

Influence of breeds on goat milk composition under field and farm rearing conditions

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Abstract

The results showed that all the factors investigated had significant ($P < 0.001$) influence on the milk composition. In this study, laboratory and field experiments were conducted to estimate milk composition applied to two breeds (Jamunapari and Jakhrana) and to determine the effect of different breeds on goat milk composition under field and farm rearing conditions. Total 1215 samples were analyzed for the analysis of field and farm rearing conditions. The Jakhrana does had the highest (1.0306 ± 0.0004) specific gravity under farm rearing conditions followed by Jamunapari (1.0294 ± 0.0004) farm conditions and lowest in Jamunapari (1.0286 ± 0.0004) does under field rearing conditions and total solids was significantly ($p < 0.050$) higher (13.15 ± 0.030) in field rearing condition than farm rearing conditions in Jakhrana goat milk whereas in case of Jamunapari goat breed milk the total solids per cent was slightly higher (13.22 ± 0.035) in field rearing condition than farm rearing conditions. The solids-not-fat percentage was significantly ($p < 0.01$) much higher (8.58 ± 0.053) in field rearing conditions either Jakhrana or Jamunapari goat breed than that of farm rearing conditions. It is due to higher fat percentage (4.69 ± 0.044) and lower percentage of protein (3.19 ± 0.034), lactose (4.42 ± 0.012) and ash (0.76 ± 0.007) in farm rearing conditions of Jakhrana as well as Jamunapari goat breeds.

Key words

Rearing condition, breeds, Influence, goat milk, milk composition.

Introduction

There are adverse ecological and physiological constraints in the Indian system of goat farming. Goat population of our country increased from 47.14 million in the year 1951 to 124.5 million during 2005. Asian regions possess about 63.78% and India 15.33% of the total world population of goats. Goat produces about 2.4- 2.8 million tones milk i.e. 2.3-3.0% of total milk produced in the India (F A O, 2005). Currently, When the scientific advances in goat

production have been mainly based on research and goat farming system research in India. Goat milk is more widely produced than sheep milk, and globally goat production yield 60 per cent of its value of milk, 35 per cent as meat and 5 per cent as skin. There is evidence that on live weight basis the goat is much more efficient milk producer than the other species (Malau-Aduli 2001).

The Jamunapari is known as the best dairy goat in India. It is also the tallest breed and commonly known as the "Pari" in its area of origin- the "home tract"-because of its majestic appearance. Its home tract and natural habitat is the Chakarnagar

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area of the Etawah district in the State of Uttar Pradesh, along the delta of the Jamuna and Chambal Rivers, and the Bhind district of the State of Madhya Pradesh along the Kaweri River, east of New Delhi. Female Jamunapari weigh about six pounds at birth, 30 pounds at six months, and 65 pounds at 12 months of age. Male kids have significantly higher body weights. Growth rate averages about two pounds per week up to three months of age, and two pounds per 10 days thereafter (Rout, et. al. 2004).

Methodology

The study was conducted at the central institute for research on goats, Makhdoom, Mathura; under the division nutrition feed resources and products technology for the study of farm rearing conditions. Milk samples were collected from two goat breed Jamunapari and Jakhrana under the farm and field rearing condition. Field samples were collected from different villages near about Agra and Mathura. The Jamunapari and Jakhrana breeds milk samples were available in both villages of Mathura, India (27° 10'N, 78° 002'E and 169 m above MSL). Geologically the Institute land falls under Jamuna alluvial is semi arid. Temperature ranges between 6° C in winter to as high 45° C in summer. Annual average rainfall is a period of 50 -60 days. Monsoon arrives in mid July and remains active till mid September Agnihotri and Rajkumar (2007). The methodology used was an adaption from Bourbouze (1995) and Alvarez Funes and Paz Motola (1997).

Experimental goats and management: - It was a total of 1215 samples from 44 particular goats including field and farm rearing conditions 377 Jamunapari milk samples and 631 Jakhrana goat milk samples under farm rearing conditions. In the field conditions, total 207 milk samples was collected 102 Jamunapari goat milk samples and 105 Jakhrana goat milk samples under field conditions. 20 particular goats were selected per breed in farm and 1 particular goat was selected from each breed in both villages under field conditions.

Sample collection and analysis: - Goat milk samples were collected from research far and field properly in January 2009 – December 2011 at various time and stages of lactation. The composition was determined by Lactoscan before the analysis of each sample was thoud at 30° C to melt the fat and cold to 20° C.

