Original Research

Effect of Feeding Different Levels of Concentrate Mixture on Yield and Composition of Milk and Lactation Length in Sirohi Goats

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Rec. Date:	Apr 16, 2018 09:58
Accept Date:	Jul 22, 2018 17:06
DOI	10.5455/ijlr.20180416095835

Abstract

A study was conducted to assess the "Effect of feeding different levels of concentrate mixture on yield and composition of milk, and lactation length in sirohi goats". The experiment was conducted at RKVY Goat unit, S.K.N. College of Agriculture, Jobner (Jaipur) during November 2016 to May, 2017. Twenty four lactating Sirohi goats (36.2±0.7 kg) were taken for the study. The total duration of feeding experiment was 90 days; however, the lactation length was also recorded. Apart from daily grazing, concentrate mixture was offered to the exyent of 0.00 gm (T_1) as control, 100gm (T_2), 200gm (T_3) and 300gm (T_4), respectively with Prosopis cineraria (Khejri) dry leaves feeding ad libitum. The results revealed that significantly ($P<0.05$) higher daily milk yield, total milk yield, % fat, % solid not-fat as well as % total solids -in T_4 than T_3, T_2 and control T_1. The mean lactation length was recorded as 153.5±1.70 days with the lactation length ranging between 141 to 160 days. Thus with increasing amount in concentrate feeding there was successive increase in daily milk yield, total milk yield and improvement in milk composition. It is concluded that there is a certain beneficial effect of concentrate mixture feeding on daily milk yield, total milk yield and milk composition performance during lactation period in Sirohi goats.

Key words: Concentrate Mixture, Milk Yield, Milk Composition, Lactating Length, Sirohi Goats

How to cite: Bhateshwar, V., Datt, M., Jat, G., Pankaj, P., Rathaur, A., & Muwal, H. (2018). Effect of Feeding Different Levels of Concentrate Mixture on Yield and Composition of Milk and Lactation Length in Sirohi Goats. International Journal of Livestock Research, 8(12), 113-119. doi: 10.5455/ijlr.20180416095835

Introduction

Goats are the backbone of the economy of small and marginal farmers and landless labours in India. It is an insurance against crop failure and provides alternate sources of livelihood of farmers round the year. They play an important role in income and employment generation and improving house hold nutrition. The goat "poor man's cow" has tremendous potential to be projected as the 'Animal of Future' for rural

prosperity under the changing agro-geo-climatic conditions and depleting resources for crop-based livelihood. There are around 880 million goats in the world out of which India has over 135.17 million (15.36%) of 23 defined and non-descript breeds that are adapted efficiently in different agro-climatic conditions all over the country. India has 26.4% goat of total livestock population (512.02 million) out of which Rajasthan contributes to 16.03% (Anonymous, 2014). The goats in India are reared primarily for meat and also for milk and hairs. The goat meat production in India has doubled (9.3% to 18.3%) and goat milk production shown a growth rate 31.53% during the last decade (Thiruvenkadan and Rajendran 2015). The country stands first in goat milk production (26.31%) and is second largest meat producer (10.41%) in the world.

Nutrition affects both the yield and composition of the milk produced by dairy animals (Bencini and Pulina, 1997). In case of goats, rations with higher energy concentration should be provided during lactation, where milk production is in high correlation with the quantity of energy consumed from food, especially in mid-lactation. Feeding strategies that include grazing and concentrate supplementation improve the milk fat, protein, lactose and total solids compared to grazing or forage alone (Soryal *et al*., 2004). Incorporation of concentrates in goat diets is intended to increase dietary energy, protein, mineral and vitamins and optimize the efficiency of feed utilization for growth, gestation or milk production (Morand-Fehr and Sauvant, 1987). Goat milk has been acknowledged as an ideal food for the aged, the sick and convalescent as well as for infants and growing children. Goat milk differs from cow or human milk by having higher digestibility, distinct alkalinity, higher buffering capacity and certain therapeutic values in human medicine and nutrition. Goat milk is more digestible due to the presence of smaller fat globules than the cow's milk.

