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Study on growth performance and morphometric traits of Chaugarkha goat kids in Almora hills of Uttarakhand

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ABSTRACT: The present investigation was conducted to demonstrate the performance and morphometric traits of native male and female kids of “Chaugarkha” kept under the traditional system of goat production employing grazing on natural rangelands and supplementation of home produce energy feeds. Sixteen newly born goat kids with an average live weight of 2.50 ± 0.041 kg and 2-5 days of age were divided into two equal groups of eight in each group, male kids are grouped as G1 and female G2, and maintained for 180 days. The kids were allowed to suckle milk from the respective mother goat twice daily up to weaning and offered locally available tree leaves and grass after 15 days of birth to lean the feeding. The kids, after 30 days of age, were allowed grazing for 7 to 8 hrs daily on natural rangelands supplemented with kitchen waste as and when available with local grains approx. 50 to 100g per day. The kids were maintained in groups under the shed and clean drinking water was available *ad-libitum* during housing and grazing. The initial live weights (birth weight) of kids were similar ($P < 0.05$) between the two kid groups, which ranged from 2.50 to 2.56 kg with mean weight of 2.52 kg, whereas live weights at the termination of the experiment were different ($P < 0.01$) between the two kid groups, which varied from 11.79 to 15.98 kg with mean live weight of 13.89 kg. The kids of G1 group were the heaviest than G2. Live weight gain during the 180 days of the experiment was 13.48 kg in G1 and 9.23 kg in G2, which were significantly ($P < 0.001$) different between the two kid groups. The phenotypic traits viz., height at wither, body length, punch girth, face length, tail and horn length were significantly ($P < 0.005$) different between the two kid groups, which were higher in G1 kids. Similarly, the kids of the G1 groups had a higher gain of height at wither, body length, punch girth, face length, tail and horn length on a monthly basis. At the age of 180 days, the mean kids' height at wither was 51.1 cm, body length 54.06 cm, punch girth 57.16 cm, face length 17.73 cm, tail length 12.14 cm and horn length 4.57 cm. The present study concluded that goat kids raised traditionally employing grazing on natural rangelands with home-available grain supplements attained appropriate live weight with an average daily gain (ADG) of 60g/ day. The male kids had higher live weights and morphometric trait gains than the female kids. The morphometric traits of the goat kids may be useful for characterising this lesser-known goat breeds of the country.

Key words: Chaugarkha goat, goat kids, growth rate, live weight gain, morphometric traits

Livestock production is a major constituent of the agricultural economy of developing countries, including India. It goes well beyond direct food production and is associated with the lives of millions of resource-poor farmers for whom animal ownership ensures varying degrees of sustainable farming, employment and economic sustainability (Dixit *et al.*, 2015). Goat production is a lucrative and low capital investment venture with higher returns, playing a significant role in the rural economy as the goat population is growing at a 6 % rate in India, which includes the labour cost of 72% and fixed cost only 13% under field conditions (Tanwar and Chand, 2013). Chaugarkha goats are small in size, primarily reared for meat. They are

hardy and well-adapted to the cold climate of the hills. This breed is native to the Chaugarkha Patti region, stretching from *Chitai* to *Danya* in the Almora district. These goat rearing in the Central Himalayan ecosystem is an unorganised, semi-feral system of husbandry, well adapted to the semi temperate bio meteorological conditions (Singh and Barwal, 2007). The synergies in crop-livestock systems provide opportunities for generating more income from the resources available. However, ruminant production in mixed farming has lagged behind in productivity and production due to several factors such as low genetic potential, poor health management and imbalanced feeding (Singh *et al.*, 2007). Nutrition remains by far the most critical

constraint to increased animal productivity and more efficient performance across the developing countries with the perpetual gap between the demand and supply of digestible crude protein and total digestible nutrients (Karim *et al.*, 2007). With the deterioration of natural rangelands due to overgrazing (Jodha, 1986), the nutrient availability to animals on grazing is poor even the dry matter requirements are not met.

