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Genetic Analysis of Growth Rates of Nellore Brown Sheep

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A B S T R A C T

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 average daily gains during 0-3(ADG_1), 3-6(ADG_2), 6-9(ADG_3) and 9-12(ADG_4) months of ages were 109.90±0.28, 84.80±0.23, 45.53 ± 0.20 and 31.29 ± 0.25 g, respectively. The growth rate decreased as the age advanced and was the lowest during 9-12 months. They ear of birth had highly significant (P≤0.01) effect on the average daily gains at 0-3 and 9-12 months of age. The effect of season of birth was non-significant (P≤0.05) on the average daily gains at all ages studied. Males recorded significantly (P≤0.01) higher average daily gains than the females at all ages studied. The estimates of heritabilities of ADGs ranged from 0.02±0.06 to 0.20±0.11.The estimates of heritabilities for ADGs indicated that non genetic factors play an important role and better feeding and management can help to improve these traits.

Introduction

Small ruminants have become the most promising livestock in the country due to ample marketing opportunities for their products. Sheep farming is a major source of income and livelihood of small and marginal farmers of arid and semi-arid regions of India besides providing nutritional security to the rural people. Sheep are efficient converters of unutilized poor quality grass and crop residues into meat and skin. In small ruminants, fast growth rate ultimately determines their meat producing capability up to marketing age and therefore, affects economic success of producing system (Abbasi *et al*., 2012). With the rising prices of mutton in the market, fast growing and heavier lambs in great demand (Narula *et al.*, 2009).

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. There is no information available on the growth performance of Nellore Brown sheep. Therefore present study was under taken to study the growth performance of Nellore Brown sheep under 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 of 22 sires 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.

Absolute growth rate is the change in size over time and calculated as (yt2 - yt1) / (t2 – t1) where y refers to body weight and t1 and t2 refers to age in days (Fitzhugh and Taylor, 1971). Absolute growth rate is often called as average daily gain (ADG) which is expressed in grams per day.

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.

The data were analysed using the following statistical model

$$Y_{ijkl} = \mu + Y_i + Se_j + S_k + e_{ijkl}$$

Where,

Y_{ijkl} = observation on l^{th} individual belonging to k^{th} sex, j^{th} season of birth and i^{th} year.

μ = Overall mean
Y_i = Effect of i^{th} year (i = 1 to 5 i.e., 2009-2013)
Se_j= Effect of j^{th} season of birth (j = 1 and 2 i.e., 1=April-June and 2= October- December)
S_k = Effect of k^{th} sex (k =1 and 2: i.e., male and female)
e_{ijkl} = Random error associated with l^{th} individual and assumed to be normally and independently distributed with mean 0 and variance σ^2_e.

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).

Results and Discussion

The overall least squares means for average daily gains during 0-3(ADG_1), 3-6(ADG_2), 6-9(ADG_3) and 9-12(ADG_4) months of ages were 109.90 ± 0.28, 84.80 ± 0.23, 45.53 ± 0.20 and 31.29 ± 0.25 g, respectively (Table 1). The growth rate decreased as the age advanced and was the lowest during 9-12 months. This decline in ADG could be attributed to the reason of advancing maturity (Jeichitra and Rajendran, 2013). The ADGs recorded in the present study coincided with the findings of Mandal *et al.,* (2003) in Muzaffarnagari sheep; Narula *et al.,* (2009) and Joshi *et al.,* (2014) in Magra sheep but

higher than that of the reported in Nali sheep by Dey and Poonia (2005), in Madras Red sheep by Balasubramanyam *et al.,* (2010) and in Mecheri sheep by Jeichitra and Rajendran (2013).

The least squares analysis of variance revealed that the year of birth had highly significant (P≤0.01) effect on the average daily gains at 0-3 and 9-12 months of age. The differences in agro-climatic conditions and management factors could be the reason for variations in average daily gains among different years. Similar findings were reported by Dey and Poonia (2005) in Nali lambs; Narula *et al.,* (2009) in Magra sheep and Ganesan *et al.,* (2013) in Madras Red sheep.

