

Research Article

Effect of supplementing various proteinaceous cakes on milk yield, milk composition and feed intake of lactating Damani goats

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Abstract

The work was designed to elucidate the effects of supplementation of proteinaceous cakes on the milk composition, its yield and feed intake. Twelve Damani goats of similar body weight, lactation numbers and age were chosen and divided into 4 groups. Trial duration was one month. Animals were grazed for six hours/day and were provided with maize fodder and straw in the evening i.e. control diet, while other three groups were offered with cakes in addition to the control diet on iso-nitrogenous basis including cotton seed cakes (Diet-CSC), mustard seed cakes (Diet-MSC) as well as maize oil cakes (Diet-MOC). Milk yield as well as feed intake data was taken daily. Each week from four consecutive milking samples were taken for milk composition analysis. Feed intake (kg/day) was 4.63 ± 0.02 observed for Diet-CSC and was the maximum ($P < .0001$) among all diets while least feed intake was recorded for control diet. Milk yield (ml/day) for Diet-CSC was noted 1080 ± 4.68 and was the highest ($P < .0001$) while 1008 ± 4.68 , 966 ± 4.68 and 887 ± 4.68 was recorded for Diet-MOC, Diet-MSC as well as control group. Maximum ($P < .0001$) fat in milk was noted for Diet-CSC $4.81 \pm 0.03\%$ while minimum was noted for control diet $4.20 \pm 0.03\%$. Maximum ($P < .0001$) milk protein for Diet-CSC was recorded $3.72 \pm 0.01\%$. As offered cakes are easily available and economical source of protein so our main aim was to check that how they can affect the production of goats in terms of milk yield, milk fat and feed intake. So our conclusion was that their supplementation has overall positive effects.

Keywords: Cotton seed cake; Diet; Maize oil cake; Mustard seed cake; Supplementation

Introduction

Huge population (191 million) of animals are facing shortage of green fodders. This shortage of green fodder is met by crop residues, natural grasses as well as byproducts wastes in which the level of crude protein is low while the fiber and

lignin fractions are high [1]. Fulfillment of dietary requirements of livestock with high fiber feed resources can greatly affect the animal productivity [2]. To enhance the production of small polygastrics a balance between energy as well as protein is required [3]. International Dairy Federation

in year 2017 ranked Pakistan at number four in the world for milk production. Milk is mainly obtained from cattle and buffalo however small ruminants also have an excellent contribution in milk production i.e. goats yield almost 851 thousand ton of milk in a year. Its share in national production is 2.5 percent approximately 2.5 % [4, 5]. Goat is a small poly gastric animal and is considered as the best among other small poly gastric animals due to its manner of grazing as well as its GIT which works efficiently in scarcity seasons. 4.1 is the lactose percentage of goat milk while 4.7 is that of cow milk, it is therefore people having lactose intolerance can use goat milk. Ca, P and K minerals in goat milk are more as compare to cow milk [6]. In the ration of large poly gastric animals proteinaceous cakes are being used conventionally, though in small poly gastric animals these cakes are not generally used [7]. Rapid growth rate, less methane production in the rumen while increased production of the propionic acid, minimizing energy losses as well as causing greater efficiency of utilization of the nutrient finally results in high milk yield [8]. Proteinaceous cakes supplementation is not only advantageous on palatability, digestibility and amino acids nutritional balance point of view but is also cheapest supplemental source of protein [9]. Major aim of our work was to explore the outcomes of supplementation of various proteinaceous concentrates on yield as well as compositional profile of milk and feed intake in lactating Damani goats.

Materials and methods

Departmental Ethical committee permitted the current study.

Experimental design

12 lactating Damani goats were selected i.e. of same age as well as lactation number. These selected were distributed into 04 dietary groups (n=3) on the basis of milk yield, age, lactation number as well as body weight.