Studying the morphometric traits of a lesser-known goat breed is crucial for several reasons. It allows for the detailed understanding of the breed's physical characteristics, such as size, shape, and structural attributes, which are essential for breed identification and classification. These traits are directly linked to the animal's productivity, including growth rate, meat yield, and overall health, making them vital for effective breeding programs. Furthermore, analyzing morphometric data helps in assessing the breed's adaptability to different environments, which is key for optimizing management practices and improving genetic selection. Ultimately, this knowledge contributes to the sustainable development and conservation of the breed, ensuring its viability and enhancing its economic value to local farmers. Therefore, the present on-farm trial was undertaken to demonstrate the growth potential and measure morphometric traits during active growth period of local goat kids for identification and characterization.

MATERIALS AND METHODS

Experimental Site - KVK farm

The on-farm investigation was conducted at Krishi Vigyan Kendra, Almora district of Uttarakhand province, located at 1668 m above sea level (29.62° latitude north and 79.67° longitude east), a Central Himalayan hilly range of Nanda devi. The location having an annual rainfall of 347 mm, temperature ranging from the highest 41.0°C (Summer) and lowest -1.0°C (winter) with humidity of 36 to 88%. Animal production system in the Almora region is largely dependent on pasture grazing with tree leaves and crop residues supplementation. Concentrate supplements only fed to lactating and advanced gestation stage of animals in a very low quantity.

Animal productivity including small ruminants is low due to poor nutritional state and management as farmers are having a few numbers of animals only and are of economically weak.

Experimental animals

Locally available kids of "Chaugarkha" goat breed were used for the study. Sixteen newly born goat kids with average live weight of 2.50 ± 0.041 kg at 2-5 days of age were divided into two equal groups of eight in each group male group (G_1) and female group (G_2) and maintained for 180 days.

Experimental protocol and observation

The two groups of goat kids were allowed milk suckling from the respective mother goat twice daily in the morning 7 am and evening 5 pm up to weaning, the 90 days of age. The kids were offered locally available tree leaves and grass after 15 days after birth to lean the feeding. The goat kids after 30 days of age were allowed grazing for 7 to 8 hours daily on natural rangelands, the rangeland pasture was a mix of wild rose, Burberry, Pear leaves, Kans grass and trifolium. The kids were also supplemented with kitchen waste, as and when available, with local grains, approximately 50 to 100g per day. The kids were de-wormed at 90 days of age to control gastrointestinal parasites. All kids were maintained in groups under the shed and clean drinking water was provided *ad-libitum* during housing and grazing.

Observations and calculation

All the goat kids were weighted at the birth and thereafter at every 30 days before watering and gazing in the morning using a dial weighing machine. Cumulative liveweight observations of kids were used to assess the pattern of live weight change, and live weight gain was calculated by subtracting the live weight at start of the trial and the final live weight at 180 days of experiment. Average daily gain (ADG) was calculated using live weight gain during the experiment by dividing days of experiment. The morphometric traits of the kids were measured at 30 days of age and thereafter at every 30 days during the experimental period. The morphometric traits considered for measurement includes body height, body length, punch girth, face length, tail length and

horn length. The total gain in a particular trait was calculated using difference between initial and final measurement and gain of trait was calculated on 30 days basis.

Statistical analysis

The observation of growth performance and morphometric traits were analyzed for statistical significance using Student's 't' test and Analysis of Variance (ANOVA) at 95% confidence level (Snedecor and Cochran, 1989).

