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GROWTH PERFORMANCE OF SIROHI GOATS IN THEIR HOME TRACT

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ABSTRACT

Data on body weights at birth, 3, 6, 9 and 12 months of age, of 3465 kids of Sirohi breed born from 1447 does and 59 bucks, spread over a period of seven years (2006-2012) were collected Flocks were maintained under All India Co-ordinated Research Project on Goats in Nathdwara Railmagra and Devegarh clusters of Rajasamand, Bhadsoda cluster of Chittorgarh and Vallabhnagar cluster of Udaipur districts of Rajasthan. The least squares means for body weights at birth, 3, 6, 9 and 12 months of age were estimated as 2.10±0.06, 13.29±0.43, 16.94±0.65, 20.00±0.87 and 24.87±1.11 kg respectively. The effects of sire, cluster, year of birth, type of birth and sex of kid were significant ($P<0.05$) on body weights from birth to yearling age. Season of birth had significant ($P<0.05$) effect on 3, 6, 9 and 12 months body weight. The weight of doe at kidding had positive and significant ($P<0.01$) effect on birth, 3 and 12 months body weights. Utilization of the information for formulating breeding plan will be helpful in bringing about further genetic improvement of this breed.

Key words: Body weights, Non-genetic effects, Rajasthan, Sirohi goats

Sirohi is the one of the best dual-purpose goat breeds of India, known for its agile look, with white spots on brown-coloured body and famous for chevon and milk production. Sirohi breed is found in arid and semi-arid region along with most part of Aravalli hills and outlying districts of central and southern Rajasthan. This breed has proved to be an excellent goat breed with respect to adaptability over wide range of climatic and feeding conditions (Meel et al., 2010). Growth is an early expressed trait and has a direct bearing on the age at maturity. It is a genetic trait and is correlated with life-time production and reproduction. Thus, the present study was undertaken to evaluate the growth performance and study the effect of genetic and non-genetic factors affecting the growth traits that can create a good foundation for genetic evaluation and formulation of breeding plans for further genetic improvement of the breed.

MATERIALS AND METHODS

Information source for the present investigation was the Sirohi farmers' flocks maintained under All India Co-ordinated Research Project (AICRP) on Sirohi Goats, Livestock Research Station, Udaipur. The project area comprised Nathdwara, Railmagra and Devegarh clusters of Rajasamand, Bhadsoda cluster of Chittorgarh and Vallabhnagar cluster of Udaipur districts. Data on body weights of 3465 kids born of 1447 does and 59 bucks were collected from 2006 to 2012 at birth, 3, 6, 9 and 12 months of age. Since the sub-class numbers were unequal and disproportionate, least squares analysis (Harvey, 1990) was carried out to study the genetic effect of sire and non-genetic effects of cluster, year of birth, season of birth, parity of dam, type of kidding, sex of kid and dam's weight at kidding on body weights at birth to yearling age using the following model:

$$Y_{ijklmnop} = \mu + a_i + B_j + C_k + D_l + E_m + F_n + G_o + b(DW_{ijklmno} - \overline{DW}) + e_{ijklmnop}$$

Where, $y_{ijklmnop}$ = Performance record of the p^{th} progeny of i^{th} sire, j^{th} cluster, k^{th} year, l^{th} season, m^{th} parity, n^{th} type of kidding, o^{th} sex ; μ = Overall population mean; a_i = Random effect of i^{th} sire; Bj= Fixed effect of j^{th} cluster (j=1, 2, 3, 4, 5); C_k = Fixed effect of k^{th} year (k=2006 to 2012). D = Fixed effect of l^{th} season (l=1, 2, 3). E = Fixed effect of m^{th} parity (1, 2, 3, 4, 5); F = Fixed effect of n^{th} type of kidding (n=1, 2, 3). G = Fixed effect of o^{th} sex (o=1, 2). b ($DW_{ijklmno}$ - $\overline{DW}$) = Regression of the corresponding trait on dams weight at kidding; $e_{ijklmnop}$ = Random error NID (0, σ^2)

The seasons of birth were rainy (July-October), winter (November-February) and summer (March-June). The difference between means was tested for significance by Duncan's multiple range test (Kramer, 1957).