The effect of season of birth was non-significant (P≤0.05) on the average daily gains at all ages studied. The least squares means for average daily gains at 0-3, 3-6, 6-9 and 9-12 months of age were 109.76 ± 0.41, 85.12 ± 0.34, 45.62 ± 0.29 and 31.62 ± 0.38 g, respectively in offseason born lambs while in main season lambs the daily gains were 110.04 ± 0.31, 84.48 ± 0.26, 45.44 ± 0.22 and 30.96 ± 0.28g, at the corresponding ages(Table1).

Table.1 Least- squares means (±SE) of average daily gains (g/day) in Nellore Brown sheep

Effects	No of observations	ADG_1 (0-3M)	ADG_2 (3-6M)	ADG_3 (6-9M)	ADG_4 (9-12M)
Overall mean	519	109.90±0.28	84.80±0.23	45.53±0.20	31.29±0.25
Year		**	**NS**	**NS**	**
2009	61	110.48^{a}±0.68	84.46±0.57	46.02±0.48	32.52^{a}±0.62
2010	39	110.76^{a}±0.80	84.18±0.67	45.92±0.57	30.52^{bc}±0.73
2011	99	109.74^{a}±0.51	85.43±0.43	45.49±0.36	30.31^{c}±0.46
2012	197	108.28^{b}±0.35	85.28±0.29	45.17±0.25	31.96^{ab}±0.32
2013	123	110.25^{a}±0.43	84.65±0.36	45.05±0.31	31.14^{abc}±0.39
Season		**NS**	**NS**	**NS**	**NS**
Off-season (April-June)	172	109.76±0.41	85.12±0.34	45.62±0.29	31.62±0.38
Main season (Oct- Dec)	347	110.04±0.31	84.48±0.26	45.44±0.22	30.96±0.28
Sex		**	**	**	**
Male	203	127.20^{a}±0.42	91.71^{a}±0.35	48.64^{a}±0.30	33.44^{a}±0.39
Female	316	92.60^{b}±0.30	77.89^{b}±0.25	42.42^{b}±0.21	29.14^{b}±0.27

* 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 Heritability estimates of average daily gains of Nellore Brown sheep

Trait	Estimate ± SE
ADG_1(0-3M)	0.04 ± 0.06
ADG_2(3-6M)	0.02 ± 0.06
ADG_3(6-9M)	0.15 ± 0.09
ADG_4(9-12M)	0.25 ±0.12

However, significant effect of season of birth on average daily gains was reported by Ganesan *et al.,* (2013) in Madras Red sheep and Jeichitra and Rajendran (2013) observed season of birth significantly affected the post weaning gains in Mecheri sheep.

Males recorded significantly (P≤0.01) higher average daily gains than the females at all ages studied. The least squares means for average daily gains during 0-3,3-6, 6-9 and 9-12 months of age were 127.20 ± 0.42, 91.71 ± 0.35, 48.64 ± 0.30 and 33.44 ± 0.39 g in males and 92.60 ± 0.30, 77.89 ± 0.25, 42.42 ± 0.21, 29.14 ± 0.27 g in females, respectively (Table 1). The present findings indicated that male lambs gained more weights than female lambs during all stages of growth period and the variation in average daily gains at all ages in both sexes might be attributed to differences in the hormonal profiles and physiological differences. Present findings for the effect of sex are similar to the reports of Dey and Poonia (2005a) in Nali sheep; Narula *et al.,* (2009) in Magra sheep and Jeichitra and Rajendran (2013) in Mecheri sheep.

The estimates of heritabilities for average daily gains during 0-3, 3-6, 6-9 and 9-12 months of ages were 0.04 ± 0.06, 0.02 ± 0.06, 0.15 ± 0.09 and 0.20 ± 0.11, respectively (Table 2). The estimates ranged from low to moderate. The heritability of ADGs increased from birth to 12months.However, the estimate may be inflated upwards as maternal effect is more pronounced up to weaning and thus, this may not be the true additive value and maybe containing a proportion of additive maternal effect in it (Ganai *et al.,* 2010). The moderate heritability estimates for ADGs is indicative of genetic improvement in these traits through selection. The average daily gains between 9-12 months age may be taken as criterion fors election. Higher heritability estimates were reported by Ganesan *et al.,* (2013) in Madras Red sheep and Joshi *et al.,* (2014) in Magra sheep. The estimates of heritabilities for ADGs indicated that non genetic factors play an important role and better feeding and management can help to improve these traits.

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