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Estimation of central tendency, dispersions and correlations of growth traits in Rambouillet sheep

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ABSTRACT

Data on growth traits of 7161 animals used in present study were collected from the history sheets of Rambouillet sheep maintained at Government Sheep Breeding Farm, Reasi, J&K, India. Growth traits included in the study were birth weight (BW), three-month weight (3MW), six-month body weight (6MW), nine-month body weight (9MW) and twelve-month body weight or yearling weight (YW). The average weight gain of individual during 0-3 months (ADG1), 3-6 months (ADG2), 6-9 months (ADG3), 9-12 months (ADG4) and 3-12 months (ADG5) were calculated as weight gain during particular period divided by duration of that period in days. The overall averages were 3.39±0.01kg, 14.16±0.03kg, 19.59±0.04kg, 24.85±0.05kg and 28.71±0.06kg, respectively for BW, 3MW, 6MW, 9MW and YW. The overall averages were 0.119±0.002kg, 0.071±0.001kg, 0.058±0.006kg, 0.056±0.001kg and 0.054±0.001kg, respectively for ADG1, ADG2, ADG3, ADG4 and ADG5. Sex had significant effect on all growth traits under study except for 9 MW, where sex had non-significant. For growth rate traits sex had non-significant effect for ADG1 and ADG4. The correlation coefficients of between different body weights and average daily weight gain ranges from -0.040±0.01 between ADG1 & ADG5 to 0.97±0.01 between BW and 9W. Most of the correlations values were highly significant barring few exceptions, which indicate improvement of one trait will result in improvement of other traits also. Low to medium coefficient of variations (CV) for growth traits indicate collateral selection will be effective for improvement of growth traits.

Key words: Co-efficient of variations, Correlations, Growth rate, Growth traits, Rambouillet

Growth potential of lambs is one of the most important traits in a genetic improvement programme for mutton sheep. Early growth traits are important factors influencing profitability in any meat producing enterprise[1]. Better growth is also essential for reproduction, production and survivability in sheep[2]. The birth weight of an animal and its early growth rate are highly influenced by genetic potential of sheep[1]. Faster growth rate entails reaching market weight early, which helps to bring quick income to the farmers[3]. The average daily weight gain per day helps to decide at which particular growth period special care should be provided to lambs. Coefficient of Variation (CV) also plays a vital role aiming towards improvement in target stock by providing the information about the variability in the trait. The correlation between different body weight measurements and average daily weight gain helps to know about the selection criteria and the proper selection methodology to be employed for bringing genetic improvement. Therefore, the present study was undertaken to calculate different measures of central tendency and dispersion along with product moment correlations between the traits.

MATERIALS AND METHODS

Performance data on 7161 animals were collected from history sheets of Rambouillet sheep maintained at Government Sheep Breeding and Research Farm, Reasi, Jammu, India. The Government Sheep Breeding and Research Farm, Reasi, is located 80 kms on north-east of Jammu and lies between 33^0

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05" N latitude and 74^0 5" E longitude. The farm follows semi-migratory production system. In middle of April the sheep are shifted to alpine pastures, viz. Zaban situated at an altitude of 6000-8000 ft above sea level and allowed to graze there upto end of September. At alpine pastures sheep are kept open and allowed to graze during day time for twelve hours without any supplementary feeding. Ewes are mated in the month of August and September when they are flushed on nutritive highland pastures. Growth traits included in the study were birth weight (BW), three-month body weight (3MW), six-month body weight (6MW), nine-month body weight (9MW) and twelve-month body weight (YW). The growth rate traits were average weight gain of individual during 0-3 months (ADG1), 3-6 months (ADG2), 6-9 months (ADG3), 9-12 months (ADG4) and 3-12 months (ADG5).

