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Relative Impact and Analysis of Composition of Goat Milk by Stall-Feeding System and Rearing with Grazing System of Goats

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ABSTRACT

In many regions of the world, goat milk and its milk products have played a major role in economic viability, particularly in developing countries like India. In terms of getting milk products high in minerals and other protein, the importance of free grazing still prevails and is preferred over stall feeding, but both ways are good in general. With the importance of the above in mind, an approach has been taken in the current study to compare the yield of milk from goats using a stall-feeding system and a free grazing system. Our findings show that milk minerals such as Calcium, Potassium, Magnesium, and Sodium are higher in stall-feeding goat systems than in free grazing systems because stall-feeding provides a computed ration – Minerals, Common salt, mineral mixture, concentrate feeding, feed additives, and feed supplement. As a result, milk minerals are higher in stall-feeding goat systems than in free grazing goat systems. Lactose levels are higher in stall-feeding systems than in open grazing systems because leguminous feeds like as lucerne and bersim grasses, as well as green forages, are used. Because they graze freely in the environment and consume various types of feeds, fat percentage is higher in the free grazing system of goats than in the stall-feeding system. Since stall-feeding systems provide feed supplement and concentrate feeding, fat soluble vitamins are higher in stall-feeding systems than in free grazing systems, which is why fat-soluble vitamins are higher in stall-feeding systems of goats.

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INTRODUCTION

In many regions of the world, particularly in poor countries, goat milk and its products have played a vital role in economic viability[1]. Goat milk can be used to make a range of goods, including fluids (low fat, fortified, or flavoured), fermented items like cheese, yoghurt, or buttermilk, frozen products like ice cream or frozen yoghurt, butter, and condensed and powdered products.[2]. However, cheese is traditionally the main commercial goat milk product produced and consumed in large quantities around the world.

Goat farming has been a feature of agriculture since virtually the beginning of domesticated animals, and it is currently expanding around the world. This expansion is reflected in part by an increase in the number of small herb gardens maintained by individuals[3]. Either as a source of income or as an avocation. Goats are particularly well adapted to this function because they require little acreage and attention while still allowing an individual to participate

actively in dairying. The goat milk generated by such a business is usually marketed as whole milk or as cheese, evaporated milk, or dried milk products[4]. Because of this increased interest, it is valuable to aware of the factor affecting the composition and nutritional value of caprine milk.

Between 1991 and 2004, the number of goats climbed from 37 million to 54.7 million. The animal produces about 2% of the world's total annual milk and is ranked third behind cows and buffaloes. The overall goat population in the world is 861.9 million, with India having 125.7 million goats and Maharashtra having 11.4 million goats. World total goat milk production is 15,510,411 tonnes per year. India is the largest producer of goat milk. In India, 83.4 percent of goats are owned by landless small-scale farmers in environmentally sensitive and drought-prone areas. More sustainable farming systems, such as goat husbandry, could benefit communities in rural India's tough conditions, but they'll need political will, financial resources, high-quality technical training and animal care, and low-cost shipping[5].

Goat milk has become more popular world-wide in recent years. The distinctive sensory qualities of goat milk products, which are characterised by a distinct and characteristic "goat" flavour, perhaps explain some of this new interest. Goat milk is distinct from bovine milk in several respects. It has more free amino acids than cow milk, and its particular casein precipitates into finer particles more easily[6]. The higher amounts of short-chain fatty acids present are partially responsible for the distinct flavour of goat milk. It is reported that the bioavailability of Zn is enhanced by goat milk in comparison to cow milk. Also goat milk has high carnitine content, and is distinguished by its high chloride and potassium contents. Several characteristics of goat milk are currently the focus of increased research interest. In this study, advantages and disadvantages of goat milk consumption were reviewed.

Researchers studied on Goat milk and its products of yoghurt, cheese and powder have three-fold significance in human nutrition: First, feeding more starving and malnourished people in developing countries than cow milk; second, treating people with cow milk allergies and gastro-intestinal disorders, which is a significant segment in many developed countries' populations; and finally, filling the gastronomic needs of connoisseur consumers, which is a growing market share in many developed countries' populations[7]. Concerning dairy goat milk supply and lactation length, substantial improvement must be made, especially in underdeveloped nations, through better education/extension, feeding, and genetics. Concerning, little unbiased medical research to provide evidence and promotional facts has been conducted, but is very much needed to reduce discrimination against goats and substantiate the many anecdotal experiences about the medical benefits from goat milk consumption, which abound in trade publications and the popular press.

