



Genetic analysis of factors affecting body weight at different ages in closed flock of Kutchi goats

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Improving growth is vital for meat, reproduction, production and survivability of goats. Besides genetic merit, expression of these traits is determined by many non genetics factors. Kutchi is one of the best dual purpose goat breed is well acclimatized to the arid and semi-arid region. But limited information is available on this breed's growth performance. The present investigation was undertaken to study the growth performance of Kutchi goats.

Data were recorded on body weight at birth, 3, 6, 9 and 12 months of age of 525 kids maintained at CSWRI, Avikanagar, Rajasthan during the years 1986 to 1993. The animals were maintained on kachcha floor. The newborn kids were kept with their mother's for first 5 days, thereafter, they were allowed to suckle thrice a day till one month and later twice a day till weaning. Goats were maintained under semi-intensive system of management (grazing for 4–6 hours a day, supplemented with concentrated, seasonally available green and dry fodder). The DCP and TDN values worked out were 14.04 and 75.45% for adult ration and 17.60 and 76.45% for kid ration. Ration was given in the morning and evening instalment. During summer season (lean period for surface grasses) animals were fed with the lopped material of trees. Least-square analysis (Harvey 1990) was carried out to study the effects of non-genetics effects on the body

weights at different ages. The factors considered were year, season, type of birth, sex and sire. Weight of dam at kidding was incorporated as covariate. The estimation of heritability, genetic and phenotypic correlation for body weights at different ages were determined by parental half-sib correlation method. Standard errors were calculated as per Swiger *et al.* (1964) and Robertson (1959) respectively. The data were corrected for the non-genetic factors for estimation of heritability and genetic correlation.

The analysis of variances revealed significant effect of sire, sex, year, season, type of birth (up to 9 months) sex and regression (linear) on body weights at birth, 3, 6, 9 and 12 months of age (Table 1). Least squares means were 3.19 ± 0.02 , 9.59 ± 0.13 , 15.83 ± 0.15 , 19.31 ± 0.16 , and 21.84 ± 0.15 at birth, 3, 6, 9 and 12 months respectively. Male were heavier than females at all the ages. Kids born in season 2 (October - November) were heavier (except birth) than those born in season 1 (February - March). Single born kids weighed more as compared to twins and triplets at birth; later on singles and multiples had almost equal body weights. The regression of body weights of dam's weight at kidding heavier would be the offspring. The results were in agreement with the findings of Saxena *et al.* (1990). Significant difference among years might be attributed to the variation in environmental condition and availability of feed across the years. The season for higher weight in February – March born kids might be due to that goats which kidded during this period had their gestation during October – February, which season with adequate availability of succulent fodder. However, kids born in February – March had to face summer followed by rains in early ages of their life. During rainy season stress is generally more and parasitic load is very high. Therefore, weight of these kids at subsequent ages was comparatively low. Higher body weight of males than that of females at all the ages might be due to aggressive behaviour of males during feeding and suckling and male sex hormone, which has an anabolic effect (Hafez 1962). Higher body weights in singles till weaning might be because dams with

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Table 1. Factor wise least-squares means of various body weight traits in Kutchi goats

Factor	Body weights (kg)					
	N	Birth wt.	3 Months	6 Months	9 Months	12 Months
mean (μ)	525	3.19 $\pm$ 0.02	9.59 $\pm$ 0.13	15.83 $\pm$ 0.15	19.31 $\pm$ 0.16	21.84 $\pm$ 0.15
Year of birth						
1986	35	3.28 $\pm$ 0.06	9.42 $\pm$ 0.31	15.38 $\pm$ 0.37	19.33 $\pm$ 0.38	22.04 $\pm$ 0.39
1987	52	3.17 $\pm$ 0.05	9.57 $\pm$ 0.25	15.99 $\pm$ 0.30	19.40 $\pm$ 0.31	21.96 $\pm$ 0.31
1988	70	3.17 $\pm$ 0.04	9.27 $\pm$ 0.21	15.53 $\pm$ 0.25	19.00 $\pm$ 0.26	21.57 $\pm$ 0.26
1989	106	3.18 $\pm$ 0.04	9.64 $\pm$ 0.19	15.96 $\pm$ 0.22	19.40 $\pm$ 0.23	21.97 $\pm$ 0.23
1990	102	3.19 $\pm$ 0.04	9.54 $\pm$ 0.19	15.85 $\pm$ 0.22	19.22 $\pm$ 0.23	21.87 $\pm$ 0.23
1991	106	3.16 $\pm$ 0.04	9.82 $\pm$ 0.20	15.89 $\pm$ 0.23	19.30 $\pm$ 0.24	21.94 $\pm$ 0.24
1992	23	3.08 $\pm$ 0.12	9.66 $\pm$ 0.55	16.12 $\pm$ 0.66	19.81 $\pm$ 0.67	21.84 $\pm$ 0.68
1993	31	3.28 $\pm$ 0.06	9.76 $\pm$ 0.28	15.94 $\pm$ 0.33	19.05 $\pm$ 0.34	21.54 $\pm$ 0.34
Season of birth						
S-1	135	3.51 $\pm$ 0.03	9.96 $\pm$ 0.16	16.24 $\pm$ 0.18	19.63 $\pm$ 0.19	22.20 $\pm$ 0.19
S-2	390	2.87 $\pm$ 0.02	9.21 $\pm$ 0.14	15.42 $\pm$ 0.15	19.00 $\pm$ 0.16	21.49 $\pm$ 0.16
Sex:						
Male	222	3.28 $\pm$ 0.02	9.71 $\pm$ 0.15	15.81 $\pm$ 0.14	19.64 $\pm$ 0.17	22.55 $\pm$ 0.17
Female	303	3.10 $\pm$ 0.02	9.46 $\pm$ 0.14	15.86 $\pm$ 0.20	18.98 $\pm$ 0.17	21.13 $\pm$ 0.17
Type of birth						
Single (1)	444	3.22 $\pm$ 0.02	9.67 $\pm$ 0.13	15.81 $\pm$ 0.14	19.27 $\pm$ 0.15	21.78 $\pm$ 0.15
Multiple (2)	81	3.16 $\pm$ 0.03	9.50 $\pm$ 0.17	15.86 $\pm$ 0.20	19.36 $\pm$ 0.21	21.90 $\pm$ 0.21

