in Deccani lambs were low during the pre-weaning periods of 0, 15, 30. 45, 60, 75 and 90 days which ranged 0.10 ± 0.01 to 0.14 ± 0.07. The heritability estimates obtained for post-weaning body weights in Deccani lambs were moderate during post-weaning periods of 6 months, 9 months and yearling ages which ranged from 0.20 ± 0.06 to 0.30 ± 0.05. Heritability estimates obtained for the post-weaning body weights indicated the effective mass selection for rapid growth. The genetic and phenotypic correlations among the pre and post-weaning body weights were all positive except that between birth and yearling ages.

Keywords: Pre-weaning, post-weaning, bodyweight, deccani, lambs, heritability, correlations

Introduction
Sheep is one of the important livestock species of India having an important role in the livelihood of rural poor farmers. In India the Sheep are mostly maintained on the natural vegetation comprising of the common grazing lands, waste and uncultivated fallow lands, cultivated crop stubbles and tree top feeds. Deccani is an important black coloured, medium sized, coarse wool sheep breed of the southern peninsular region spread across the Deccan Plateau. This breed is well-suited to the harsh climatic conditions of this region and is capable of long-distance migration. The main reason for the low productivity at the farmer level is due to the inadequate selection of the breeding rams, and much prevalent inter-mating among the neighbouring sheep breeds of this region. In order to formulate the strategies, improve the production potential of this breed, the present study was carried out with the objective of studying the genetic parameters like heritabilities, genetic and phenotypic correlations of the growth traits like pre and post-weaning body weights.

Materials and Methods
In this study a flock comprising of 300 purebred Deccani lambs born to 15 sires were evaluated for the growth traits pertaining to pre-weaning bodyweights and post-weaning bodyweights. The pre-weaning bodyweights were recorded at 0 (birth), 15, 30, 45, 60, 75 and 90 days of age whereas the post weaning body weights at 180 (6 months), 270 (9 months) and 360 (Yearling) days of age. The animals were housed in standard sheds with mud floor and asbestos roofing. Sheep were grazed for 8 hours in the morning by the semi-intensive method. Additional feeding was provided to the lambs in the form of green fodder @ 3 kg per lamb and concentrate mixture (CP 18%) @ 300 gm/lamb. The body weights on mornings were recorded in grams (gm) using a digital weighing balance with 50 gm accuracy every fortnight from birth to yearling age.
The data was corrected for significant genetic and non-genetic effects like season of birth of the lamb, sex of the lamb, weight of ewe at lambing and ewe parity at lambing before it was utilized for genetic parameters (Heritabilities and Correlations) estimation. Heritabilities were estimated by the paternal half-sib correlation method (Becker, 1984). The Genetic and Phenotypic correlations were estimated by Minimum Variance Quadratic Unbiased Estimator (MIVQUE).

Results and Discussion

Heritabilities of Pre-weaning and Post-weaning bodyweights in Deccani lambs

Heritability measures the heritable variation of a particular trait. By adopting the best breeding methods, we can change the population when the knowledge of the heritability is available. In order to get the better gains in the population the magnitude of the heritability helps us in the choice of the selection method and the breeding system to be adopted. The evidence of change in the proportion of the genetic variance with age in the population is demonstrated by the Heritability estimates for body weights taken at various ages.

The heritability estimates (Table 1) obtained in the present study for the body weights in Deccani lambs were low during the pre-weaning period which ranged from 0.10±0.01 to 0.14±0.07 whereas they were moderate during the post-weaning period which ranged from 0.20±0.06 to 0.30±0.05. The present study showed the presence of effective variation for selective breeding of these traits so that further genetic improvement can be obtained and modest rate of genetic progress will be possible for the body weight. The heritability estimate obtained for the weaning weight at 90 days was low measuring 0.14 which indicated the presence of the maternal effects. The maternal effects arise due to the maternal behaviour exhibited by the ewe and the ability of the ewe to produce milk for the lambs. The heritability estimate obtained for the weight at 360 days age is the highest in this study which measured 0.30 which indicated the possibility that the additive genes for growth were better expressed at this age or the environmental variance is progressively reduced as the age progresses at later ages.

