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GENETIC ANALYSIS OF GROWTH PERFORMANCE OF NELLORE BROWN SHEEP

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Abstract: The data on body weights at birth, 3, 6, 9 and 12 months of age recorded on 519 Nellore Brown lambs born during 2009 to 2013 maintained at Livestock Research Station, Mamnoor, Warangal district which is a constituent of Sri P.V. Narsimha Rao Telangana Veterinary University, Hyderabad, were utilized for the present study. The overall least squares means for body weight at birth, 3, 6, 9 and 12 months of age were 2.63±0.01, 12.52±0.03, 20.15±0.03, 24.25±0.03 and 27.06±0.03 kg, respectively. The year of birth had significant (P≤0.05) effect on body weight at all ages except at six months of age. Males were significantly (P≤0.01) heavier than females at all ages. The season of birth significantly (P≤0.05) influenced the body weight at all ages except at 3 months of age. The lambs born in main season were heavier at all ages. The estimates of heritabilities of body weights ranged from 0.01±0.06 to 0.25±0.12; All the genetic, phenotypic and environmental correlations are positive except that of genetic correlations of birth weight. Heritability estimates for 6months body weight (0.13 ± 0.09) and 12months body weight (0.25 ± 0.12) indicated the presence of moderate genetic variance, which could facilitate the improvement through selection coupled with optimum managerial practices.

Keywords: Nellore brown sheep, Body Weights, non-genetic factors, Genetic parameters.

INTRODUCTION

Most of the south Indian breeds are mainly maintained for meat production. Mutton is one kind of meat towards, which there is no prejudice by any community in India and further development of superior breeds for mutton production will have a great scope in the developing economy of India. The role of sheep is more pronounced as a source of non-vegetarian food. Further, the demand for non-vegetarian food products is on increase and its consumption would be nearly 8.0-9.0 million tons by 2020, up from 2.0-3.0 million tons in 2001 (Birthal and Taneja, 2006). To meet the surging domestic and international demand for mutton and mutton products, it is necessary to improve the production and productivity of sheep.

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Nellore is a popular and tallest mutton breed in the country distributed predominantly in Nellore and Prakasam districts of Andhra Pradesh. Nellore is also known for heat tolerance, disease resistance and thrives well in harsh conditions. Based on coat color pattern Nellore sheep is classified into three varieties *viz*. Palla, Jodipi and Brown or Dora. Nellore breed has made rapid strides into semi-arid Telangana state at the expense of native Deccani sheep, because of its higher growth rates. There is no information available on the performance of Nellore Brown sheep in the semi-arid environment of Telangana. Therefore an attempt was made to study the growth performance of Nellore Brown sheep in the semi-arid environment of Telanganaunder organized farm conditions.

MATERIALS AND METHODS

The data on body weights at birth, 3, 6, 9 and 12 months of age recorded on 519 Nellore Brown lambs born during 2009 to 2013 maintained at Livestock Research Station, Mamnoor, Warangal district which is a constituent of Sri P.V. Narsimha Rao Telangana Veterinary University, Hyderabad, were utilized for the present study. The animals were maintained on semi-intensive system with a provision of concentrates supplementation (250-300g/ day/animal) and 8hours grazing. Water is provided *ad libitum* in the farm and grazing areas. Lambs were weaned at the age of 3 months. The least squares analysis of variance technique using mixed model least-squares and maximum likelihood computer program pc-2 developed by Harvey (1990) was applied to study the influence of various non-genetic factors such as season, year of birth and sex on body weights. Duncan's Multiple Range Test (D.M.R.T) as modified by Kramer (1957) was used for comparing the sub-group means. Heritability Estimates were computed for various traits based on the data adjusted for non-genetic effects by paternal half-sib correlation method as per Becker (1985). The genetic and phenotypic correlations among body weights at different ages were estimated by paternal half-sib correlation method as per the procedure described by Becker (1985).

RESULTS AND DISCUSSION

The overall least squares means of body weights at birth, 3, 6, 9 and 12 months of age were 2.63 ± 0.01, 12.52 ± 0.03, 20.15 ± 0.03, 24.25 ± 0.03 and 27.06 ± 0.03 kg respectively (Table 1). These values higher than the values reported by Balasubramanyam *et al.* (2012) in Madras Red sheep; Chikurdekar *et al.* (2012) and Mane *et al.* (2014) in Deccani sheep and Jalajakshi *et al.* (2015) in Nellore brown sheep. The effect of year of birth was significant ($P \leq 0.05$) on body weights at all ages except six months of age (Table 1). Lambs born during the year 2009 were heavier at all ages over than those born during other years. The year differences in body

weights might be due to variations in the agro-climatic conditions which affected the availability of feed and fodder to the animals and other management factors prevailing in different years. The results were in agreement with the findings of Reddy *et al.* (2009), Ekambaram *et al.* (2013) and Jalajakshi *et al.* (2015) in Nellore sheep. Balasubramanyam *et al.* (2012) in Madras Red sheep; Chikurdekar *et al.* (2012) in Deccani sheep in Deccani sheep.

Season of birth had significantly ($P \leq 0.05$) affected the body weights at all ages except at 3 months of age (Table 1). The lambs born in main season (Oct- Dec) were heavier than lambs born in off season (April-June) at all ages. Since the pregnant ewes had access to rich pasture during the monsoon, the body weights of the lambs born in main season were increased due to good body condition of their mothers. Significant effect of season noticed for body weights in the present study was well in agreement with the findings of Reddy *et al.* (2009), Rathod and Sreedhar (2010), Ekambaram *et al.* (2013) and Jalajakshi *et al.* (2015) in Nellore sheep; Balasubramanyam *et al.* (2012) and Chikurdekar *et al.* (2012) and Mane *et al.* (2014) in Deccani sheep.