Materials and Method

Present experiment was conducted on 24 lactating Sirohi goats of second lactation with an average body weight of 36.2±0.7 kg. Goats were randomly divided into four equal (n=6) groups. The concentrate mixture was fed to goats individually as per requirement of experiment. All goats were managed semi-intensively under of standard management practices. Goats were also allowed feeding leaves of *Prosopis cineraria* (Khejri) *ad libitum* besides concentrate mixture feeding. Animals were allowed access to fresh drinking water *ad libitum* in the barns. The feeding practice was remained uniform throughout the study period.

The total duration of experiment was 210 days. But feeding experiment i.e. recording of milk yield and milk composition was done only upto 90 days with an interval of 15 days. For individual doe, daily milk yield was measured at 15 days intervals beginning on post-partum day 15 (*i.e.* on days 15, 30, 45, 60, 75, and 90) by hand milking. Hand milking was performed on two occasions (morning around 8 am and in the evening, around 4 pm). On the days of milk recording, the kids were separated from does and were reintroduced to their mother after milking. Measuring the amount of milk was done with a 500ml graduated

 DOI 10.5455/ijlr.20180416095835

cylinder kept at individual milking units, with the lowest digit of 10 ml. For carrying out study on proportional milk composition analysis, volumes of morning milk was taken every 15 days intervals after cleaning and disinfecting teats and discharging the first streams of foremilk. Samples were collected in 200 ml clean and sterile plastic bottles at 15 days intervals upto 90 days experimental period. There were a total of six sampling on each goat during the period of 90 days trial. The milk composition (quantity of milk fat, solid non-fat and total solid) was determined by electronic milk analyzer (Master Eco.). All values were expressed in percentage. Lactation length was calculated from 15 days after kidding until daily milk yield dropped to below 0.20 lit. Lactation length data was recorded for each doe on separate proforma specially designed for this purpose.

Statistical Analysis

The data related to daily milk yield, milk composition and lactation length were statistically analyzed using the one-way analysis of variance (SAS system 'Local', W32-7PRO) for completely randomized design. All statement of significant differences was based on the 0.05 probability level. Significant differences among treatment, within the experiment, were analyzed using Duncan's multiple rang test.

Result and Discussion

There was 18-20% crude protein (minimum), 12% crude fiber (maximum), 2% salt and 2400 Kcal. (ME) / Kg in concentrate mixture that was taken for present study.

Table 1: Chemical composition (% DM basis) of concentrate mixture fed to the Sirohi goats

Nutrients	Concentrate Mixture
Crude protein (%), Min.	20
Crude fat (%), Min.	2.5
Crude fibre (%), Max.	12
Common salt (%), Max.	2
Calcium (%), Min.	0.8
Phosphorus (%), Min.	0.5
Ether extract (%), Max.	2.53
Total ash (%), Max.	9.48
ME / Kg.	2400 Kcal.

Data of daily milk yield (DMY) and total milk yield (TMY) during lactation periods are presented in Table 2. The total milk yield (TMY) taken upto 90 days of lactation was the highest in T_4 (25.38 litres) followed by T_3 (21.96 litres) then T_2 (19.14 litres) compared with control T_1 (16.14 litres) which were higher by 57.24%, 36.05% and 18.58%, respectively, compared with control. The results of this study were similar to those of Rohilla and Chand (2004) who reported higher TMY in the supplemented Marwari lactating does compared to those on grazing. Also the present results corroborates with the findings of Basitan and Jarcia (2013) and Saba *et al.* (2016).

DOI 10.5455/ijlr.20180416095835

Table 2: Effect of concentrate mixture feeding on average daily milk yield (DMY) and total milk yield (TMY) of goats during the lactation period

DMY (lit.)	Treatments				SE±M	P value
	T_1	T_2	T_3	T_4		
15 days	0.33^{b}	0.38^{b}	0.41^{b}	0.55^{a}	0.0473	0.001
30 days	0.33^{b}	0.40^{b}	0.52^{a}	0.60^{a}	0.055	0.0005
45 days	0.45^{b}	0.52^{b}	0.55^{ab}	0.63^{a}	0.0468	0.0075
60 days	0.48^{c}	0.57^{bc}	0.65^{ab}	0.73^{a}	0.043	<0.0001
75 days	0.53^{c}	0.62^{c}	0.75^{b}	0.85^{a}	0.0431	<0.0001
90 days	0.57^{d}	0.70^{c}	0.78^{b}	0.87^{a}	0.0398	<0.0001
TMY (lit.)	16.14^{d}	19.14^{c}	21.96^{b}	25.38^{a}	-	-

a, b, c and d means with the same letters in the same row are non-significantly different (P< 0.05).

