

Effect of season on the milk quality of Jamunapari goats under field and farm rearing condition

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Abstract

The study was conducted at the central institute for research on goats, Makhdoom, Mathura; under the division nutrition feed resources and products technology. The Jakhrana breed milk samples were from villages of Mathura and Agra. A total of 479 milk samples were collected from field and farm rearing condition 106 summer (field 26 and farm 80), rainy 255 (field 18 and farm 237) and winter 118 (field 58 and farm 60) milk samples. The specific gravity of milk of Jamunapari goat under field and farm rearing conditions in summer, rainy and winter seasons it was 1.0292 ± 0.0004 and 1.0302 ± 0.00038 , 1.0282 ± 0.00038 and 1.0280 ± 0.00038 and 1.0284 ± 0.00039 , and 1.0300 ± 0.00039 , respectively. The fat of milk of Jamunapari goat under field and farm rearing conditions for the aforesaid seasons was found to be 4.70 ± 0.049 and 4.88 ± 0.050 , 4.94 ± 0.046 and 5.10 ± 0.047 and 4.80 ± 0.043 and 4.98 ± 0.048 , respectively. The protein content of Jamunapari milk under field and farm rearing conditions in aforesaid seasons was 3.11 ± 0.028 and 3.02 ± 0.039 , 3.23 ± 0.026 and 3.10 ± 0.036 and 3.32 ± 0.026 and 3.15 ± 0.032 per cent, respectively. The total solids per cent were found to be 13.17 ± 0.040 and 13.10 ± 0.034 , 13.21 ± 0.033 and 13.16 ± 0.033 and 13.28 ± 0.040 and 13.20 ± 0.038 , respectively. The statistical analysis revealed that solids-not-fat content was significantly greater in field rearing samples than farm rearing samples in all seasons. Seasons had a significant effect on specific gravity and fat content in Jamunapari goat breed under field or farm rearing conditions at 1% level of significance.

Key words:

Jamunapari, rearing condition, goat milk, milk quality, season

Introduction

Goats are integer part of livestock production and play a vital role in the socio-economic structure of rural poor. The aim of this study was to project the importance and significance of goat milk with special reference to Indian field and farm rearing conditions. 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 (FAO, 2005). The world total numbers of goats and sheep were 861.9 and 1078.2 million, respectively, *i.e.* there is about one goat to approximately 1.25 sheep in the world. The total number of goats in the world increased by 146% of the total number (590.1 million) encountered in 1990. Number of goats in the world has been increasing since 1990 by about 1% to 4% each year (FAOSTAT, 2008). The largest number of goats in the world is in China, followed by India, Pakistan and Bangladesh, all of them are in Asia. Number of goats in these four countries constitutes about 45% of the world total. There are tremendous variations among the different parts of the world regarding the number of goats, its ratio to sheep and their percentages. Dairy goat is considered the cow of the poor. The goat eats little, occupies a small area and produces

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enough milk for the average unitary family, whereas maintaining a cow at home cannot be afforded by the homeowner, hence, the growing popularity of goat as the poor person's cow. Dairy goats produce about

15.2 million metric tons (MT) of milk, accounting for about 2% of the world total amount of milk produced by livestock species (FAOSTAT, 2008).



Fig. 1: Jamunapari goat

The Jamunapari is known as the best dairy goat in India. It is also the tallest breed and commonly known as the "Pari"(Angel) in its area of origin-the "home tract"-because of its majestic appearance. Its home tract and natural habitat is the Chakarnagar 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 (Fig. 1.). 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 condition. Milk samples were collected from Jamunapari goat under the farm and field rearing condition. Field samples were collected from different villages. The Jamunapari breed milk samples were from villages of Mathura and Agra, India (27° 10'N, 78° 00' E and 169 m above MSL). Geologically the Institute is situated under Yamuna river semi arid soil. 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 : - A total of 479 milk samples were collected from field and farm rearing condition 106 summer (field 26 and farm 80), rainy 255 (field 18 and farm 237) and winter 118 (field 58 and farm 60) milk samples.