Table 2. Habitability, genetics and phenotypic correlations among body weights at various ages in Kutchi goats

Traits	Birth weight	3 m weight	6 M weight	9 M weight	12 M weight
Birth weight	0.090 $\pm$ 0.088	0.788 $\pm$ 0.384	0.337 $\pm$ 0.524	0.142 $\pm$ 0.529	0.238 $\pm$ 0.528
3 M weight	0.354	0.232 $\pm$ 0.116	0.635 $\pm$ 0.240	0.758 $\pm$ 0.185	0.843 $\pm$ 0.174
6 M weight	0.313	0.727	0.161 $\pm$ 0.102	0.969 $\pm$ 0.051	1.081 $\pm$ 0.075
9 M weight	0.261	0.672	0.903	0.204 $\pm$ 0.110	1.011 $\pm$ 0.029
12 M weight	0.253	0.619	0.831	0.920	0.185 $\pm$ 0.107

*Significant at $P < 0.05$, ** Significant at $P < 0.01$. Diagonal values are heritability estimates and values above diagonal are genetic correlation's and below are phenotypic correlations.

single kid could provide more nutrition to their kids during prenatal and suckling period. Results with significant differences were in agreement with Roy *et al.* (2002).

The means for body weights at different ages observed in present study were in agreement with those reported by Mittal (1991) in Kutchi-goats. However, Khan and Sahani, (1983) reported that higher body weights means at different ages in Jamunapari goats could be because of greater size.

The h^2 estimates for all growth traits were moderate except for birth weight because of almost zero sire components of variance (Table 2). The h^2 , genetic and phenotypic correlation's obtained in present study were higher than those reported by Siddique *et al.* (1982) in Osmanabadi goats and Nagpal and Chawla (1987) in Alpine $\times$ Beetal goats. Moderate estimates of h^2 for body weight traits were desirable indicating scope of improvement through judicious selection along with appropriate management. Present results were in agreement to the findings of Singh and Sengar (1990) and Singh *et al.* (1992).

Phenotypic and genetic correlation among body weight

at different ages were positive (Table 2) indicating that kids for higher present and future growth traits could be selected at early ages (6 to 9 months). Similar estimates of correlation had reported by Singh and Sengar (1990), Singh *et al.* (1992) in Beetal and Black Bengal goats. However slightly higher h^2 estimates for body weight at 9 months of age were observed by Siddique *et al.* (1982) in Osmanabadi goats.

SUMMARY

Present study was undertaken on 525 kids of Kutchi goats maintained at Central Sheep and Wool Research Institute (CSWRI) Avikanagar, Rajasthan. Least squares means were 3.19 $\pm$ 0.02, 9.59 $\pm$ 0.13, 15.83 $\pm$ 0.15, 19.31 $\pm$ 0.16 and 21.84 $\pm$ 0.15 for birth, 3, 6, 9 and 12 months of age respectively. Effects of sire, sex, year, season, type of birth (up to 9 months) and regression of dam's weight at kidding were significant on body weight at birth, 3, 6, 9, and 12 months of age. Males and kids born in autumn season recorded higher weights at birth and at subsequent ages. Single born lambs were also significantly heavier at birth.

Heritability was moderate for all growth traits except birth weight; genetic and phenotypic correlation among growth traits were significantly positive indicating that kids could be selected at early ages. (6 to 9 months) for present and future growth traits.

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