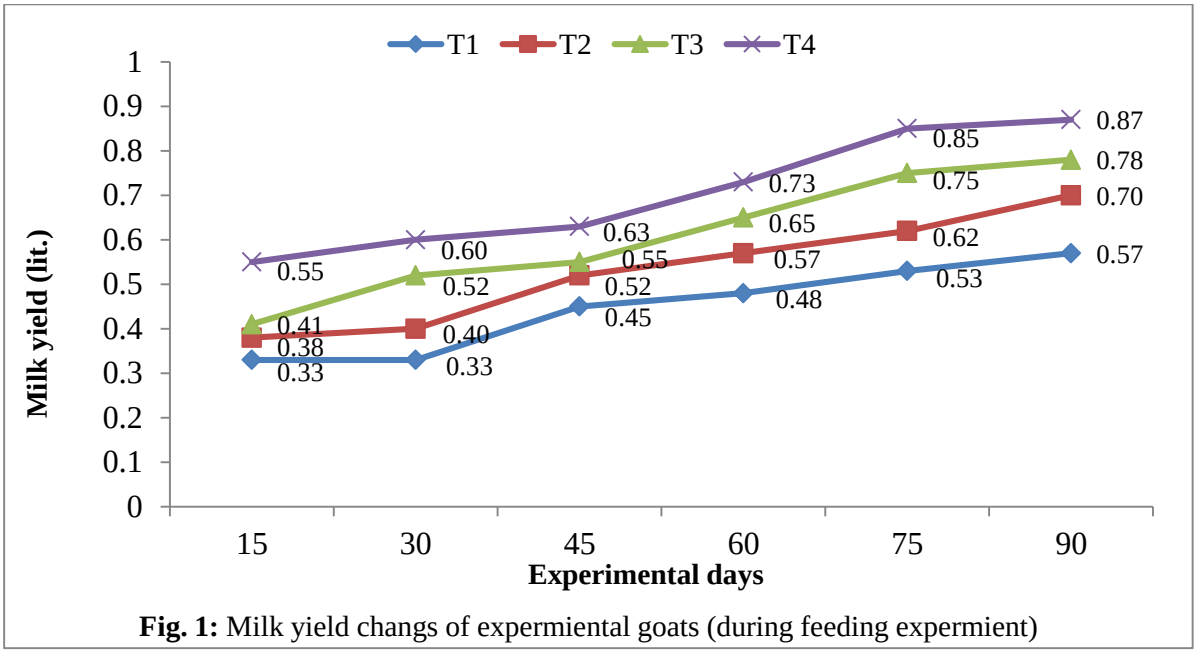

Fig. 1: Milk yield changs of expermiental goats (during feeding expermient)

The effect of supplementing various levels of concentrate mixture on milk fat percentage are presented in Table (3). The overall mean of various feeding treatments showed the same trend as the highest value for T_4 (3.91%) followed by T_3 (3.62%) then T_2 (3.40%) compared to Control T_1 (3.17%) 23.34%, 14.19% and 7.25%, respectively compared to control T_1 group. Statistically, the fat percentage and overall mean of treatment showed the highest estimates with T_4 followed by T_3 then T_2 and then T_1 control. When concentrate mixture was increased in T_4 and T_3 the milk fat percentage increased gradually with advancing stage of lactation. The results of this study were found similar to those reported by Kassab *et al.* (2009) and Okunlola *et al.* (2015). However, Kushwaha *et al.* (2012) found non-significant differences in values of fat in treatment and control group in Indian lactating goats. This could be due to variation in treatments i.e. quantity of concentrate supplementation and stage of lactation or environmental effect.