Results and Discussion

There were significant ($P < 0.001$) effects of field and farm rearing conditions on Jakhrana and Jamunapari goat milk composition (Table 1).

Effect of breed on specific gravity either field or farm rearing conditions was significant at 5% level of significance and a significant difference existed in the fat content. It is clear from the above table that protein per cent in field conditions was greater than that of farm rearing goat milk in both breeds significantly at 1% level of significance. The analysis of variance of these data (Table 1.) reveled that protein content variation either Jakhrana or Jamunapari goat breeds had significant ($p < 0.05$) effect on field and farm rearing conditions. Kala and Prakash (1990) reported that during the suckling period of 90 days, milk production was estimated at 7 days intervals and milk constituents, fat, protein, lactose, solids-not-fat (SNF) and total solids (TS) were estimated at 15 day intervals from the day of kidding in Jamunapari and Barbari goats. Heritability estimates of milk yield and constituents in the two breeds ranged from medium to high (0.22 for SNF to 0.48 for TS).

The lactose content in field rearing conditions was significantly higher than that of farm rearing conditions in Jakhrana as well as Jamunapari goat breeds at $p < 0.05$. It is also clear from the above table that ash content in the milk of Jakhrana or Jamunapari goat breed under field rearing conditions was significantly greater than that of farm rearing conditions. The analysis of variance table showed that ash content of Jakhrana goat breed's milk in field or farm rearing conditions was significantly more than that of Jamunapari goat breed milk. Prasad et. al.

Table 1. Effect of breed on goat milk composition under field and farm rearing conditions.

Factor	Overall	Jamunapari		Jakhrana		Table value(t)	
		Field	Farm	Field	Farm	5%	1%
N	1215	102	377	105	631		
Specific	1.0295±0.0004	1.0286±0.0004	1.0294±0.0004	1.0294±0.0004	1.0306±0.0004	1.960	2.576
Gravity	(1215)	(102)	(377)	(105)	(631)		
Fat	4.76±0.046 (1215)	4.82±0.046 (102)	4.99±0.048 (377)	4.55±0.044 (105)	4.69±0.044 (631)		
Protein	3.205±0.32 (1215)	3.22±0.027 (102)	3.09±0.036 (377)	3.33±0.028 (105)	3.19±0.034 (631)		
Lactose	4.43±0.014 (1215)	4.44±0.016 (102)	4.38±0.011 (377)	4.49±0.016 (105)	4.42±0.012 (631)		
Ash	0.745±0.007 (1215)	0.74±0.007 (102)	0.70±0.005 (377)	0.78±0.008 (105)	0.76±0.007 (631)		
Total solid	13.15±0.035 (377)	13.22±0.035 (1215)	13.16±0.035 (102)	13.15±0.030 (105)	13.06±0.040 (631)		
Solids-not-fat	8.38±0.053 (1215)	8.40±0.056 (102)	8.17±0.053 (377)	8.58±0.053 (105)	8.37±0.050 (631)		

(2005) observed that the breed significantly affected both the milk yield and composition. The milk yield was maximum ($p < 0.01$) in Jakhrana (0.770 L day^{-1}) and lowest (0.500 L day^{-1}) in Marwari breed. Similar trend was observed for fat content. Milk pH was pH, had higher ($p < 0.01$) titratable acidity. No significant difference was observed in other milk constituents. Lower values have been reported by Pal et. al. (1994) and Agnihotriet. al. (2002).

The total solids was significantly ($p < 0.050$) higher in field rearing condition than farm rearing conditions in Jakhrana goats where as in case of Jamunapari goat milk the total solids per cent was slightly higher in field rearing condition than farm rearing conditions but this difference was insignificant. The solids-not-fat percentage was significantly ($p < 0.01$) much higher in field rearing conditions either Jakhrana or Jamunapari goat breed than that of farm rearing conditions. It is due to higher fat percentage and lower percentage of protein, lactose and ash in farm rearing conditions of Jakhrana as well as Jamunapari goat breeds. The analysis of variance table on these data also revealed

that significantly breed variation on solids-not-fat content was observed either field or farm rearing conditions. According to the annual report of C.I.R.G. (2010-11) a total of pooled milk samples were collected from the different goat units of the institute. Higher fat, S.N.F., T.S., protein and lactose content was in Barbari goats maintained at nutritional experimental shed in comparison to Barbari unit animals may be due to composition of female flock and/or feeding management of the animals. All constituents were also found in lower constriction in Barbari unit goat milk in comparison to Jamunapari, Jakhrana and mixed milk of Sirohi and Barbari goats. There was no significant breed difference in ash content of goat milk.

