



# Effect of Concentrate Feeding Frequency on Growth Performance of Sirohi Goat Kids

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## ABSTRACT

**Background:** The growth rate and body weight increased with increment in feed frequencies due to microbial activities enhancing nutrient absorption in the animal's body (Yaunas *et al.*, 2014, Bawala *et al.*, 2009). The efficacy of growth by increased feeding frequency is due to a large improvement in the efficiency of food utilization. Smaller ruminants require more frequent feedings than larger ruminants because of their higher basal metabolism.

**Methods:** The effects of concentrate feeding frequency on growth performance were assessed in a three-month trial including twenty-one female *Sirohi* goat kids. Three groups (T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>) containing concentrate were randomly assigned to feed the *Sirohi* goat kids once, twice, or three times a day. Throughout the ninety-day trial, uniform management techniques and feeding like green or dry fodder were kept up. Each animal was given an exact quantity of food and water each morning during the trial and the remaining feed and water were weighed the next morning.

**Result:** Total daily feed intake was significantly (P<0.01) higher in T<sub>3</sub> (885.88±4.06 g/d) than in T<sub>2</sub> (775.03±7.52 g/d) and T<sub>1</sub> (702.54±5.78 g/d). Average daily weight gain (ADG) was significantly (P<0.01) higher in T<sub>3</sub> (43.68±1.8 g) than in T<sub>1</sub> (32.30±2.61 g) and T<sub>2</sub> (37.73±2.42 g). Non-significantly differing feed conversion ratio (3.06±0.31) in T<sub>3</sub> than in T<sub>2</sub> (3.16±0.29) and T<sub>1</sub> (3.39±0.31), indicating a positive impact of thrice-a-day concentrate feeding on feed intake and growth but not affect feed efficiency in goat kids.

**Key words:** Daily feed intake, Feed conversion ratio, Feeding frequency, Growth performance.

## INTRODUCTION

India is sharing 11.6 per cent of total livestock in the world. In India, the current goat population is 148.88 million as per the 20<sup>th</sup> livestock census of the country, which is a 27.8 per cent contribution to the total livestock population. Goat milk makes up 3% of India's total milk production, while goat meat accounts for 13.63 per cent of the total meat production of the nation (BAHS, 2022-23).

Rajasthan with its 56.76 million total livestock population ranks second in India and contributes more than 11.27% of India's total livestock population (Animal Husbandry Department Rajasthan, 2019). The animal husbandry sector contributes to state GDP by approximately 8%. According to the 20<sup>th</sup> Livestock Census (2019), Rajasthan stands in first position in goat population with 20.8 million which accounts for 16.03% of India's total goat population. The total goat population in Chittorgarh is 488760 of which 77178 male goats and 411582 female goats contribute (20<sup>th</sup> Livestock Census Raj., 2019).

The predominant breed in the Udaipur region of Rajasthan is the *Sirohi* goat. *Sirohi* goats are widely preferred by farmers over other varieties due to their amazing looks, bright colors and superior performance as miniature cows. The growth and performance of animals are enhanced by adequate nutrition and management. The concentrate feed improves the growth performance in terms of body weight gain in sheep (Vidya *et al.*, 2016, Kumar *et al.*, 2022). Feeding frequency influences the production of the animal by affecting microflora in the rumen. When ruminants

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consume a significant amount of concentrate at a single meal, the pH of their rumen becomes lower, which causes ruminal acidosis and reduces productivity (Schwartzkopf-Genswein *et al.*, 2003).

Feeding frequency influences the production of the animal by affecting microflora in the rumen. When ruminants consume a significant amount of concentrate at a single meal, the pH of their rumen becomes lower, which causes ruminal acidosis and reduces productivity (Schwartzkopf-Genswein *et al.*, 2004). This has detrimental effects on the welfare of ruminants. Thus, it is preferable to feed concentrate multiple times a day to preserve the health of the rumen and the animal's performance. When an animal is fed once or twice daily, the ruminal microbes work for a short period, thus decreasing microbial activity due to the

diluting effect of feed, saliva and passage of some organisms from the rumen to the abomasum (Cuthbertson *et al.*, 1969).