RESULTS AND DISCUSSION

The overall least squares means for body weights at birth, 3, 6, 9 and 12 months of age were 2.10±0.06, 13.29±0.43, 16.94±0.65, 20.00± 0.87 and 24.87±1.11 kg, respectively (Table 1). The random effect of sire was significant (P<0.01) on body weight at birth, 3, 6, 9 and 12 months of ages. This finding was in agreement with the reports of Yadav et al. (2003) and Sharma (2005). The significant effect of sire on body weight at all ages indicates existence of additive genetic variability and therefore, sire could be used effectively for further improvement in farmers' flocks. Cluster-wise variations in birth, 3, 6, 9 and 12 months body weights were significant (P<0.01). Similar results were observed by Sharma et al. (2010) and Tyagi et al. (2013). The cluster-wise variation may be due to the difference in management practices followed by farmers, grazing resources and feed availability.

Table 1. Least squares means (±SE) for body weights (kg) across different factors in Sirohi goats

Factor	Age				
	Birth	3 months	6 months	9 months	12 months
Overall (μ)	2.10±0.06 (3465)	13.29±0.43 (2898)	16.94±0.65 (2281)	20.00±0.87 (1753)	24.87±1.11 (1167)
Sire	**	**	**	**	**
Cluster	**	**	**	**	**
Nathdwara	1.90±0.09 (121)	13.68±0.57 (93)	16.52±0.84^{c} (79)	18.75±1.13^{b} (42)	21.59±1.64^{b} (20)
Railmagra	2.08±0.07^{b} (615)	13.31±0.46^{b} (571)	16.15±0.70^{b} (542)	19.07±0.94^{b} (417)	26.13±1.26^{d} (222)
Devegarh	2.20±0.07^{c} (1594)	13.33±0.46^{b} (1391)	17.16±0.70^{d} (1214)	19.94±0.95^{c} (1036)	24.21±1.30^{c} (760)
Bhadsoda	2.38±0.07^{d} (791)	14.73±0.47^{c} (569)	20.47±0.72^{e} (283)	25.19±0.98^{d} (175)	32.41±1.33^{e} (114)
Vallabhnagar	1.95±0.07^{a} (344)	11.37±0.46^{a} (274)	14.38±0.71^{a} (163)	17.06±0.99^{a} (83)	20.00±1.38^{a} (51)
Year of birth	**	**	**	**	**
2006	2.27±0.07^{f} (330)	12.55±0.47^{a} (311)	15.25±0.70^{a} (272)	18.04±0.92^{a} (195)	22.77±1.17^{a} (137)
2007	2.33±0.07^{g} (476)	12.44±0.45^{a} (453)	15.71±0.68^{b} (406)	19.90±0.90^{b} (349)	24.32±1.14^{c} (298)
2008	2.17±0.06^{e} (617)	12.89±0.45^{b} (546)	16.18±0.67^{c} (444)	19.64±0.89^{b} (358)	24.82±1.14^{d} (260)
2009	1.88±0.06^{a} (594)	12.83±0.44^{b} (516)	16.87±0.66^{d} (386)	19.73±0.89^{b} (308)	23.97±1.13^{bc} (179)
2010	1.98±0.07^{b} (505)	13.34±0.45^{c} (424)	17.33±0.68^{e} (341)	20.73±0.91^{c} (285)	26.01±1.16^{e} (204)
2011	2.03±0.06^{c} (616)	13.99±0.45^{d} (535)	17.89±0.68^{f} (382)	21.97±0.91^{d} (258)	27.31±1.19^{f} (89)
2012	2.07±0.07^{d} (327)	14.96±0.48^{e} (113)	19.33±0.75^{g} (50)	-	-
Season of birth	NS	**	*	**	**
Rainy	2.10±0.06 (1460)	13.25±0.43^{a} (1154)	17.14±0.65^{b} (884)	20.52±0.87^{b} (664)	25.23±1.11^{b} (451)
Winter	2.10±0.06 (1436)	13.51±0.43^{b} (1258)	16.92±0.66^{ab} (1033)	19.81±0.88^{a} (811)	24.62±1.11^{a} (524)
Summer	2.12±0.06 (569)	13.10±0.43^{a} (486)	16.76±0.66^{a} (364)	19.68±0.88^{a} (278)	24.75±1.12^{a} (192)
Parity	NS	NS	**	NS	*
1^{st}	2.07±0.06 (770)	13.16±0.43 (670)	16.83±0.66^{ab} (563)	20.03±0.88 (448)	25.21±1.12^{b} (308)
2^{nd}	2.11±0.06 (641)	13.29±0.43 (548)	17.16±0.66^{b} (464)	20.16±0.88 (374)	25.20±1.12^{b} (240)
3^{rd}	2.11±0.06 (613)	13.39±0.43 (524)	17.04±0.66^{ab} (418)	20.05±0.88 (308)	24.84±1.12^{b} (204)
4^{th}	2.11±0.06 (529)	13.38±0.44 (430)	16.99±0.66^{ab} (330)	20.07±0.88 (250)	24.76±1.12^{ab} (160)
5^{th}	2.12±0.06 (912)	13.21±0.43 (726)	16.67±0.66^{a} (506)	19.70±0.88 (373)	24.32±1.12^{a} (255)
Type of birth	**	**	**	**	**
Single	2.77±0.06 (2063)	14.44±0.42 (1783)	18.38±0.63^{c} (1464)	21.57±0.84^{c} (1141)	25.69±1.07^{b} (767)
Twin	2.00±0.06^{b} (1327)	12.98±0.42^{b} (1069)	16.89±0.64^{b} (796)	20.23±0.85^{b} (598)	24.38±1.08^{a} (391)
Triplet	1.54±0.07^{a} (75)	12.44±0.50^{a} (46)	15.54±0.80^{a} (21)	18.21±1.10^{a} (14)	24.53±1.41^{a} (9)
Sex	**	**	**	**	**
Male	2.22±0.06 (1733)	13.83±0.43 (1454)	17.59±0.65 (1077)	20.86±0.87 (735)	26.00±1.11 (376)
Female	1.99±0.06 (1732)	12.74±0.43 (1444)	16.29±0.65 (1204)	19.14±0.87 (1018)	23.73±1.10 (791)
Regression on dam's weight at kidding	**	**	NS	NS	**
Regression coefficient	0.02±0.00	0.05±0.02	0.03±0.03	0.06±0.03	0.14±0.04