The mean, standard deviation (SD), standard error (SE) and coefficient of variation (CV) were calculated by using standard formulae[4]. The standard error of correlation was computed by the formula given below

$$S.E.\ (r) = \sqrt{[(1- r^2) / (N-2)]}$$

Where, r = product moment correlation, N = number of observations

RESULTS AND DISCUSSION

The overall mean and standard error of various growth traits under study (BW, 3MW, 6MW, 9MW and YW) alongwith their corresponding standard deviations (SD) are depicted in Table 1. Sex had significant effect ($p<0.05$) on all growth traits under study barring exception for 9MW. Males had higher values for BW, 3MW and 6MW, whereas, females were heavier for 9MW and YW. Similar BW was reported in Rambouillet crossbred sheep[1]. Lower overall means for BW, 6-BW, 12- BW were reported in Dorper crossbred sheep[5]. Lower overall estimates for birth weight (BWT) & weaning weight (WWT) were reported in Kashmir Merino sheep[6]. However, higher overall means of weaning weight was reported in Rambouillet crossbred sheep[1] and in Dorper crossbred sheep[5]. Similar results were reported for BW, 3MW, 6MW and 9MW in Baluchi male and female sheep populations[7]. On the other hand, lower values for both male and female populations of crossbred sheep and Nellore sheep respectively were reported for BW, 3MW, 6MW, 9MW and YW[8]. Higher estimates of different body weights i.e., BW, 3MW, 6MW, 9MW and YW were reported in Baluchi sheep[9]. The coefficients of variations for overall population were ranging from 14.99% to 26.10% for YW and BW, respectively (Table 1). Similar types of lower CV were also found in male and female population. This showed that BW had maximum variability hence there is scope for its improvement. The co-efficient of variation CV (%) for different traits under study were low to moderate indicating that there are low to moderate variations among these traits and these traits can be improved with proper breeding, selection and management practices or importing good rams from other herds. Low CV values for BW, 3MW, 6MW, 9MW and YW were reported in Baluchi sheep[9]. Lower CV values were reported for BWT and WWT in Ramboillet crossbred sheep[10], in Kashmir Merino sheep[6] and in Dorper crossbred sheep[5]. Same low CV values were reported in Rambouillet crossbred sheep for BWT and WWT[1].

Table 1. Averages of different body weights

Parameters	BW	3MW	6MW	9MW	YW
Overall					
Mean±SE(kg)	3.39±0.01	14.16±0.03	19.59±0.04	24.85±0.05	28.71±0.06
SD	0.89	2.50	3.40	3.86	4.30
N	7161	6482	5879	5001	4540
CV (%)	26.10	17.58	17.36	15.52	14.99
Male					
Mean±SE(kg)	3.44±0.01	14.24±0.04	19.87±0.06	24.76±0.06	28.54±0.09
SD	0.89	2.45	3.40	3.79	4.23

N	3564	3251	2972	2482	2258
CV (%)	25.83	17.19	17.11	15.32	14.82
Female					
Mean±SE(kg)	3.34±0.01	14.08±0.04	19.29±0.06	24.94±0.06	28.88±0.09
SD	0.88	2.53	3.38	3.91	4.37
N	3597	3231	2907	2519	2282
CV (%)	26.29	17.95	17.52	15.69	15.13
Significant for sex	**	*	**	NS	**

NS-Non-significant *P<0.05 **P<0.01

The values for overall means with standard error and CV (%) of different average daily weight gain were presented in Table 2. For growth rate traits sex had non-significant effect for ADG1 and ADG4 and significant effect (p<0.01) on ADG2, ADG3 and ADG5. In males daily weight gain was higher up to six month of age, whereas, in females daily weight gains were higher after 6 months of age. Higher ADG1 values and lower ADG2, ADG3 and ADG4 values were reported in Dorper crossbred sheep[3]. Lower ADG during pre-weaning (0-3 months) and post-weaning (3-12 months) period was reported in Madras Red sheep[11]. The co-efficient of variations for ADG3 and ADG4 were very high. It indicates that maximum chances of improvement in the stock are during the post-weaning periods of growth (6-9 and 9-12 months) which may be achieved after applying appropriate selection procedures. Higher CV values for ADG1 and ADG2 were reported in Baluchi sheep[9].