Goats have many unique differences in anatomy, physiology and product biochemistry from sheep and cattle, which supports the contention of many unique qualities of dairy goat products for human nutrition. Few countries like France have pioneered a very well-organized industry of goat milk production, processing, marketing, promotion and research, which has created a strong consumer clientele like in no other country, but deserves very much to be copied for the general benefit to human nutrition and goat milk producers. The physiological and biochemical facts of the unique qualities of goat milk are just barely known and little exploited, especially not the high levels in goat milk of short and medium chain fatty acids, which have recognized medical values for many disorders and diseases of people. The new concept of tailor making foods to better fit human needs has not been applied to goat milk and its products so far, otherwise the enrichment of short and medium chain fatty acids in goat butter, and their greater concentration compared to cow butter, could have become a valued consumer item. Also revisions to human dietary recommendations towards admitting the health benefits of some essential fats supports the idea of promoting goat butter. While goat yoghurt, goat cheeses and goat milk powder are widely appreciated around the world, goat butter is not produced anywhere commercially in significant volume.

Variations in the milk content of Nigerian cattle, sheep, and goats, as well as residual phenotypic connections between the milk elements, were explored, according to the researchers[8]. The study utilized Bunaji, Yankasa and Red Sokoto breeds of cattle, sheep and goats, respect ively. Results indicated that sheep and goats differed significantly ($P<0.05$) from cattle in all constituents except protein percentage that averaged 5.43, 5.43 and 5.49%. Caprine milk contained the highest percentages of fat (5.8 0%), total solids (15.37%) and ash (0.77%), while bovine milk contained the least percentages of fat (0.68%) and lactose (1.84%). Overall,milk compositions of sheep and goats were very similar since they were not statistically different from each other ($P>0.05$). Residual phenotypi c correlations between the milk constituents revealed highly significant ($P<0.01$) and positive relationships between total solids and solids -not-fat (0.97 and 0.98 in cattle and sheep, respectively). All other correlations were positive (ranging from 0.12 to 0.77), except between protein and total solids (-0.44) and protein and solids-not-fat (-0.64) in cattle. Multiple linear regression equations were fitted to predict the percentages of protein and fat. It was demonstrated that protein percentage could be predicted from total solids and solids -not-fat with the highest accuracy of 94, 86 and 82 % in cattle, sheep and goats, respectively. On the other hand, the accuracy of prediction of fat percentage was very low in

all the species (R 2=0.01, 0.03 and 0.37 in cattle, sheep and goats, respectively).

The goal of this research is to compare and contrast the physicochemical, medicinal, nutritional, biological, radioactive, and immunological properties of goat and sheep milk[9]. It also deals with changes in milk constituents due to heat treatments as well as dairy products produced from these species to focus international attention on the dairy products which can be produced a large scale in many countries.

Goats are an important component of the livestock business because of their capacity to adapt to severe conditions, making them ideal for landless and marginal farmers[10]. The contribution of goats in supplying milk and milk products is high and it has significant role in rural economy and health. Goat milk contains higher amount of Ca, Mg and P than cow and human milk. Medium Chain Triglycerides (MCT) which are more in goat milk have been recognized as unique lipid with unique health benefits. The soft curd of goat milk may be an advantage for adult humans suffering from gastrointestinal disturbances and ulcers. Goat milk is recommended for infants, old and convalescent people. The consumer acceptance of goat milk and its products is reported to be excellent. Goat cheese production in Nepal is coming up in a big way which will prove to be a boon to Nepalese cheese industry. Despite this fact, goat has remained neglected in research and development. Universally recognized as poor man's cow., goat now has to be fully exploited to get maximum benefits, particularly meat, milk and milk products having medicinal values.

Table 1: Composition of milk of different species[11,12,13]

Sr. No	Species	Water%	Fat%	Protein%	Lactose%	Ash%
1.	Goat	86.5%	4.5%	3.5%	4.7%	0.8%
2.	Sheep	83.3%	5.3%	5.5%	4.6%	1.9%
3.	Cow	86.7%	4.6%	3.4%	4.9%	0.7%
4.	Buffalo	84.2%	6.6%	3.9%	5.2%	0.8%
5.	Camel	86.5%	3.1%	4.0%	5.6%	0.8%
6.	Human	87.7%	3.6%	1.8%	6.8%	0.1%

