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Effect of Different Levels of Concentrate Mixture Feeding on Milk Composition in Sirohi Goats

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ABSTRACT

A study was conducted on Effect of different levels of concentrate mixture feeding on milk composition 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 to investigate the effect of different levels of concentrate mixture feeding on milk composition in Sirohi goats. The total duration of feeding experiment was 90 days. Apart from daily grazing, concentrate mixture feeding were given to Sirohi goats in ratio of 0.00 gm (T_1), 100gm (T_2), 200gm (T_3) and 300gm (T_4) respectively with *Prosopis cineraria* dry leaves (Khejri) ad libitum. The results revealed that the Sirohi goats showed significantly ($P<0.05$) higher milk composition in T_4 than T_3, T_2 and control T_1. The overall means of milk composition for fat % was found higher in T_4 than T_3, T_2 and T_1 ie., 3.91, 3.62, 3.40 and 3.17%. The solid-not fat % was found higher in T_4 than T_3, T_2 and T_1 ie., 10.29, 9.75, 9.29 and 8.62%. The total solid % was also found higher in T_4 than T_3, T_2 and T_1 ie., 14.73, 13.36, 12.70 and 10.78% respectively. It was observed that with increasing amount in feeding ratio was successive increase in milk composition. The present results help to conclude that there is a certain beneficial effect of concentrate mixture feeding on daily fat %, solid not fat %, total solid % and overall means of milk composition performance during lactation period in Sirohi goats.

Keywords: Concentrate mixture, Milk composition, Fat, Solid-not fat, Total solid, Sirohi Goats

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 generation, 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. Goat is a poor Man's cow because of their immense contribution to the poor peoples economy. It is regular source of additional income for poor and landless or marginal farmers being small sized animal the goat can easily be managed by women and children (Prasad, 2010). Goat husbandry in India is essentially an endeavour of millions of small and marginal families, who rear animals on "Crop Residues" and "Common Property Resources". Goats play an important role in converting crop residues into valuable products i.e. meat and milk which has special value in human nutrition in households which cannot afford keeping dairy cows (Soryal *et al*., 2004). 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 contains 16.03% (Livestock census, 2012). 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. The country stands first in goat milk production and is second largest meat producer in the world sharing 26.31% goat milk and 10.41% goat

meat production. Goats are the important animals for the provision of animal protein and as a source of income to small holder in the less developed part of the world.

Concentrate mixture is usually described as a feed or feed mixture which supplies primary nutrients (protein, carbohydrate and fat) at higher level but contains less than 18% crude fiber with low moisture. In general concentrate are feeds that are high in nitrogen-free-extract and TDN and low in crude fiber. 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). Nutrition affects both the yield and composition of the milk produced (Bencini and Pulina, 1997).

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 digestible due to the presence of smaller fat globules than the cow's milk. Fat and SNF content of milk are two most important parameters for evaluation of milk quality and price of milk usually based on its fat percentage. Along with various components, fat plays significant role in enhancing nutritive value, flavor, physical properties and palatability of milk and milk products. Variation in fat and SNF cause changes in specific gravity of milk.

Sirohi is one the best dual purpose goat breed in India. The breed has its name from Sirohi district of Rajasthan. Animals of this breed are found in arid and semi arid region along with most part of Arawali hills and outlying district in central and southern Rajasthan. Farmer prefer to rear these goats because their shining body colour, beautiful look and good performance in field condition. The body weight gain of Sirohi goat is faster than the other goat breeds of Rajasthan. This breed has proved to be an excellent goat breed with respect to disease resistance, adaptability in dry or hot climate, growth and production performance under poor quality range condition (Meel *et al.,* 2010).

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. 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. All goats were managed semi-intensively under of standard management practices. Goats were also allowed feeding leaves of *Prosopis cineraria* (Khejri) ad libitum and concentrate mixture was fed to goats individually as per requirement of experiment. 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 composition was done only upto 90 days at the interval of 15 days. For carrying out study on proportional milk composition analysis, volumes of morning milk was taken every 15 days intervals after cleaning and disinfecting of 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.

Statistical Analysis

Data related to milk composition 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.