Sample collection and analysis: - Goat milk samples were collected from research farm and field properly at varied environmental conditions and seasons (summer, rainy and winter). 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

The observations on the percentage of milk components of Jamunapari goat breed under field and farm rearing conditions to studied seasonal effect are presented in below Table. The specific gravity of milk of Jamunapari goat under field and farm rearing conditions in summer, rainy and winner seasons it was 1.0292 ± 0.0004 and 1.0302 ± 0.00038 , 1.0282 ± 0.00038 and 1.0280 ± 0.00038 and 1.0284 ± 0.00039 , and 1.0300 ± 0.00039 , respectively. These data suggested that the specific gravity was higher in summer seasons and lower in rainy seasons in both breed of goat under field and farm rearing conditions. It is also observed from the above table that specific gravity of farm rearing samples was more

than that of field samples in all seasons. The effect of seasonal variation on specific gravity of milk of Jamunapari goat breed under field and farm rearing conditions was also determined. It is observed that the effect of seasons was significant in both breed at 5% level of significance. The fat of milk of Jamunapari goat under field and farm rearing conditions for the aforesaid seasons was found to be 4.70 ± 0.049 and 4.88 ± 0.050 , 4.94 ± 0.046 and 5.10 ± 0.047 and 4.80 ± 0.043 and 4.98 ± 0.048 , respectively. Seasons had a significant effect on fat content in Jamunapari goat breed under field or farm rearing conditions at 1% level of significance. The protein content of Jamunapari milk under field and farm rearing conditions in aforesaid seasons was

3.11 ± 0.028 and 3.02 ± 0.039 , 3.23 ± 0.026 and 3.10 ± 0.036 and 3.32 ± 0.026 and 3.15 ± 0.032 per cent, respectively. The statistical analysis revealed that protein content under field conditions in Jamunapari goat breed in all seasons was significantly higher than that of farm rearing conditions. Seasonal effect on protein content was significantly different in all seasons under field or farm rearing condition. The results obtain in this investigation on the level of protein content are equal with the findings of Prasad et. al. (2002) & (2005), but not with those of Kala and Prakash (1990) who have obtained higher values for protein content. Prasad et. al. (2005) reported that the season of kidding significantly affected composition and major milk constituents except fat content was significantly higher in the winter season.

Table: - Effect of seasons on the percentage of milk components of Jamunapari goats under field and farm rearing conditions.

Sl. No.	Component of Jamunapari goat milk	Field	Farm	Overall average	Test of significance	Table value (t) 5% 1%
1.	Sp. Gravity					
	(i) Summer	1.0292 ± 0.0004	1.0282 ± 0.00038	1.0284 ± 0.00039	2.033 ⁺	1.960
	(ii) Rainy	1.0302 ± 0.00038	1.0280 ± 0.00038	1.0300 ± 0.00039	1.765 ^{NS}	2.576
	(iii) Winter	1.0297 ± 0.00039	1.0281 ± 0.00038	1.0292 ± 0.00039	2.107 ⁺	
2.	Fat					
	(i) Summer	4.70 ± 0.049	4.88 ± 0.050	4.79 ± 0.050	2.602 ⁺⁺	
	(ii) Rainy	4.94 ± 0.046	5.10 ± 0.047	5.02 ± 0.0465	2.596 ⁺⁺	
	(iii) Winter	4.80 ± 0.043	4.98 ± 0.048	4.89 ± 0.045	2.710 ⁺⁺	
3.	Protein					
	(i) Summer	3.11 ± 0.028	3.02 ± 0.039	3.065 ± 0.036	2.050 ⁺	
	(ii) Rainy	3.23 ± 0.026	3.10 ± 0.036	3.165 ± 0.036	2.146 ⁺	
	(iii) Winter	3.32 ± 0.026	3.15 ± 0.032	3.235 ± 0.25	2.428 ⁺	
4.	Lactose					
	(i) Summer	4.39 ± 0.018	4.33 ± 0.008	4.36 ± 0.014	2.063 ⁺	
	(ii) Rainy	4.43 ± 0.014	4.37 ± 0.012	4.40 ± 0.014	3.628 ⁺⁺	
	(iii) Winter	4.50 ± 0.015	4.44 ± 0.009	4.47 ± 0.013	3.021 ⁺⁺	
5.	Ash					
	(i) Summer	0.70 ± 0.007	0.68 ± 0.011	0.690 ± 0.009	2.063 ⁺	
	(ii) Rainy	0.73 ± 0.009	0.70 ± 0.010	0.715 ± 0.09	2.734 ⁺⁺	
	(iii) Winter	0.79 ± 0.006	0.72 ± 0.012	0.755 ± 0.009	3.643 ⁺⁺	
6.	T S					
	(i) Summer	13.17 ± 0.040	13.10 ± 0.034	13.14 ± 0.035	2.469 ⁺	
	(ii) Rainy	13.21 ± 0.033	13.16 ± 0.033	13.19 ± 0.033	1.966 ⁺	
	(iii) Winter	13.28 ± 0.040	13.20 ± 0.038	13.24 ± 0.039	2.101 ⁺	
7.	SNF					
	(i) Summer	8.41 ± 0.056 (26)	8.24 ± 0.054 (80)	8.33 ± 0.055 (106)	7.361 ⁺⁺	
	(ii) Rainy	8.25 ± 0.058 (18)	8.00 ± 0.053 (237)	8.12 ± 0.056 (255)	11.260 ⁺⁺	
	(iii) Winter	8.52 ± 0.056 (58)	8.28 ± 0.050 (60)	8.40 ± 0.054 (118)	10.093 ⁺⁺	