Goat milk is a crucial vitamin for humans, especially those who suffer from lactose intolerance and are sensitive to the milk of other animals[14]. Goat milk is composed of different usable nutrients which are important to their young and humans. Among those important nutrients that are found in goat milk are fat, protein, lactose, vitamins, enzymes and mineral salts. Most of the components of goat milk are greater than that of other milk producing animals. For instance, goat's milk contains 25% more vitamin B6, 47% more vitamin A and 13% more calcium than cow's milk. However, available information concerning goat milk is mainly limited to data on its gross composition, and information on the nutritional quality of goat milk, especially important nutritional constituents are scarce. In addition, cultural beliefs challenge the reputation of the advantage of goat milk consumption and the development of the sector, especially in developing countries. Knowledge about the nature of goat milk is important to investigate the use of the goat milk to humans. Moreover, goat milk is also used as therapy against different problems including gastrointestinal disturbances, vomiting, colic, diarrhea, constipation and respiratory problems.

In this paper, we look at the impact of stall-feeding on goat milk composition, the impact of rearing goats with grazing systems on milk composition, and the composition of stall-feeding and rearing with grazing systems on milk composite.

MATERIALS AND METHODS

The research was carried out at Maharashtra Udaygiri Mahavidyalaya Udgir's dairy science department. The current study focused on the "Impact & Accessment of Goat stall-feeding and Rearing with Grazing System" using milk samples from stall-feeding goats from Giridhar Kendre in Patoda Tq. Jalkot Dist. Latur was collected every 10 days, and a sample of milk from a goat grazing system was also taken from a goat farm belonging to Bhaurao Surnar Khoras Tq. Palam Dist. Parbhani was collected every 10 days.

The samples were then subjected to minor analysis in our college laboratory, including fat, acidity, specific gravity, total solids, and ash. The identical material was sent to a well-known laboratory in Pune for additional evaluation.

Table 2: Laboratory analysis for the collected sample of given parameters.

Sr. No	Constituent
1	Protein
2	Lactose

3	Fat
4	Salts
5	Calcium
6	Magnesium
7	Potassium
8	Sodium
9	Vitamin-A
10	Vitamin-D
11	Vitamin-E
12	Vitamin-K

RESULT AND DISCUSSION

Table 3: Comparison of protein value in sample A and sample B

Test sample	Protein Value of sample A	Protein Value of sample B
01	2.9	3.1
02	2.8	3.2
03	3.2	3.4
04	3	3.2
05	3	3.3
06	3.1	3

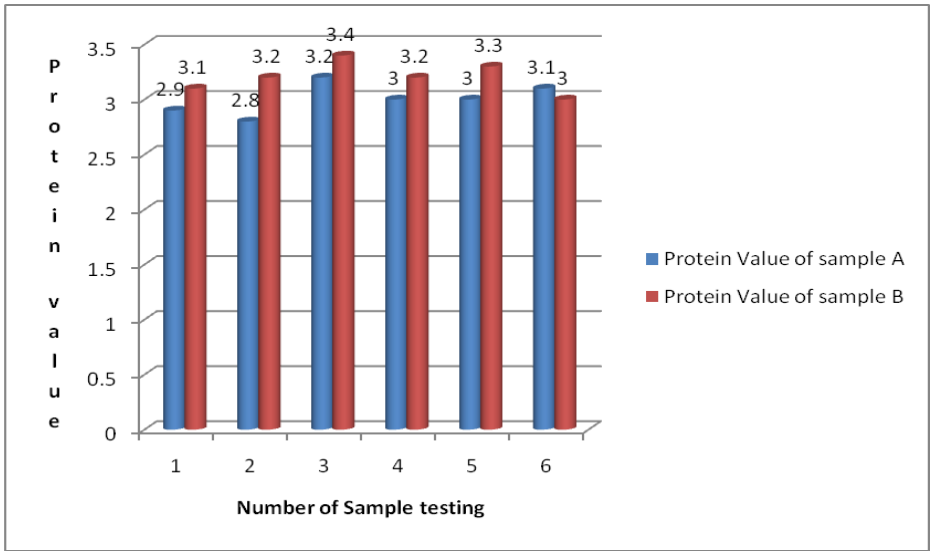

Fig. 1 graphical representation of protein concentration in sample A and B

The maximum average protein level was observed 3.2 % in Grazing system and the minimum average was observed 3.0 % in stall-feeding system (Fig. 1).