Table 2. Averages for different growth rate traits

Parameter	ADG1 (0-3 month)	ADG2 (3-6 month)	ADG3 (6-9 month)	ADG4 (9-12 month)	ADG5 (3-12 month)
Overall					
Mean±SE(kg)	0.119±0.002	0.071±0.001	0.058±0.006	0.056±0.001	0.054±0.001
SD	0.026	0.036	0.041	0.038	0.019
N	6482	5797	4536	4221	4168
CV (%)	22.11	49.99	70.69	67.86	34.47
Male					
Mean±SE(kg)	0.120±0.002	0.072±0.001	0.062±0.009	0.055±0.001	0.053±0.001
SD	0.026	0.035	0.044	0.030	0.018
N	3251	2930	2276	2110	2091
CV (%)	21.75	48.90	70.97	54.55	34.34
Female					
Mean±SE(kg)	0.119±0.001	0.070±0.001	0.054±0.008	0.057±0.001	0.055±0.001
SD	0.027	0.036	0.038	0.036	0.019
N	3231	2867	2260	2111	2077
CV (%)	22.47	51.08	70.37	63.16	34.48
Significant for sex	NS	**	**	NS	**

NS-Non-Significant **P<0.01

The product moment correlations of different growth and growth rate traits are presented in Table 3. The correlation between different body weight and average daily weight gain ranges from -0.040±0.01 between ADG1 & ADG5 to 0.97±0.01 between BW and 9MW. The correlations values were mostly highly significant (p<0.01) for most of the correlation co-efficient values barring few exceptions. Birth weight had highly significant (p<0.01) product moment correlations with all other traits under trait except for six month weight (6MW). High product moment correlations with other traits of BW and 3MW, indicate that early selection on the basis of birth weight and 3MW will be effective for improvement of other traits also and there will be more genetic gain due to lower generation interval. Positive phenotypic correlations of BW with other growth traits were reported in Dorper crossbred sheep[3]. Negative phenotypic correlations between ADG1 and ADG2, ADG3 & ADG4; ADG2 & ADG3 were found in Dorper crossbred sheep[3].

Table 3. Product moment correlations between different growth and growth rate traits

	3MW	6MW	9MW	YW	ADG1	ADG2	ADG3	ADG4	ADG5
BW	0.30**±0.01	0.02±0.01	0.97**±0.01	0.67**±0.01	0.08**±0.01	0.23**±0.01	0.46**±0.01	0.25**±0.02	0.63**±0.01
3MW		0.31**±0.01	0.28**±0.01	0.23**±0.01	0.04**±0.01	0.08**±0.01	0.12**±0.02	-0.01**±0.02	0.21**±0.02
6MW		_	0.03**±0.01	0.02±0.02	0.03±0.012	0.02*±0.01	-0.05±0.02	0.02**±0.015	-0.01±0.02
9MW		_	_	0.80**±0.01	0.60**±0.01	0.23**±0.01	0.49**±0.01	-0.13**±0.015	0.70**±0.01
YW		_	_	_	0.08**±0.02	0.17**±0.02	0.39**±0.01	0.15**±0.015	0.86**±0.01
ADG1		_	_	_	_	-0.34**±0.01	-0.13**±0.02	-0.03±0.015	-0.40**±0.01
ADG2		_	_	_	_	_	-0.28**±0.02	0.03*±0.02	0.36**±0.01
ADG3		_	_	_	_	_	_	-0.03*±0.02	0.47**±0.01
ADG4		_	_	_	_	_	_	_	0.20**±0.02

*P<0.05 **P<0.01

CONCLUSION

From the present study it can be concluded that low to medium CV for growth traits indicate collateral selection will be effective for improvement of growth traits along with better management. Good rams from other herds can be introduced for genetic improvement. Significant correlations suggest that improvement of one trait will help to improve in other growth traits.

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