Such low heritability estimates for pre-weaning body weights in the different Indian sheep breeds were also reported by different authors like (Nehra and Singh 2006; Devendran *et al.,* 2010; Balasubramanyam *et al.,* 2012; Devendran *et al.*, 2014; Jeichitra *et al.,* 2015 and Venkataramanan *et al*., 2015) [8, 3, 1, 4, 6, 11] in Marwari, Madras Red, Mecheri, Nilagiri and Sandyno lambs which ranged from 0.08 to 0.17. The moderate heritability estimates for post-weaning body weights, were reported by (Kushwaha *et al.,* 2009; Gowane and Arora 2010; Prince *et al.,* 2010; Devendran *et al* 2010; Ved Prakash *et al.,* 2012; Devendran *et al.,* 2014; Jeichitra *et al.,* 2015 and Venkataramanan *et al*., 2015) [7, 10, 3, 4, 6, 11] in the different sheep breeds like Chokla, Malpura, Avikalin, Madras Red, Mecheri, Nilagiri and Sandyno lambs which ranged from 0.08 to 0.33.

The moderate heritabilities obtained in this study indicated the possibility of improvement by selection for the post-weaning body weights obtained by the paternal half-sib correlation method. Heritability estimates seemed to be a good criterion for selection for 180, 270 and 360 days body weights because they were substantial.

Genetic and phenotypic correlations of pre-weaning and post-weaning bodyweights in deccani lambs

The genetic and phenotypic correlations (Table 1) among the pre and post-weaning body weights recorded in the present study were all positive except that for between birth weight and yearling weight. The genetic correlations in this study ranged from -0.06 to 0.96 while the phenotypic correlations ranged from -0.06 to 0.95. The moderate to high positive genetic correlations among most of the pre and post-weaning body weight traits indicated the possibility of correlated response to selection.

As per the published reports in the different sheep breeds by Balasubramanyam *et al.,* (2012) [1] in Madras Red, Jeichitra *et al.,* (2015) [6] in Mecheri and Venkataramanan *et al*., (2015 and 2016) [11, 12] in Nilagiri and Sandyno the genetic correlations ranged from -0.36 to 0.99 and phenotypic correlations ranged from -0.32 to 0.99 among the pre and post-weaning body weights.

Table 1: Heritability estimates of Deccani lambs for pre and post-weaning body weights (BW) (on diagonal) and genetic correlations (above diagonal) and phenotypic correlations (below diagonal)

Age (days)	BW0	BW15	BW30	BW45	BW60	BW75	BW90	BW180	BW270	BW360
BW0	0.10±0.01	0.61±0.04	0.46±0.03	0.24±0.02	0.23±0.02	0.22±0.01	0.17±0.01	0.24±0.02	0.09±0.00	-0.06±0.00
BW15	0.62±0.05	0.10±0.04	0.93±0.02	0.73±0.05	0.06±0.02	0.06±0.02	0.59±0.03	0.52±0.04	0.44±0.04	0.22±0.04
BW30	0.47±0.05	0.91±0.02	0.10±0.06	0.85±0.06	0.79±0.04	0.77±0.01	0.69±0.08	0.56±0.09	0.52±0.05	0.30±0.05
BW45	0.22±0.06	0.66±0.04	0.79±0.03	0.11±0.05	0.95±0.05	0.93±0.00	0.87±0.06	0.74±0.03	0.73±0.02	0.45±0.04
BW60	0.23±0.06	0.61±0.04	0.71±0.04	0.91±0.02	0.11±0.02	0.94±-0.40	0.89±0.07	0.77±0.04	0.73±0.07	0.43±0.05
BW75	0.21±0.06	0.59±0.04	0.69±0.04	0.89±0.02	0.92±0.03	0.13±0.05	0.96±0.09	0.82±0.05	0.79±0.02	0.48±0.01
BW90	0.17±0.06	0.54±0.05	0.64±0.04	0.85±0.03	0.86±0.04	0.95±0.02	0.14±0.07	0.85±0.07	0.79±0.09	0.46±0.06
BW180	0.20±0.06	0.49±0.06	0.52±0.05	0.75±0.05	0.79±0.05	0.84±0.05	0.87±0.05	0.20±0.06	0.41±0.04	0.81±0.10
BW270	0.10±0.06	0.43±0.05	0.52±0.05	0.74±0.04	0.78±0.05	0.84±0.05	0.82±0.05	0.83±0.04	0.28±0.03	0.82±0.02
BW360	-0.06±0.00	0.23±0.05	0.32±0.05	0.48±0.05	0.48±0.05	0.53±0.05	0.49±0.05	0.42±0.05	0.82±0.02	0.30±0.05

Conclusion

By following the best scientific managemental practices the optimum output and boosted production performance can be obtained in the Deccani lambs. The heritabilities in the present study were low to medium which offers us a better scope for the genetic improvement through selective breeding methods. The positive genetic and phenotypic correlations give a chance to the animal breeder for adopting the indirect selection in this breed.

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