Table 4: Variation of Lactose content in sample A and sample B

Test Sample	Lactose Value of sample A	Lactose Value of sample B
01	4.5	4.2
02	4.6	4.1

03	4.3	4.3
04	4.5	4.2
05	4.4	4
06	4.7	4.4

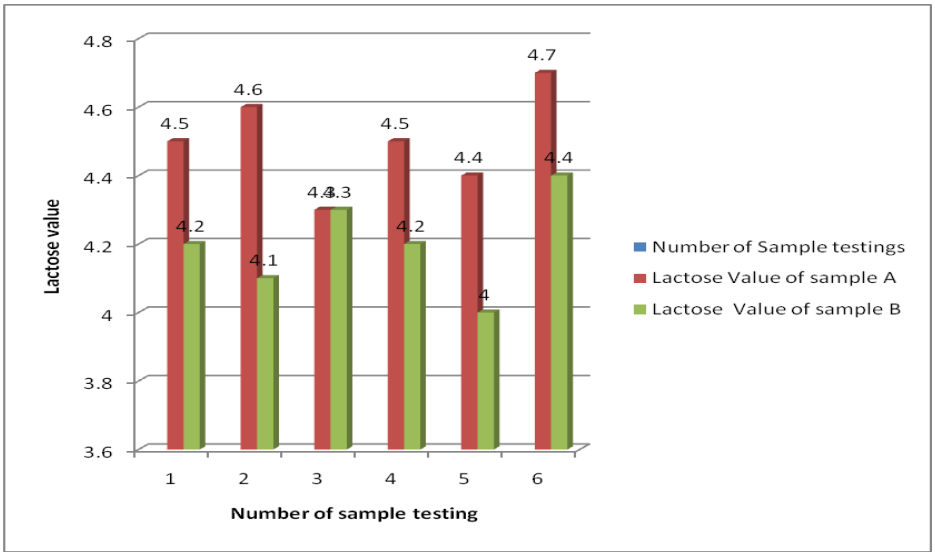

Fig. 2: Differences in Lactose content of sample A and B

The maximum average lactose level i.e 4.5 was observed in stall-feeding system and the minimum average is 4.2 was observed in free grazing system (Fig. 2).

Table 5: Variation of fat content in sample A and sample B

Test Sample	Fat Value of sample A	Fat Value of sample B
01	3.2	3.5
02	3.5	3.7
03	3.4	3.8
04	3.4	3.6
05	3.6	3.6
06	3.3	3.4

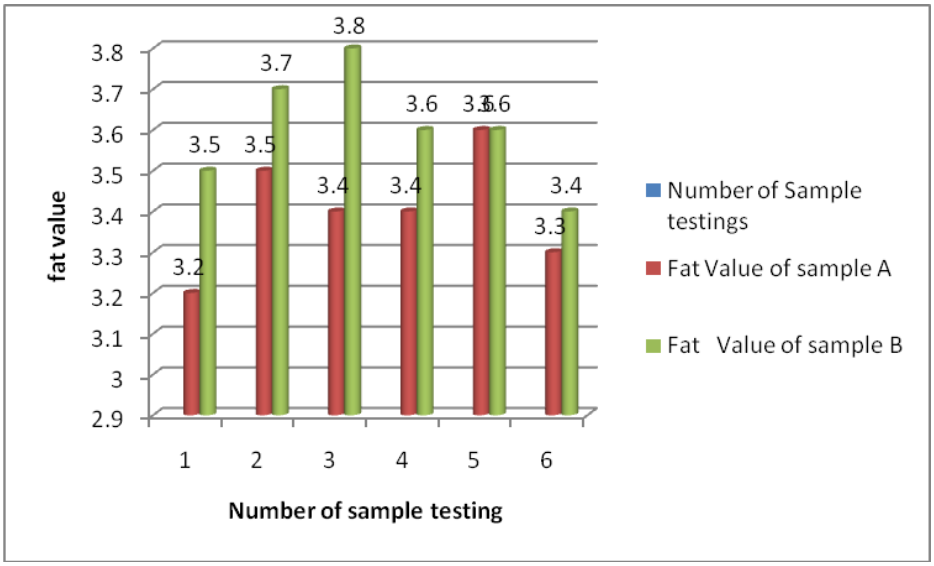

Fig. 3 Variation in fat values of sample A and B

Relative Impact and Analysis of Composition of Goat Milk by Stall-Feeding System and Rearing with Grazing System of Goats

The maximum average level fat 3.6 was observed in free grazing system and the minimum average level is 3.4 was observed in stall-feeding system (Fig 3). Whereas, no significant variation was observed in salt concentration in Goat milk from both sample, sample A and sample B.