The present experiment has been carried out with the following objectives:

1. To evaluate the effect of feeding frequency on feed and water intake of Sirohi goat kids.
2. To observe the effect of feeding frequency on the growth performance of Sirohi goat kids.

## MATERIALS AND METHODS

The experiment was conducted at Livestock Research Station (LRS), Boujunda, Chittorgarh, Rajasthan, to investigate the effect of different feeding frequencies of concentrate on the growth performance of female *Sirohi* goat kids. Twenty-one weaned *Sirohi* kids of nearly the same age (170-185 days) and nearly the same weight (13-14 kg) were selected from available flocks at LRS.

The kids were vaccinated and ear-tagged for identification. The kids were randomly allocated into three groups ( $T_1$ ,  $T_2$  and  $T_3$ ), with seven kids in each group. The kids of all groups were offered berseem (*Trifolium alexandrinum*) as green fodder ad-libitum, gram straw as dry fodder and concentrate @ 1% of their body weight once (9 A.M.), twice (9 A.M. and 12 P.M.) and three times daily (9 A.M., 12 P.M. and 6 P.M.), respectively. The composition of the experimental concentrate feed is given in Table 1.

### Data recorded

#### Daily feed (gm) and water Intake (ml)

Daily feed consumed in each container/tub was weighed starting from zero-day to the end of 90 days of the

**Table 1:** Composition of readymade saras concentrate feed.

Ingredients	Amount
Moisture	11%
Crude protein	20%
Fat	4%
Crude fiber	10%
Total ash	3%
Common salt	1%
Metabolic energy (Kcal/Kg)	2400
Vit-A	7000 IU/Kg
Vit-D3	1200 IU/Kg
Vit-E	30 IU/Kg

**Table 2:** Effect of feeding frequency on daily feed and water intake (Mean±S.E.) of kids during 90 days trial.

Parameter	Concentrate feeding frequency		
	Once ( $T_1$ )	Twice ( $T_2$ )	Thrice ( $T_3$ )
Average concentrate intake (g)	150	150	150
Average green fodder intake (g)	454.39±5.29 <sup>a</sup>	512.16±6.49 <sup>b</sup>	611.45±3.31 <sup>c</sup>
Average dry fodder intake (g)	98.15±1.05 <sup>a</sup>	112.87±2.29 <sup>b</sup>	124.43±3.82 <sup>c</sup>
Overall average feed intake (g)	702.54±5.78 <sup>a</sup>	775.03±7.52 <sup>b</sup>	885.88±4.06 <sup>c</sup>
Overall average water intake (ml)	5750.59±24.64 <sup>a</sup>	6608.02±32.15 <sup>b</sup>	7526.47±29.18 <sup>c</sup>

Mean with different superscripts differ significantly ( $P < 0.05$ ) from each other in a row.

experiment. The refusal quantity of feed in all treatment groups was measured the next day before placing feed. Feed was given to the kids and refusals were recorded daily in each group kid by using of weighing machine throughout the experimental period. Total water intake refers to the amount of water consumed over the course of 24 hours. For a period of 90 days, the total amount of water intake was monitored every day.

### Growth performance

The kids were weighed individually at the start of the experiment and weekly intervals thereafter, up to 90 days. The weighting of individual kids was recorded in the morning time before the feed was offered with the help of a digital weighing balance. The feed conversion ratio was calculated by dividing the cumulative feed intake (gm) by the body weight gain (gm) of the kids during two consecutive periods. The FCE and FCR were calculated as a ratio of body weight gm per week and vice-versa, respectively.