DOI 10.5455/ijlr.20180416095835

Table 3: Effect of concentrate mixture feeding on milk fat levels

Daily Fat %	Treatments				SE±M	P value
	T_1	T_2	T_3	T_4		
15 days	2.54^{a}	2.56^{a}	2.62^{a}	2.69^{a}	0.1354	0.6777
30 days	2.64^{a}	2.72^{a}	2.77^{a}	2.81^{a}	0.0832	0.2131
45 days	3.40^{d}	3.74^{c}	3.95^{b}	4.31^{a}	0.0389	<.0001
60 days	3.44^{d}	3.76^{c}	4.05^{b}	4.48^{a}	0.0419	<.0001
75 days	3.47^{d}	3.79^{c}	4.11^{b}	4.56^{a}	0.0387	<.0001
90 days	3.54^{d}	3.85^{c}	4.21^{b}	4.61^{a}	0.0281	<.0001
Overall mean of treatment	3.17^{d}	3.40^{c}	3.62^{b}	3.91^{a}	-	-

a, b, c and d means with the same letters in the same row are non-significantly different (P< 0.05).

The effect of supplementing various levels of concentrate mixture on solid-not fat (SNF) percentage are presented in Table 4. The overall mean of various feeding treatment showed the same trend as the highest value for T_4 (10.29%) followed by T_3 (9.75%) then T_2 (9.29%) compared to control T_1 (8.62%) and in terms of percentage as 19.37%, 13.11% and 7.77% respectively compared to T_1 control. Statistical analysis showed significantly higher value for T_4 followed T_3 then T_2 and then T_1 control. The results of present investigations are in close agreement to those reported by Hejazi and Omar (2009) who studied the effects of feeding sesame oil cake (SOC) on milk quality of Anglo-Nubian goats. However, Kushwaha *et al*. (2012) reported non-significant effect of supplementation on SNF content of milk in Indian lactating goats in control as well as treatment group. Which could be due to variation in treatment i.e. quantity of concentrate supplementation and stage of lactation or environmental effect.

Table 4: Effect of concentrate mixture feeding on solid-not fat (SNF) levels

Daily SNF %	Treatments				SE±M	P value
	T_1	T_2	T_3	T_4		
15 days	8.34^{c}	8.51^{bc}	8.68^{ab}	8.81^{a}	0.1045	0.0014
30 days	8.56^{b}	8.69^{ab}	8.90^{a}	8.85^{a}	0.1279	0.0614
45 days	8.54^{d}	9.38^{c}	9.88^{b}	10.72^{a}	0.0818	<.0001
60 days	8.64^{d}	9.57^{c}	10.21^{b}	10.97^{a}	0.0579	<.0001
75 days	8.77^{d}	9.78^{c}	10.33^{b}	11.15^{a}	0.0609	<.0001
90 days	8.82^{d}	9.81^{c}	10.47^{b}	11.24^{a}	0.0416	<.0001
Overall mean of treatment	8.62^{d}	9.29^{c}	9.75^{b}	10.29^{a}	-	-

a, b, c and d means with the same letters in the same row are non-significantly different (P< 0.05).

The effect of supplementing various levels of concentrate mixture on total solid (TS) percentage are presented in Table 5. The overall mean of treatment showed the same trend as the highest value with T_4 (14.73%) followed by T_3 (13.36%) then T_2 (12.70%) compared with control T_1 (10.78%) and when expressed in percentage to the tune of 36.64%, 23.93% and 17.81%, respectively compared to T_1 group. Statistical analysis revealed highest estimates for T_4 followed T_3 then T_2 and then control T_1. The results of present investigations are in close agreement to those reported by Singh *et al.* (2014). Similar results were

 DOI 10.5455/ijlr.20180416095835

reported by Okunlola *et al.* (2015) who studied effect of supplementation on milk composition in Red Sokoto goats. However, Kushwaha *et al*. (2012) reported non-significant effect of supplementation on TS content of milk on Indian lactating goats in control as well as treatment group. This could be due to variation in treatments i.e. quantity of concentrate supplementation and stage of lactation or environmental effect.