Table 6: Minerals content present in unit mg/100 ml of milk sample

	Calcium		Magnesium		Potassium		Sodium	
Sr. no	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
01	140	136.11	33.72	27.4	216	215	36.5	37.5
02	142	133.67	34.28	26.4	215	212	38	39.5
03	143	135.89	34.84	25.6	214	214	38.5	38.5
04	142	134.89	34.28	26.4	216	213	38	38
05	141	133.89	34.36	27.2	218	213	39.5	36.5
06	144	134.89	34.2	25.4	217	211	37.5	38

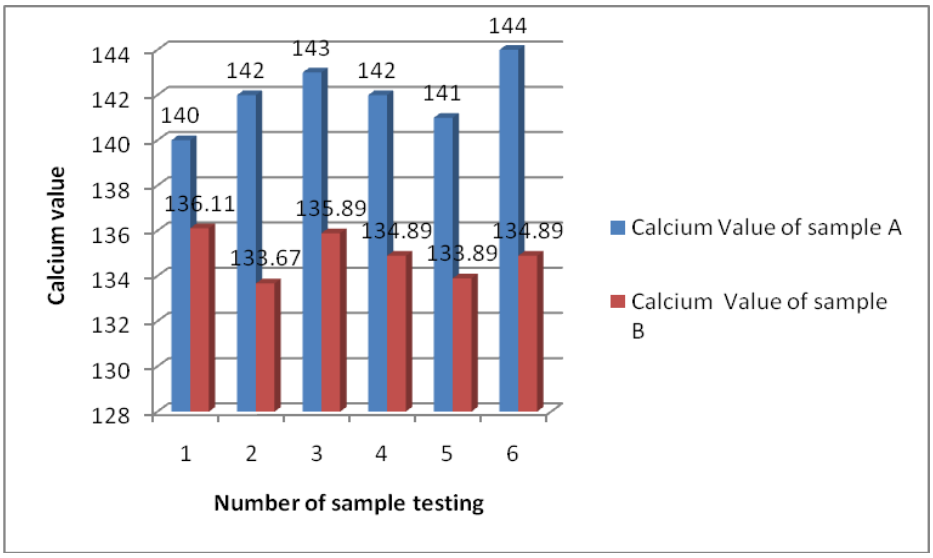

Fig. 4 Calcium values of sample A and B

Maximum average level calcium 142.00 mg/100 ml was observed in stall-feeding system and the minimum average level is 134.89 mg/100 ml was observed in free grazing system (Fig. 4)

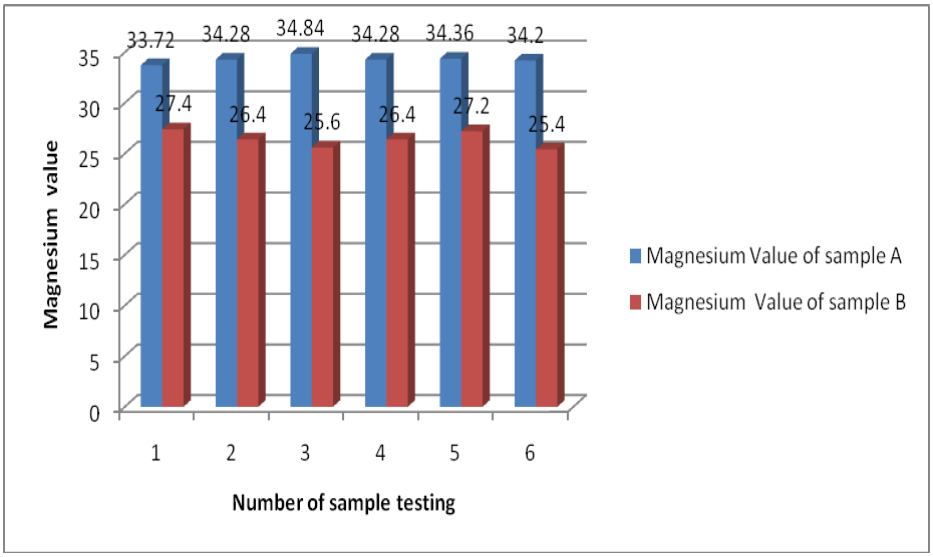

Fig. 5 Magnesium values of sample A and B

Maximum average level Magnesium i.e 34.28 was observed in stall-feeding system and the minimum average level is 26.4 is observed in free grazing system (Fig. 5).