RESULTS AND DISCUSSION

Growth performance

The growth performance of the goat kids during the experimental period is presented in Table 1 and growth pattern in fig 1. The initial live weights (birth weight) of kids were similar ($P < 0.05$) between the two kid groups which ranged from 2.50 to 2.56 kg with mean weight of 2.52 kg, whereas live weights at termination of experiment were different ($P < 0.01$) between the two kid groups, which varied from 11.79 to 15.98 kg with mean live weight of 13.89 kg. The kids of G₁ group were the heaviest than of the G₂. Live weight gain during the 180 days of experiment was 13.48 kg in G₁ and 9.23 kg in G₂, which were significantly ($P < 0.001$) different between the two kid groups. Similar to present study Singh *et al.* (2009) also reported higher live weights of male than in female goat kids. The average live weight gain was 11.36 kg of the experimental goat kids during the 180 days of age/ experiment. Similarly, average daily gain (ADG) was also higher in G₁ (74.89 g) than occurred in G₂ (51.28 g), and were different ($P < 0.001$) between the two kid groups. The experimental kids had an average gain of 60.08 g/day. Chauhan *et al.* (2021) reported the least squares means at birth, three months, six months and were 1.83 ± 0.03 , 7.67 ± 0.13 , and 11.45 ± 0.17 kg, respectively. The performance of the goat kids of the present study was within the normal range of variations reported for the growing goats under field and farm conditions (Jodha, 1986; Owen and Jayasuriya, 1989; Tripathi *et al.*, 2011) Similar growth rate ranging from 51 to 75 g of the goat kids under field condition has been reported (Naulia, 2015) for

the local breed supplemented with concentrate mixture in addition to grazing on natural pasture, whereas lower average daily gain (30 g/day) were in goat kids maintained on grazing alone. The daily growth rate between 60 to 70 g is considered optimum for goat kids during active growth phase under optimized production system for conventional goat rearing (Chaudhary *et al.*, 2015). However, a higher live weight gain and growth rate may be achieved through improved nutritional and managerial conditions for commercial goat kid productions (Kushwaha *et al.*, 2016). A better plane of nutrition employing higher rate of concentrates feeding is known to support and promote higher growth during active growth phase of small ruminants (Tripathi *et al.*, 2011). The optimum growth of the kids in present study was due to optimum nutrient available to the kids through milk suckling, grazing and of supplementation of kitchen waste along with cereal grains. The results indicated that goat kids of farmers have higher growth potential under better nutritional management than those reported for the genotype maintained under extensive range management system of production (Sahoo, *et al.*, 2015, Kaushik *et al.*, 1990). The concentrate supplementation to grazing therefore make available more nutrient for improved performance and carcass traits of goat kids (Mushi *et al.*, 2009, Safari *et al.*, 2009), and the kitchen waste supplementation has similar impact on growth. Further, highest live weight and ADG of goat kids

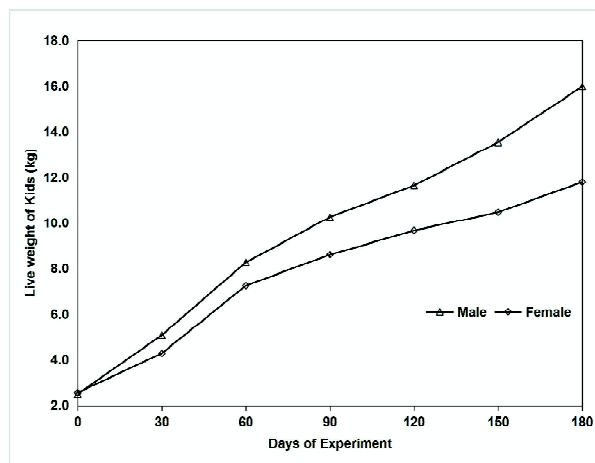


Fig. 1: Growth pattern of Goat kids during experiment

in G1 were attributed due to better genetic differences exists among male and female animals, male animals grew faster and are heavier than the female counter parts of same genetic origin.