Year of birth had significant (P<0.01) effect on body weight at different growth ages. This could be attributed to the occurrence of drought in some years, varied feed / fodder availability, age at first kidding and incidence of multiple births. Similar findings were reported by Meel et al. (2010) and Sharma et al. (2010) in Sirohi goats. Higher birth weight of kids born in the initial two years and sharp decline in the next two years with gradual improvement thereafter may be due to variable feeding practices. The gradual improvement in body weight of kids over the years at different ages reflects the impact of the project through implementation of technical guidance and mineral supplementation for growing stock. Growth might have also been improved by use of superior bucks selected on the basis of body weights.

The effect of season of birth on birth weight was non-significant. However, significant (P<0.05) influence was found on 3, 6, 9 and 12 months body weights. Similar results were also reported by Singh et al. (2009) and Arora et al. (2011). Kids born in winter season grew well up to 3 months of age and attained highest weight. This might be due to better health and nutrition of their dams which they got during rainy season in their pregnancy and nourished their young ones well. Growth of kids after six months of age was significantly faster in kids born during rainy season as compared to those born in winter and summer months.

The effect of parity on body weights of kids at all ages was inconsistent. It might be due to differential culling rates of kids at different ages born from different parities and might also be due to different age at first conception and kidding. Moreover, parity of dam and regression of dam's weight at kidding might be showing some interaction relationship and might not be acting independently as per the assumptions of the model. This might also be attributed to errors due to management practices and herdman skills (Momoh et al., 2013). Type of birth had significant (P<0.01) effect on body weight at all stages of growth. These results were in agreement to the findings of Meel et al. (2010), Arora et al. (2011) and Yadav et al. (2013). Kids born as single were heavier than those born as multiples, which may be due to physiological limitations of uterine environment available to multiple foetuses partitioning of maternal resources in pre-natal life. However, differences in body weight after nine months became negligible (<5%) among single and multiple born kids. The effect of sex on body weights was significant (P<0.01) at birth, 3, 6, 9 and 12 months of age. Similar results were reported by Meel et al. (2010), Arora et al. (2011), Birari et al. (2012) and Singh et al. (2013). On the contrary, Sharma et al. (2010) and Tyagi et al. (2013) reported non-significant effect of sex of kid.