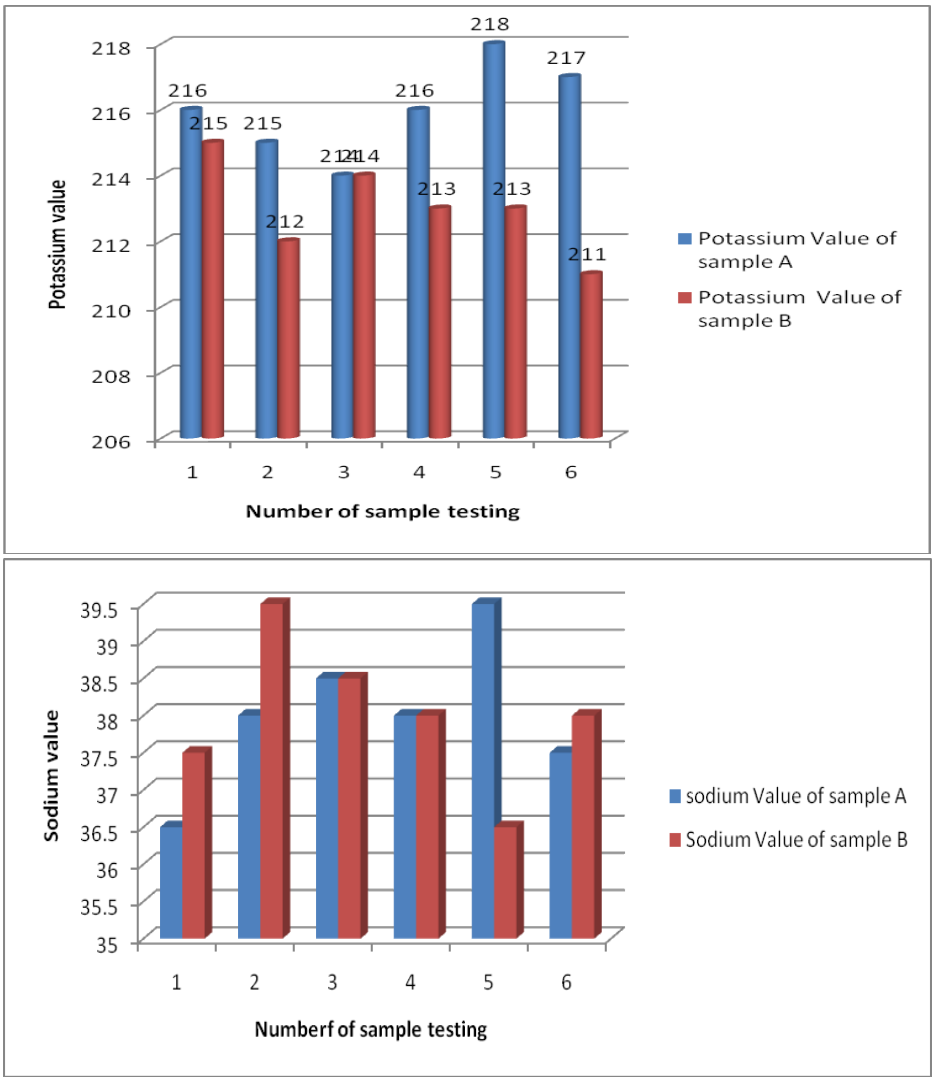

Fig. 6 Potassium values of sample A and B

the potassium average level i.e. 216 was observed in stall-feeding system and the minimum average level is 213 was observed in free grazing system (Fig. 6)