Morphometric traits

The phenotypic traits *viz.*, body height, body length, punch girth, face length, tail and horn length were significantly ($P < 0.005$) different between the two kid groups (Table 2), which were higher in G1 kids. Similarly, the kids of G1 group had the higher gain of height, length, punch girth, face length, tail and horn length. At the age of 180 days, the mean kids

body height was 51.1 cm, body length 54.06 cm, punch girth 57.16 cm, face length 17.73 cm, tail length 12.14 cm and horn length 4.57 cm. The physical attributes of an animal/ species are the uniqueness of the characters that make them distinct from the population. Phenotypic traits are also used for characterization and registration of goat breeds improvement and conservation of the breed/ species. The morphometric traits of the present study are at lower level that reported in Jhakrana, Jhalawadi, Marwadi and kuchhi goats (Rai and Singh 2004; Singh *et al.*, 2007). Singh *et al.* (2009) reported a height of 70 to 82 cm, length 70-81 cm, face length

Table 1: Growth performance of goat kids

Attribute	Goat kid groups*		Mean	SEM [#]	P ^s
	G ₁	G ₂			
Initial live weight (kg) birth wt.	2.50	2.56	2.52	0.02	NS ¹
Final live weight (kg) (3 month)	15.98	11.79	13.89	1.396	**
Live weight gain (kg)	13.48	9.23	11.36	1.412	**
Average daily gain (g/day)	74.89	51.28	60.08	7.870	**

*G₁-Male kids; G₂- Female kids, #-Standard error of means, P^s-level of significance: NS-not significant, **-P<0.001

Table 2: Change in phenotypic traits of goat kids during experimental period

Attribute	Goat kid groups*		Mean	SEM [#]	P ^s
	G ₁	G ₂			
Body Height (cm)					
Initial at birth	36.95	33.75	35.35	1.066	**
Final at 180days	52.75	49.45	51.10	1.100	**
Total Gain (cm)	15.80	15.7	15.75	0.033	**
Body Length (cm)					
Initial at birth	30.00	29.075	29.54	0.038	**
Final at 180days	55.25	52.875	54.06	0.791	**
Total Gain (cm)	25.25	23.8	24.53	0.483	**
Heart girth (cm)					
Initial at birth	40.325	38.125	39.23	0.733	**
Final at 180days	60.575	53.75	57.16	2.275	**
Total Gain (cm)	20.25	15.625	17.94	1.541	**
Face length (cm)					
Initial at birth	10.825	10.25	10.54	0.191	**
Final at 180days	18.125	17.325	17.73	0.266	**
Total Gain (cm)	7.3	7.075	7.19	0.075	**
Tail length (cm)					
Initial at birth	7.7	7.875	7.79	0.058	**
Final at 180days	13.2	11.075	12.14	0.708	**
Total Gain (cm)	5.5	3.2	4.35	0.766	**
Horn length (cm)					
Initial at birth	0	0	0	0	NS
Final at 180days	5.13	4.00	4.57	0.376	**
Total Gain (cm)	5.13	4.00	4.57	0.376	**

*G1-Male kids; G2- Female kids, #-Standard error of means, P^s-level of significance, NS-not significant, **P<0.001

16-22 cm and horn length 12-17 cm, which were higher than our study, majorly due to breed and age effect. The measurements of the present study were of kids up to the age of 180 days whereas Singh *et al.* (2009) reported observations of adult goats.

CONCLUSION

The growth performance of goat kids during the experimental period revealed significant differences between the two groups studied. While initial birth weights were similar, the final live weights varied significantly, with G1 kids achieving higher weights and average daily gains compared to G2. These findings align with previous studies, indicating that male kids generally exhibit higher growth rates than female kids. The average daily gain observed in this study was within the expected range for goat kids under optimal nutritional and management conditions. Morphometric traits, including body height, length, and girth, also showed significant differences between the groups, underscoring the role of genetics and nutrition in physical development. These traits are critical for breed characterization and improvement, and the study's findings suggest that enhanced nutritional strategies can significantly boost the growth and development of goat kids. Overall, the results indicate that optimized nutritional management can unlock the higher growth potential of goat kids, which is vital for improving meat production and economic returns in goat farming. The phenotypic traits of the goat kids will be useful for characterization of Goat breeds of the Country.

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