The regression of dam's weight at kidding was positive and significant (P<0.01) on the birth and 3 months body weights of kids. These results were in agreement with the findings of Arora et al. (2011) and Yadav et al. (2013). Positive regression coefficient indicates that the heavier kids were produced by those dams whose body weight at kidding was higher, which might be that heavier dam provided better nourishment and more space for developing foetus resulting in heavier weights at birth and at early growth ages. However, the effect of regression of dam's weight at lambing was found highly significant on body weight at 12 months of age. This might be due to confounding effect between parity of dam and regression of dam's weight at lambing that sometimes arises when both the factors are analyzed together in the model for post-weaning traits. The study suggests that most of the effects included in the study were significant source of variation for body weights at different ages of life. These significant factors should be given due importance in general management and formulation of breeding policies for further increase in the productivity of the breed. In Bhadsoda cluster of Chittorgarh district, mean of 12 month body weight was >32 kg which indicated the high growth potential of this breed.

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REFERENCES

Arora, A.L., Prakash, V., Gowane, G.R. and Chopra, A. 2011. Non-genetic variation in Sirohi goats. Indian Veterinary Journal 88: 35-36.

Biran, D.R., Desale, R.J., Deokar, D.K., Deshmukh, A.R. and Mandakmale, S.D. 2012. Growth performance of Osmanabadi goats under field conditions. Indian Journal of Small Ruminants 18: 135-137.

Harvey, W.R. 1990. User's Guide for LSMLMW and MIXMDL PC-2 version. Mixed model least-squares and maximum likelihood computer program. Ohio State University, Columbus, Ohio, USA.

Kramer, C.Y. 1957. Extension of multiple range tests to group correlated adjusted means. Biometrics 13: 13-18.

Meel, U.K., Nagda, R.K., Sharma, S.K. and Rajawat, B.S. 2010. Growth performance of Sirohi goats under field conditions. Indian Journal of Small Ruminants 16: 246-248.

Momoh, O.M., Rotimi, E.A. and Dim, N.I. 2013. Breed effect and non-genetic factors affecting growth performance of sheep in a semi-arid region of Nigeria. Journal of Applied Biosciences 67: 5302-5307.

Sharma, M.C. 2005. Genetic investigation of body weight and morphometry traits of Sirohi goats in the field. Ph.D thesis, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan.

Sharma, M.C., Pathodiya, O.P., Tailor, S.P. and Mishra, S. 2010. Pre-weaning growth traits of Sirohi kids under farmer's management system. Indian Journal of Small Ruminants 16: 243-245.

Singh, M.K., Rai, B. and Singh, N.P. 2009. Environmental and genetic effects on growth traits in Jamunapari kids. Indian Journal of Animal Science 79: 582-586.

Singh, P., Singh, M.K. and Singh, S.K. 2013. Effect of non-genetic factors on body weights of Jamunapari goats. Indian Journal of Small Ruminants 19: 146-150.

Tyagi, K.K., Patel, M.D., Sorathiya, L.M. and Fulsoundar, A.B. 2013. Body weight variability in Surti kids under field conditions. Indian Journal of Small Ruminants 19: 211-214.

Yadav, J.S., Kumar, S., Bhasin, V., Singh, L., Yadav, M.C. and Khan, B.U. 2013. Genetic analysis of factors affecting body weight at different ages in closed flock of Kutchi goats. Indian Journal of Animal Sciences 83: 554-556.

Yadav, J.S., Rai, B., Singh, B.K., Yadav, M.C. and Khan B.U. 2003. Factors affecting body weight at different ages in flock of Kutchi goats. Indian Journal of Small Ruminants 9: 53-55.