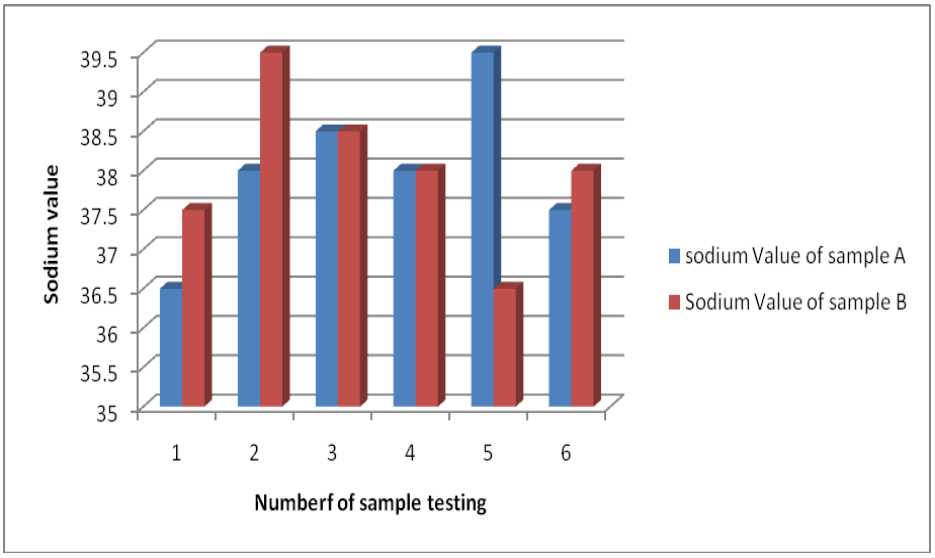

Fig. 7 Sodium values of sample A and B

No significant difference was observed for Sodium in both sample sample A and sample B (Fig. 7)

VITAMINS

Table 7: Variation in concentration of Vitamins in milk sample.

Sr. no	Vitamin -A		Vitamin -D		Vitamin -E	
	A	B	A	B	A	B
01	36.8	35.8	0.7	0.7	0.32	0.29
02	37.1	36.1	0.7	0.7	0.29	0.27
03	36.9	35.9	0.7	0.7	0.28	0.26
04	37	36	0.7	0.7	0.3	0.27
05	37	36.2	0.7	0.7	0.3	0.28
06	37.2	36	0.7	0.7	0.31	0.26

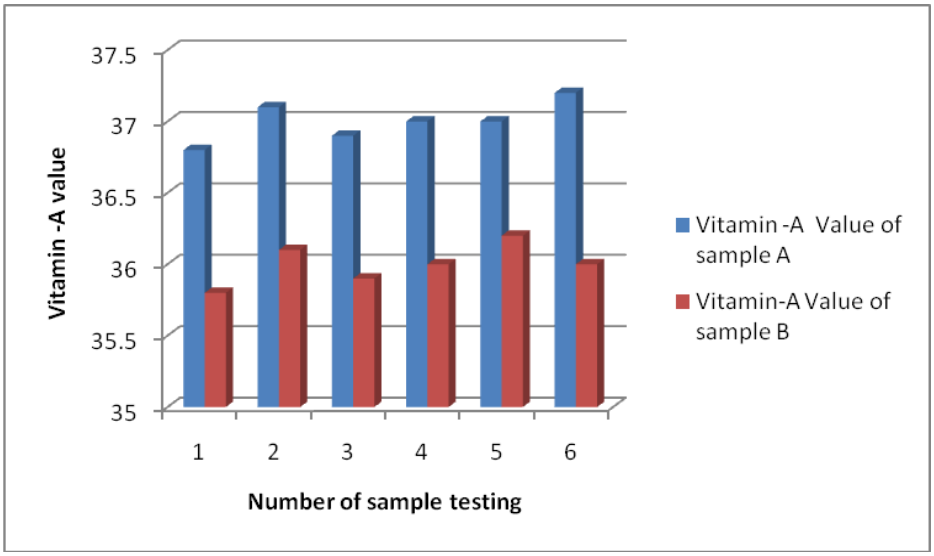

Fig. 8 Vitamin-A values of sample A and B

Maximum average level vitamin-A i.e 37.00 (IU/gram fat) was observed in stall-feeding system and the minimum average level is 36.00 (IU/gram fat) was observed in free grazing system (Fig. 8).