Sex of lambs had significant ($P \leq 0.01$) influence on all the traits. Males were significantly heavier than females at all stages of growth (Table 1). The mean body weights at birth, 3, 6, 9 and 12 months of age in males were 2.71 ± 0.02, 14.16 ± 0.04, 22.42 ± 0.04, 26.79 ± 0.04 and 29.80 ± 0.04 kg, respectively while in females the corresponding means were 2.54 ± 0.01, 10.87 ± 0.03, 17.88 ± 0.03, 21.70 ± 0.03 and 24.33 ± 0.03 kg (Table1). This might be due to differences in physiology of two sexes. Reddy *et al.* (2009), Rathod and Sreedhar (2010), Ekambaram *et al.* (2013) and Jalajakshi *et al.* (2015) also reported significant effect of sex on body weight traits in Nellore sheep; however, in contrast to present results non-significant effect of sex on body weights was reported by Sivakumar *et al.*(2009) in Madras Red sheep.

The estimates of heritabilities of body weights at birth, 3, 6, 9 and 12 months of ages were 0.09 ± 0.08, 0.01 ± 0.06, 0.13 ± 0.09, 0.06 ± 0.07 and 0.25 ± 0.12 respectively (Table 2) and the magnitude of heritability is low to moderate. The relatively low estimates of heritabilities with high standard errors indicating that a greater portion of variation in body weights was due to non-genetic factors and similar findings were reported by Nehra and Singh (2006) in Marwari sheep. In present study, heritability estimated for body weight at 12 months was high and this indicating that at this stage expression of genes occurred maximum and less influenced by maternal effects, so 12 month of age may be considered as criteria for selection of this flock and similar findings were reported by Balasubramanyam *et al.* (2012) in Madras

Red sheep. All the genetic, phenotypic and environmental correlations are positive except that of genetic correlations of birth weight. Similar results were reported by Nehra and Singh (2006) in Marwari sheep.

Heritability estimates for 6months body weight (0.13 ± 0.09) and 12months body weight (0.25 ± 0.12) indicated the presence of moderate genetic variance, which could facilitate the improvement through selection coupled with optimum managerial practices. The genetic and phenotypic correlations between 6 months body weight with later ages were strongly correlated. Hence, selection may be practiced on the basis of body weight at 6 months age to improve the subsequent body weights both on genetic as well as phenotypic scale.

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Table 1: Least- squares means (±SE) of body weights (kg) at different ages in Nellore brown sheep

Effects	Birth	3 months	6 months	9 month s	12 months
Overall mean	2.63±0.01	12.52±0.03	20.15±0.03	24.25±0.03	27.06±0.03
Year	**	*	NS	*	**
2009	2.68±0.03^{a}	12.63±0.06^{a}	20.23±0.07	24.37±0.06^{a}	27.30±0.07^{a}
2010	2.60±0.04^{ab}	12.56±0.08^{ab}	20.14±0.08	24.27±0.08^{ab}	27.02±0.08^{b}
2011	2.63±0.02^{a}	12.51±0.05^{ab}	20.19±0.05	24.29±0.05^{a}	27.02±0.05^{b}
2012	2.66±0.02^{a}	12.41±0.03^{b}	20.08±0.03	24.15±0.03^{b}	27.03±0.03^{b}
2013	2.56±0.02^{b}	12.49±0.04^{ab}	20.11±0.04	24.16±0.04^{b}	26.96±0.04^{b}
Season	**	**NS**	*	*	**
Main season (Oct- Dec)	2.66±0.02^{a}	12.53±0.04	20.20±0.04^{a}	24.30±0.04^{a}	27.15±0.04^{a}
Off-season (April-June)	2.60±0.01^{b}	12.50±0.03	20.11±0.03^{b}	24.19±0.03^{b}	26.98±0.03^{b}
Sex	**	**	**	**	**
Male	2.71±0.02^{a}	14.16±0.04^{a}	22.42±0.04^{a}	26.79±0.04^{a}	29.80±0.04^{a}
Female	2.54±0.01^{b}	10.87±0.03^{b}	17.88±0.03^{b}	21.70±0.03^{b}	24.33±0.03^{b}

* Significant (P≤0.05); ** Significant (P≤0.01); NS-Non Significant; Means followed by the same super script(s) do not differ significantly (P≤0.05)

Table 2: Estimates of heritability (on diagonal) and genetic (below diagonal), phenotypic (above diagonal) and environmental correlations (above diagonal within parentheses)

Trait	Birth	3 months	6 months	9 month s	12 months
Birth	**0.09±0.08**	0.36 (0.38)	0.29 (0.33)	0.28 (0.30)	0.53 (0.64)
3 months	-0.08	**0.01 ±0.06**	0.69 (0.67)	0.59 (0.56)	0.47 (0.44)
6 months	-0.02	0.49	**0.13 ±0.09**	0.78 (0.80)	0.50 (0.58)
9 month s	-0.01	0.57	0.63	**0.06 ±0.07**	0.64 (0.65)
12 months	-0.02	0.52	0.20	0.75	**0.25 ±0.12**