Experimental ration

All animals were allowed to graze for six hours per day, in addition to this they were offered with maize fodder (chopped with piece size 1-2 inches) as well as wheat straw *ad libitum* (control diet) animals of other three groups were offered with control diet plus supplements i.e. cotton seed cake 300 grams per day and the group was named Diet CSC, 212 gram per day was the mustard seed cake and this particular group was named Diet MSC last group was given with maize oil cake at the rate of 416 gram in a day, the group was named as Diet MOC on iso-N basis. Those supplements contributed nearly 40% of total nutrient supplies [10]. During trail fresh drinking water was accessible to the goats round the clock.

Experimental trial

Trail duration was set 30 days with first 7 days were given as an adaptation period and remaining 23 days were the experimental period. During trail milk composition, feed intake and milk yield were checked that how the supplementation affects them. Data was collected for feed offered, grazing time and feed refused.

Collection, preservation and transportation of feed and milk samples

In each week maize fodder, proteinaceous cakes, grazing pasture, feed refused sampling was completed. For compositional analysis of milk out of four successive milking in each week samples were collected in clean labelled sample tubes and were immediately transferred to VRI Dera Ismail Khan in box with ice pack, where milk compositional analysis was done through using lacto scan.

Results

Chemical Composition of different feed ingredients

In addition to grazing, maize fodder as well as wheat straw were given as a basal diet. Except control group animals of treatment groups were fed with cotton seed cake, maize oil cake as well as mustard seed cake. Proximate analysis including DM, Moisture, Ash, CP, CF and EE [11] of feed

stuff samples were executed in the Animal nutrition laboratory of Animal and Poultry Production Department of Faculty of

Veterinary and Animal Sciences Gomal University. DM Proximate composition of given feed is in (Table 1).

Table 1. DM basis proximate composition of feed stuff

Proximate composition (%)	Wheat Straw	Cotton seed cake	Maize oil cake	Maize Fodder	Mustard seed cake
CP	3	23.5	16.6	9.7	32.4
DM	90.6	91.8	94.6	23.7	91.7
EE	0.1	8.9	12.2	1.8	9.7
CF	41.8	27.5	9.3	27.2	9.4
ASH	10.9	6.8	1.6	9.9	1.7

Milk yield and feed intake

Feed intake as well as milk yield record is briefed in (Table 2). Total Intake of animals offered with Diet-CSC was recorded maximum ($P<0.001$) 4.63 kg per day. Next to this was for the animals offered with Diet-MOC and Diet-MSC and feed intake recorded for them was 4.51 kg and 4.33 kg per day respectively. Animals offered with control diet had minimum feed intake 4.17 kg per day. Feed intake record for animals supplemented with proteinaceous cakes was higher as compare to animals offered with control diet only. Statistically intake

was significantly different ($P<0.001$) for all offered diets. For Diet-CSC offered animals milk yield was recorded maximum ($P<0.001$) among all the groups. 1080ml was the per day milk yield of goats offered with Diet-CSC. Diet- MOC as well as Diet-MSC animals' milk yield was 1008 ml and 966 ml respectively while 887 ml the lowest milk yield and was observed for control group animals. Milk yield was significantly changed ($P<0.001$) for all given diets and also yield was noted higher for groups offered with protein supplements.

Table 2. Effects of oilseed cakes on feed intake and milk yield

Diet	Feed Intake (kg/day)	Milk Yield (ml/day)
Control	4.17 ^d	887.9 ^d
Diet-CSC	4.63 ^a	1080 ^a
Diet-MSC	4.34 ^c	966 ^c
Diet-MOC	4.51 ^b	1008 ^b
SEM	0.02	4.68
P Value	$P<0.001$	$P<0.001$

Milk composition

In (Table 3) data for milk composition is briefed. Uppermost ($P<0.001$) milk fat contents were noted for Diet-CSC 4.81%. Goats fed with Diet-MOC had 4.63% whereas Diet-MSC milk fat was 4.50%. Similarly, 4.20 % milk fat the minimum among all was noted for control diet. 3.72% was the noted milk protein for Diet-CSC and was the maximum ($P<0.001$) among all groups. 3.67% and 3.60 % were observed milk protein of animals given with Diet-MOC and Diet-MSC respectively. For

control diet 3.48% the minimum milk protein was noted. On statistical grounds supplementation of proteinaceous cakes affects milk fat as well as on milk protein significantly ($P<0.001$). Milk lactose contents were noted statistically not significant (NS) ($P>0.001$) however their percentage recorded for various dietary groups i.e. 4.61% for Diet-MOC, 4.56% for Diet-CSC, 4.58% for Diet-MSC and 4.54% for control diet. 8.83% the maximum ($P<0.001$) solid not fat (SNF) in milk was noted for Diet-CSC. Diet-MOC SNF was

8.76% and SNF for Diet-MSC was 8.62%. SNF for control diet was 8.57% the lowest among all.