Table 5: Effect of concentrate mixture feeding on total solid (TS) levels

Daily TS %	Treatments				SE±M	P value
	T_1	T_2	T_3	T_4		
15 days	10.88^{b}	11.07^{ab}	11.30^{ab}	11.46^{a}	0.2112	0.0602
30 days	11.20^{b}	11.40^{ab}	11.67^{a}	11.68^{a}	0.1873	0.0535
45 days	11.94^{d}	13.11^{c}	13.83^{b}	15.12^{a}	0.1189	<.0001
60 days	12.07^{d}	13.33^{c}	14.26^{b}	15.45^{a}	0.0838	<.0001
75 days	12.24^{d}	13.57^{c}	14.44^{b}	15.80^{a}	0.1124	<.0001
90 days	12.36^{d}	13.70^{c}	14.68^{b}	15.85^{a}	0.0499	<.0001
Overall mean of treatment	10.78^{d}	12.70^{c}	13.36^{b}	14.73^{a}	-	-

a, b, c and d means with the same letters in the same row are non-significantly different (P< 0.05).

The mean lactation length in present investigation was recorded as 153.5±1.70 days and the lactation length ranges between 141 to 160 days (Fig. 2) which was similar in all groups.

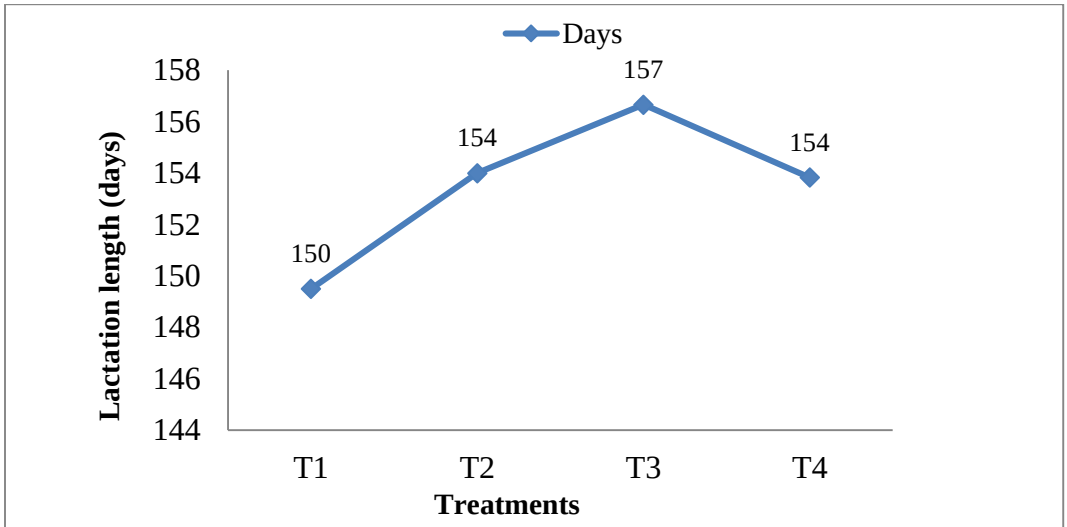

Fig. 2: Lactation length curve of expermiental Sirohi goats managed under semi-intensive management conditions

The results of present investigations are in close agreement to those reported by Rai and Singh (2005). However, higher lactation length was reported in Jakhrana breed of goat (183.04±4.04days) by Mandal *et al.* (2010) and in Kutchi breed of goat (202.5±5.65 days) by Kumar *et al.* (2004) respectively. This could be due to variation in breed or variation in nutrition provided to lactating does as nutrition is one of the most important factors that directly influence the lactation period in goats.

DOI 10.5455/ijlr.20180416095835

Conclusion

On the basis of the present investigation, it may be concluded that the higher daily milk yield and total milk yield with better milk composition can be obtained in Sirohi goats with increasing amount of concentrate mixture in comparison to control; however, the effect of different levels of concentrate mixture feeding on lactation length was found to be non-significant. These results are only indicative and require further experimentation to arrive at some more consistent conclusion.

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DOI 10.5455/ijlr.20180416095835