Jamunapari breed under above rearing conditions in summer, rainy and winter seasons had an average of 4.39 ± 0.018 and 4.33 ± 0.008 , 4.43 ± 0.014 and 4.37 ± 0.012 and 4.50 ± 0.015 and 4.44 ± 0.009 per cent, respectively. Our results on lactose per cent presented in above table revealed that variation in lactose content under field and farm rearing conditions was observed significantly in both breeds. Our results further showed that higher lactose content was found in field rearing conditions than that of farm rearing conditions in Jamunapari goat breed. Seasonal effect on lactose content in the milk of Jamunapari goat breed under field and farm rearing conditions was observed significantly at 5 per cent level of significance. Our results on lactose content of goat milk in different seasons are corroborated by the observations of Annual report of C.I.R.G. (2010-11) and Prasad et. al (2002). Kala and prakash (1990) reported lower level of lactose in winter season in the milk of aforesaid goats where Prasad et. al (2002) & (2005) reported higher level of lactose content in different seasons in Jamunapari and other goat breed's milk. Jamunapari goat breed's milk under field and farm rearing conditions in summer, rainy and winter seasons was found to be 0.70 ± 0.007 and 0.68 ± 0.011 , 0.73 ± 0.009 and 0.70 ± 0.010 and 0.79 ± 0.006 and 0.72 ± 0.012 per cent, respectively. These data suggested that the ash content was higher in winter season and lower in summer season in Jamunapari goats under field as well as farm rearing conditions. It is also observed from our present investigations that ash per cent in the milk of field rearing conditions of milk samples was greater than that of farm rearing samples in all above seasons. Analysis of variance for the effect of seasons on ash content of milk of Jamunapari goat breed under field and farm rearing conditions was analyzed and found that significant variation was observed in all seasons at 5 and 1% level of significance. Our results on ash content in different seasons are greater than observations of Annual report of C.I.R.G. (2010-11). The total solids per cent were found to be 13.17 ± 0.040 and 13.10 ± 0.034 , 13.21 ± 0.033 and 13.16 ± 0.033 and

13.28 ± 0.040 and 13.20 ± 0.038 , respectively. It is observed from above table that the total solids content was significantly greater in field samples than farm rearing samples in all seasons. The highest total solids percentage was recorded in winter season in milk samples either field or farm rearing conditions. The effect of seasons on total solids content was significantly different in Jamunapari goat breed milk under field and farm rearing conditions at 5% level of significance. Our results on milk composition are in agreement with the findings of Addass et. al. (2013) who reported higher ($5.04 \pm 0.02\%$) fat content during wet season than the dry season ($4.49 \pm 0.12\%$). Non significant effect of season on protein content of milk in this work may be due to steady nutrition and management practices under which the animals were subjected to throughout the period of study which might have suppressed the effect of season on protein content of the goats' milk. The lower fat content of milk during dry season observed in this study might be due to higher ambient temperature during the season. There was no significant effect of season on total ash content of goat milk. Lactose content was also found to be significantly lower in the dry season than wet season which might be due to poor nutrition during the season. The solids-not-fat per cent was found to be 8.41 ± 0.056 and 8.24 ± 0.054 , 8.25 ± 0.058 and 8.00 ± 0.053 and 8.52 ± 0.056 and 8.28 ± 0.050 , respectively. The statistical analysis revealed that solids-not-fat content was significantly greater in field rearing samples than farm rearing samples in all seasons. The highest solids-not-fat percentage was recorded in winter season in both breeds' samples either field or farm rearing conditions. Solids-not-fat content was significantly different in Jamunapari goat breed milk under field and farm rearing conditions 1% level of significance.

Conclusion

The specific gravity and fat percentage in the milk of Jamunapari breed under farm rearing conditions was significantly higher than that of field rearing conditions. Season had conspicuous effects on milk quality of goats under study.

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