Table 3. Effect of oilseed cakes on milk composition

Diet	Milk Constituents (%)			
	Fat	Protein	Lactose	SNF
Control	4.20 ^d	3.48 ^d	4.54	8.57 ^d
Diet-CSC	4.81 ^a	3.72 ^a	4.56	8.83 ^a
Diet-MSC	4.50 ^c	3.60 ^c	4.58	8.62 ^c
Diet-MOC	4.63 ^b	3.67 ^b	4.61	8.76 ^b
SEM	0.033	0.010	0.112	0.013
P Value	P<0.001	P<0.001	NS	P<0.001

Discussion

According to our observations feed intake was improved with supplementation of proteinaceous cakes. Maximum feed intake was noted for goats offered by Diet-CSC and reason behind this is perhaps the palatability of cotton seed cakes. [12] Observations were same as we noted in our experiments that cotton seed cakes (CSC) in addition with mustard seed cakes (MSC) when offered their outcomes regarding feed intake were positive. It was also proved by them that feed intake was improved as the level of CSC was raised in the diet. [13] According to his findings with offering of energy as well as proteinaceous supplements the basal diet intake was increased. [14] In his experiment judged that with elevation of level of proteinaceous concentrates in the ration of animal the roughage intake was enhanced. According to [15] CSC is not only palatable but is also a good appetizer and perhaps this is the reason that dry matter intake was enhanced when CSC was used as a proteinaceous supplement, As the total digestible nutrients, minerals as well as the nitrogen are generally little in the basal diet based on forages so in such circumstances provision of proteinaceous supplements can not only increase the total dry matter intake but can also fulfil the nutrients deficiencies. 4.81%, 4.63% and 4.50% are the noted values of milk fat contents for Diet-CSC, Diet-MOC and Diet-MSC respectively and according to our findings with proteinaceous

supplementation the milk fat contents were also increased. [16] Noted in his studies that use of CSC as proteinaceous supplements has enhanced effects on milk fat contents in Dwarf Red Sokoto. [17] In final results of his research trial on dairy cows he concluded that supplementation of CSC can significantly ($P<0.05$) improved the fat contents of milk. [18] In dairy cows the SNF contents of milk were not affected with the supply of proteinaceous supplements in the feed. Goats provided with Diet-CSC has 1080.0 ml per day milk yield recorded and it was the highest milk yield among all while 887 ml per day was noted milk yield of control group and was the lowest milk yield recorded among all groups. [19] Also observed the outcomes same like us that Proteinaceous cakes when used in the diet can have positive impact on yield, fat as well as protein contents of milk. [20] also supported our results regarding milk yield he observed that cows fed with 35% CSC has higher levels of milk yield. [17] Who narrated that milk yield was significantly improved with the diet having higher level of CSC. [21] Also got results like us he noted that milk production was significantly increased for those animals whose ration contain 50 percent CSC.

Conclusion

Through recent work it is evident that agro-industrial byproducts when use in the diet of Damani goats as an economical protein source like cotton, mustard as well as maize oil cakes have considerably improve the

milk yield. Supplementation also has beneficial effects on total feed intake as they are high palatable similarly milk fat as well as milk protein contents were also improved. So we recommend the use of above proteinaceous cakes in the diet of small ruminants for better health and production.

Author's contributions

Conceived and designed the experiments: M Zeeshan, SA Fatima, Performed the experiments: M Zeeshan, S Ullah, Analyzed the data: U Farooq, SA Fatima, Contributed reagents/materials/analysis tools: M Zeeshan, S Ali, Wrote the paper: M Zeeshan

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