Statistical procedures proposed by Snedecor and Cochran, (1994) were used to assess the observation of each parameter of the experiment and Duncan's New multiple range test (DNMRT), modified by Kramer (1957), was used to determine the significance of the mean difference.

## RESULTS AND DISCUSSION

Feeding frequency had a significant ( $P < 0.01$ ) effect on the feed and water intake (Table 2). The average daily total feed intake (including 150 g concentrate) was 702.54, 775.03 and 885.88 g in  $T_1$ ,  $T_2$  and  $T_3$  group, respectively. Similar findings for feed intake with different feeding frequencies were also reported by Younas *et al.* (2014) in Beetal kids, Farooq *et al.* (2017) in Lohi lambs, Mohammed *et al.* (2018) in Karadi lambs, Nazari *et al.* (2019) in Mahabadi kids and Al-Maamari and Al-Juwari, (2023) in Awassi lambs. However, Canesin *et al.* (2014) in Nellore steers and Saldanha *et al.* (2021) in lambs observed non-significant effects of feeding frequencies on feed intake. In the present study the higher water intake in  $T_3$  than  $T_1$  and  $T_2$  may be due to high feed intake (by increment of feeding frequencies) with resultant increased loss of water in faeces. Robles *et al.* (2007) also reported a linear increase in water intake with increased feeding frequency in kids. Thus, the effect of the feeding frequency of concentrate in the diet of goat kids improved daily water intake significantly

**Table 3:** Effect (Mean±S.E.) of feeding frequency on growth performance by *Sirohi* goat kids during 90 days trial.

Parameter	Concentrate feeding frequency		
	Once (T <sub>1</sub> )	Twice (T <sub>2</sub> )	Thrice (T <sub>3</sub> )
Initial body weight (kg)	13.24±0.01	13.25±0.01	13.25±0.01
Final body weight (kg)	16.18±0.14 <sup>a</sup>	16.68±0.03 <sup>b</sup>	17.22±0.06 <sup>c</sup>
Total weight gain (kg)	2.94±0.02 <sup>a</sup>	3.43±0.02 <sup>b</sup>	3.97±0.01 <sup>c</sup>
Total average feed intake (gm)	702.54±5.78 <sup>a</sup>	775.03±7.52 <sup>b</sup>	885.88±4.06 <sup>c</sup>
Average gain per week (gm)	226.12±10.36 <sup>a</sup>	264.12±2.83 <sup>b</sup>	305.76±4.18 <sup>c</sup>
Average daily gain (g)	32.30±2.61 <sup>a</sup>	37.73±2.42 <sup>ab</sup>	43.68±1.8 <sup>b</sup>
Feed conversion ratio	3.11±0.31	2.93±0.29	2.89±0.31

Mean with different superscript differ significantly (P<0.05) from each other in a row.

**Table 4:** Economics of feeding frequency in *sirohi* goat kids (90 days feeding).

Parameter	Concentrate feeding frequency		
	Once (T <sub>1</sub> )	Twice (T <sub>2</sub> )	Thrice (T <sub>3</sub> )
Total green fodder consumed (kg)	286.26	322.66	385.22
Total dry fodder consumed (kg)	61.83	71.10	78.39
Total concentrate consumed (kg)	94.50	94.50	94.50
Total feed consumed (kg)	442.6	488.26	558.11
<sup>1</sup> Cost of green fodder @ Rs. 2/kg	572.52	645.32	770.44
<sup>1</sup> Cost of dry fodder @ Rs. 6/kg	371.00	426.60	470.34
<sup>1</sup> Cost of concentrate @ Rs. 30/kg	2835.00	2835.00	2835.00
Total feed cost (Rs.)	3778.52	3907	4075.78
Total body weight gain (kg)	2.94	3.43	3.97
<sup>2</sup> Sale price of live kids @ Rs. 350/kg	5663.00	5838.00	6027.00
Total income (Rs.)	1884.48	1931.00	1951.22

<sup>1</sup>Cost of feed and fodder based on LRS, Boujunda and CVAS, Navania.