The results of the present investigation on fat content of Jakhrana and Jamunapari goat breeds are in consonance with the observation of Qureshi et. al. (1981) was the mean values for fat, solids-not-fat; total solids, lactose and ash were 4.70 and 4.71, 8.56 and 8.61, 13.26 and 13.35, 3.95 and 3.98 and 0.807 and 0.787 per cent for individual and herd samples respectively. However, reported lower values.

Table 2. Analysis of variance for the effect of breeds on the milk composition under field and farm rearing conditions.

Contents for the source of variance	Variance ratio		F- Value table	
	Field	Farm	5%	1%
Specific Gravity	3.907 ⁺	3.878 ⁺	3.841	6.635
Fat	4.113 ⁺	4.621 ⁺	3.841	6.635
Protein	4.891 ⁺	4.362 ⁺	3.841	6.635
Lactose	3.962 ⁺	3.886 ⁺	3.841	6.635
Ash	4.124 ⁺	6.736 ⁺⁺	3.841	6.635
Total solid	3.061 ^{NS}	3.913 ⁺	3.841	6.635
Solids-not-fat	4.121 ⁺	4.133 ⁺	3.841	6.635

Conclusion

The specific gravity content and fat percentage in the milk of Jakhrana as well as Jamunapari goat breeds under farm rearing conditions was significantly higher than that of field rearing conditions. It is due to better feeding in farm rearing conditions but the protein, lactose, ash, total solids and solids-not-fat in the milk of Jakhrana as well as Jamunapari goat breeds under field rearing conditions were higher than that of farm rearing conditions

References

1. **Agnihotrim M.K.; Singh Nawab and Babji Y.** (2002) : Milk composition of goat reared under field condition. *Indian J. of Anim. Sci.* **72** (11):1019-1921.
2. **Alvarez Funes R. and Paz Motola R.** (1997): Metodologíay asociada al diseño de propuestas para el desarrollo de la producción lecheracaprina (Associated methodology for the design of proposals for development of milk goat production). *Archivos de Zootecnia* **46**:211–224.
3. **Bourbouze A.** (1995) : Goat production system study methods. In: El Aich, A., Landau, S., Borbouze, A., Rubino, R., Morand-Fehr, P. (Eds.), *Goat Production Systems in the Mediterranean*, vol. 71. EAAP Publication, Wageningen Pers, Wageningen, pp. 6–19.
4. **C.I.R.G.** (2010) : Effect of different breeds on goat milk composition. 57-58. Annual report. F.A.O. 2005. Food and Agricultural Organization,
5. **United Nations** <<http://faostat.fao.org/site/339/default.aspx>>.
6. **Kala S.N. and Prakash B.** (1990) : Genetic and Phenotypic Parameters of Milk Yield and Milk Composition in Two Indian Goat Breeds. *Small Ruminant Research* **3**:475-484.
7. **Malau-Aduli B.S.; Eduvie I.O.; Lakpini C.A.M. and Malau-Aduli E.O.** (2001) : Effects of supplementation on the milk yield of Red Sokoto does. Proceedings of the 26th Annual Conference of Nigerian Society for Animal Production, March 2001, ABU, Zaria, Nigeria, pp 353-355.
8. **Pal U.K.; Agnihotri M.K. and Sharma R.B.** (1994) : Seasonal Variation in Goat Milk Composition and Its Effect on Paneer Yield. *World-Review-of-Animal-Production* **29**:3-4, 96-99.
9. **Pal U.K.; Mandal P.K.; Rao V.K. and Das C.D.** (2011) : Quality and Utility of Goat Milk with Special Reference to India: An Overview. *Asian Journal of Animal Sciences*, **5**:56-63.
10. **Prasad H.; Tiwari H.A. and Sengar O.P.S.** (2005) : Milk yield and their crosses with Jamunapari, Barbari and Black Bengal breeds of goat. *Small Rumin. Res.* **58**:2:195-199.
11. **Qureshi H.A.; Deshpande K.S. and Bonde H.S.** (1981) : Studies on chemical composition of goat milk. *Indian Veterinary Journal*, **58**:212-214.
12. **Rout P.K.; Mandal A.; Singh M.K.; Roy R.; Sharma N. and Hanelein G.F.W.** (2004): Jamunapari - A dairy goat breed in India. www.dairygoatjournal.com. 209,85,175, 9.