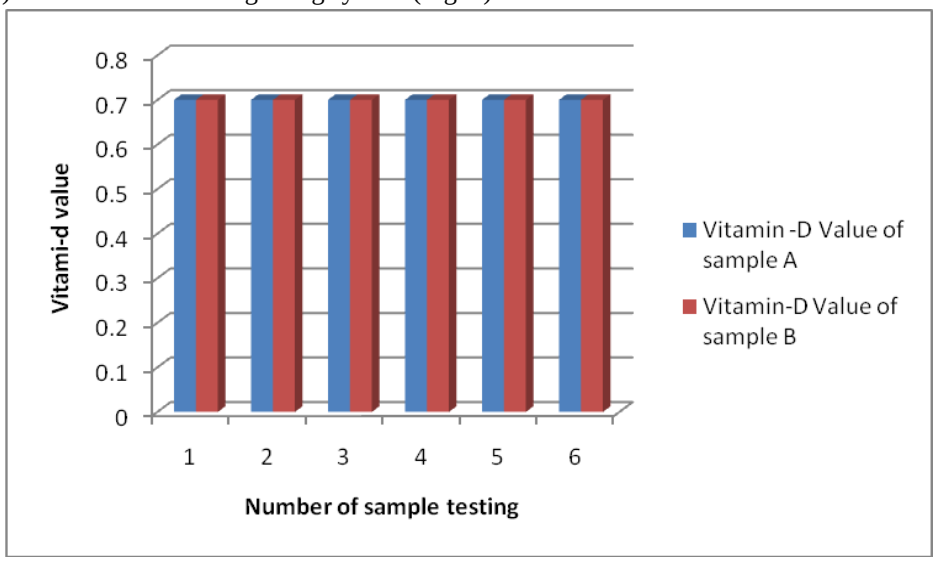

Fig. 9 Vitamin- D values of sample A and B

We have getting the same value of Vitamin-D in Goat milk of both sample Sample A and Sample B (Fig. 9)

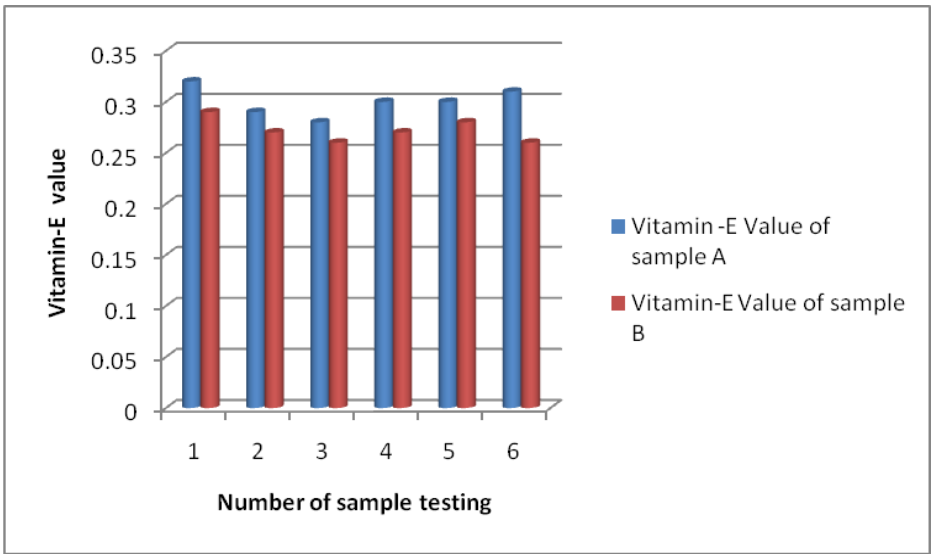

Fig. 10 Vitamin-E values of sample A and B

The least average level, 0.3, was recorded in the stall-feeding system, while the maximum average level, o.27, was observed in the free grazing goat system (Fig. 10.). We found the same concentration of vitamin-k in both samples of goat milk.

Protein is increased in the grazing system of goats as compared to the stall-feeding system of goats because in the free grazing system goats are free to graze feed on the field and are fed a variety of feeds such as small herbs, babul tree leaves, green grass, and so on. As a result, milk protein in free grazing systems should be higher than in stall-feeding systems. Lactose levels are higher in stall-feeding systems than in open grazing systems because leguminous feeds like as lucerne and bersim grasses, as well as green forages, are used. Because they graze freely in the environment and consume all types of feeds, fat percentage is higher in the free grazing system of goats than in the stall-feeding system. According to a study comparing the stall-feeding system and the free grazing system of goats, milk minerals such as calcium, potassium, magnesium, and sodium are increased in the stall-feeding system of goats because stall-feeding provides a calculated ration– Minerals, stall-feeding goats have higher milk minerals than free grazing goats because of common salt, mineral mixture, concentrate feeding, feed additives, and feed supplement. Because they provide feed supplement and concentrate feeding, fat soluble vitamins are higher in stall-feeding systems than in free grazing systems, so fat-soluble vitamins are higher in stall-feeding systems of goats.

CONCLUSION

Milk is basic food necessity of every individual, to improve the quality of milk grazing system was found to be better than stall-feeding. Moreover, grazing system resulted in increased Fat content in milk which is primary demand in milk consumers in India. Hence, grazing system should be promoted for increased yield and good quality milk.

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