<sup>2</sup>Cost of live kids provided by dealer's rate.

(P<0.01) due to the positive relationship between feed intake and water consumption (Ali *et al.*, 2015). Similar findings for the water intake increase during different feeding frequencies were also reported by Abozed *et al.* (2021) in Farafra ram-lambs and Nayel *et al.* (2022) in Barki ewes.

The final body weight was significantly (P<0.01) highest (17.22±0.06 kg) in kids fed concentrate thrice a day followed by 16.68±0.03 kg in T<sub>2</sub> and lowest (16.18±0.14 kg) in T<sub>1</sub> kids (Table 3). The average daily gains were found significantly higher (P<0.01) in the T<sub>3</sub> group (43.68±1.8 g) as compared to T<sub>1</sub> (32.30±2.61), however, T<sub>3</sub> group and T<sub>2</sub> group (37.73±2.42 g) were non-significantly differ. Similar observations were reported by Younas *et al.* (2014) in Beetal goat, Abozed *et al.* (2021) in Farafra lambs and Al-Maamari and Al-Juwari, (2023) in Awassi lambs. However, Abouheif *et al.* (2010) in Najdi lambs and Saldanha *et al.* (2021) in lambs observed no discernible effects of feeding frequencies on body weight.

The average weekly feed conversion ratio was found non-significantly difference in the T<sub>3</sub> group in comparison with both the T<sub>1</sub> and T<sub>2</sub> groups. The increased growth rate of kids fed thrice a day compared to those fed once or twice a day may be the reason for improved feed efficiency.

Similarly, Mehla *et al.* (2005) in Murrah buffalo, Drennan *et al.* (2006) in cattle, Hill *et al.* (2015) in calves and Saldanha *et al.* (2021) in lambs observed non-significant effect of feeding frequencies on FCR. In contrary, Farooq *et al.* (2017) in Lohi lambs and Silva *et al.* (2018) in cattle also found that feeding frequency of diet offering had a substantial impact on feed conversion efficiency. Bawala *et al.* (2009) reported that Red Sokoto goats fed twice a day had the maximum feed efficiency (P<0.05) compared to goats fed once or thrice a day.

The total feed cost was 3779.24, 3907.00 and 4075.78 Rs. consumed by experimental kids and income from live body weight was 5663, 5838 and 6027 Rs. for groups T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively (Table 4). The net income was 1883.76, 1931.00 and 1951.22 Rs. for groups T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively. The comparison of total income across the treatment groups suggests that there were marginal variations in income levels. Although the T<sub>3</sub> group exhibited slightly higher total income compared to the T<sub>1</sub> and T<sub>2</sub> groups. This indicates that the frequency of concentrate feeding may have a substantial impact on total income in goat farming.

It was inferred that *Sirohi* goat kids fed concentrate three times a day had a considerably higher daily feed and

water intake, better growth rate than kids fed once or twice a day and had a positive impact on the income of farmers.

## CONCLUSION

The results of this investigation generated the following conclusions being reached:

- *Sirohi* goat kids who were fed concentrate three times a day had a considerably greater average daily feed and water consumption than kids who were fed once or twice a day. This suggests kids who are fed more frequently consume larger amounts of feed.
- *Sirohi* goat kids fed thrice a day exhibited superior growth parameters including weekly body weight, weekly body weight gain, daily weight gain and feed conversion efficiency compared to those kids fed once or twice a day. This implies that kids who obtain more frequently will consume greater amounts of feed overall and will be found to have higher weight gain than other groups.
- The kids who were fed three times a day had a slight impact on the income of farmers compared to once and twice-a-day feeding. It indicates that the cost-benefit ratios held constant concerning the frequency of feeding, demonstrating effective resource management as well as usage across the various feeding schedules.

## Conflict of interest

There is no conflict of interest.

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