RESULTS AND DISCUSSION

Milk fat percentage

The effect of supplementing various levels of concentrate

mixture feeding on milk fat percentage are presented in Table 1. The overall mean of various feeding treatments showed the same trend as the highest value with T_4 (3.91%) followed by T_3 (3.62%) then T_2 (3.40%) compared with control T_1 (3.17%). By calculation percentage increase in fat T_4, T_3 and T_2 daily fat yield by 23.34%, 14.19% and 7.25% respectively compared to control T_1 group. Over 90 days the fat percentage and overall mean of treatment significantly 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) who studied on twenty four Sohagi ewes in a comparative feeding trial to investigate the effect of feeding protein protected canola meal on milk yield and composition. Milk fat percentage gradually increased with advancing stage of lactation where it averaged 5.46, 5.72 and 5.59 % for control, T_1 and T_2 respectively with significant differences among them.

Table 1: Effect of concentrate mixture feeding on milk fat levels

Daily Fat %	Treatments				SEM±	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 results were found in agreement with present study. Similar result reported by Okunlola *et al.* (2015) who carried out a study on milk composition of Red Sokoto goats fed varying levels of baobab (*Adansonia digitata*) pulp and seed meal to saw the effect on milk yield and composition. They found significant difference (P<0.05) in the values of milk. The fat content of the milk in the study was at the increasing range of 3.0%, 4.05%, 4.60% and 5.78% respectively for inclusion levels of 0-30% baobab pulp and seed in the experimental diets. 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 food supplementation and stage of lactation or environmental effect.

Milk Solid-Not Fat (SNF) percentage

The effect of supplementing various levels of concentrate mixture feeding on solid-not fat (SNF) percentage are presented in Table 2.

Table 2: Effect of concentrate mixture feeding on solid-not fat (SNF) levels

Daily SNF %	Treatments				SEM±	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	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 overall mean of various feeding treatment showed the same trend as the highest value with T_4 (10.29%) followed by T_3 (9.75%) then T_2 (9.29%) compared with control T_1 (8.62%). By calculation percentage increase in solid-not fat in T_4, T_3 and T_2 daily SNF yield by 19.37%, 13.11% and 7.77% respectively compared to T_1 control. Over 90 days the SNF percentage and overall mean of treatment significantly showed the highest estimates with 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 Ogunbosoye and Babayemi, (2010) who carried out a study on twenty one goats of West African dwarf (WAD) breed to see the effects of five different forages and supplemented with a compounded ratio at 2% body weight on milk composition. They found significant effect on solid-not fat 11.7 to 13.30%. The SNF values were found varied significantly (P<0.05) among different

stage of lactation. However, Kushwaha *et al*. (2012) reported non significant effect of supplementation on SNF content of milk on Indian lactating goats in control as well as treatment group. This could be variation in treatment i.e. quantity of food supplementation and stage of lactation or environmental effect.

Milk total solid (TS) percentage

The effect of supplementing various levels of concentrate mixture feeding on total solid (TS) percentage are presented in Table (3).

Table 3: Effect of concentrate mixture feeding on total solid (TS) levels

Daily TS %	Treatments				SEM±	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 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%). By calculation percentage increase in TS in T_4, T_3 and T_2 daily TS yield by 36.64%, 23.93% and 17.81%, respectively compared to T_1 group. Over 90 days the TS percentage and overall mean of treatment significantly showed the highest estimated with 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) also evaluated the conspicuous effects on milk quality of farm and field rearing two important goat breed Jamunapari and Jakhrana. Electronic Milk Analyzer provides TS% (13.15±0.034), and SNF% (8.38±0.053) of all the samples. The milk of farm rearing goats had significantly (P<0.05) higher content of TS and SNF in comparison to field rearing goats. Similar results were reported by Okunlola *et al.* (2015) who studied effect of supplementation on milk composition in Red Sokoto goats.

CONCLUSION

On the basis of the present investigation, it may be concluded that the milk composition in Sirohi goats was found higher in T_4 than T_3, T_2 and control T_1 respectively. It was observed that with increasing amount in feeding ratio was successive increase in milk composition. These results are only indicative and require further experimentation to arrive at some more consistent conclusion.

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