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Impact of stage of lactation, milk yield, parity, season and type of milking on milk constituents of crossbred cow milk in Kerala

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Abstract

The present study was conducted to evaluate the influence of stage of lactation, milk yield, parity, season, and type of milking on the fat, protein, lactose, total solids, and solids-not-fat (SNF) contents of crossbred cow milk in Thrissur district, Kerala. Morning milk samples were collected and classified into low-SNF (<8.3%) and normal-SNF (>8.3%) groups. In low-SNF milk samples, stage of lactation had a significant effect on fat and total solids percentages ($P<0.05$). However, in normal-SNF milk samples, stage of lactation did not have a significant effect on any of the milk constituents studied. Season had no significant effect on the milk constituents in the low-SNF group. In the normal-SNF group, season significantly influenced fat and total solids percentages ($P<0.01$), whereas its effect on protein, lactose, and SNF percentages was not significant. The effects of type of milking, parity, and milk yield on fat, protein, lactose, total solids, and SNF contents were not significant in either category of milk samples. The findings indicate that stage of lactation and season may influence certain milk constituents, particularly fat and total solids, depending on the SNF category, while type of milking, parity, and milk yield had no significant influence under the conditions of the present study.

Keywords: Crossbred cows, Milk constituents, Stage of lactation, Season, Solids-not-fat (SNF)

Introduction

Dairying is an important component of Indian agriculture and contributes significantly to the livelihood and nutritional security of rural households. In Kerala, crossbred cattle form a major component of the dairy sector. The quality and nutritional value of milk are primarily determined by its chemical constituents, particularly fat, protein, lactose, total solids and solids-not-fat (SNF).

Milk composition varies among animals and is influenced by several factors, including breed, nutrition, health status, parity, stage of lactation, season and management practices. SNF is an important indicator of milk quality and nutritional value, and variations in its concentration may be associated with changes in protein, lactose and mineral contents. Understanding the factors affecting milk constituents is therefore important for maintaining milk quality and improving dairy production.

The present study was undertaken to assess the influence of stage of lactation, milk yield, parity, season and type of milking on fat, protein, lactose, total solids and SNF contents of milk from crossbred cows in Thrissur district, Kerala, with particular emphasis on low-SNF and normal-SNF milk categories.

Materials and Methods

The study was conducted using milk samples collected from crossbred cows maintained at the University Livestock Farm and Fodder Research Development Scheme, KVASU, Mannuthy, Thrissur; Cattle Breeding Farm, Thumboormuzhi; and selected households in Thrissur district, Kerala. A total of 274 morning milk samples were collected, including 150 samples from the Cattle Breeding Farm, Thumboormuzhi, and 124 samples from household dairy farms.

Approximately 100 mL of milk was collected from each animal after thorough mixing of the morning milk. Samples were transferred into clean, sterile sample bottles, maintained in an ice bath during transportation, and immediately transported to the laboratory. The samples were stored at 4 °C until analysis.

The milk samples were classified according to stage of lactation, milk yield, parity, season and type of milking. Based on SNF content, the samples were categorized into low-SNF (<8.3%) and normal-SNF (>8.3%) groups.

Milk fat percentage was estimated by the Gerber method, total solids percentage by the gravimetric method, protein percentage by the Kjeldahl method using a Pelican Kjeldahl apparatus, and lactose percentage by the Lane-Eynon method. The SNF percentage was calculated as the difference between total solids and fat percentages. All analytical procedures were carried out following the methods prescribed by BIS (1981). The data obtained were subjected to statistical analysis

Results

A total of 274 milk samples from crossbred cows were analysed for fat, protein, lactose, total solids (TS) and solids-not-fat (SNF). The samples were classified according to stage of lactation, daily milk yield, parity, season and milking method. Based on SNF concentration, samples were further categorized as low-SNF (<8.3%) and normal-SNF (≥8.3%).

The distribution of samples across different categories is presented in Table 1.

Table 1: Number of milk samples under different category of stage of lactation, yield, parity, season and type of milking and percentages

Parameters	Category	Sample size	Percentage
Stage of lactation	Early	88	32
	Mid	120	44
	Late	66	24
Yield	< 5	48	17
	5- 7.5	76	28
	7.5- 10	87	32
	>10	63	23
Parity	1	71	26
	2	106	39
	3	56	20
	>3	41	15
Season	Post-monsoon	54	20
	Summer	220	80
Type of milking	Hand	135	49
	Machine	139	51

Stage of Lactation

Milk samples were grouped into three stages viz., early, mid and late lactation. The percentage distribution is depicted in Fig. 1.

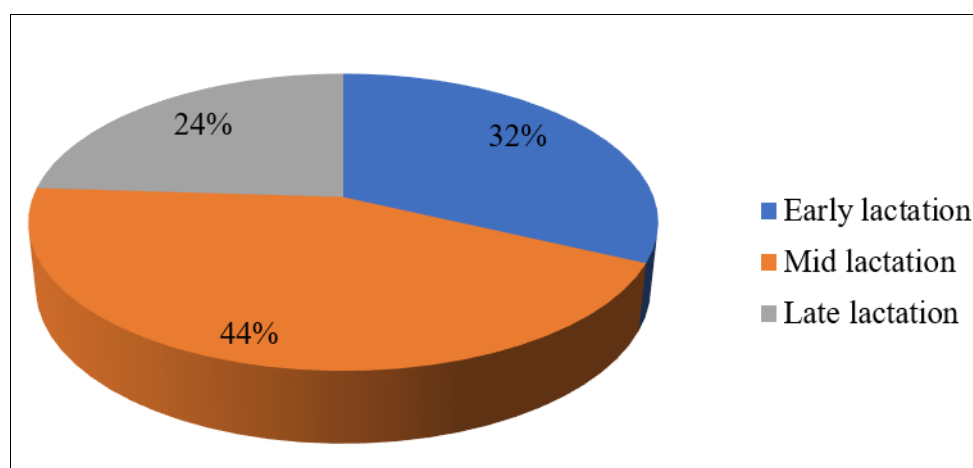


Fig 1: Percentage of cow milk samples under different stages of lactation

One-way ANOVA revealed that stage of lactation had a significant ($P<0.05$) effect on fat percent and total solids content in low-SNF milk samples. The mean values are given in Table 2. In normal-SNF milk samples, stage of lactation had no significant influence on any of the milk constituents.

Table 2: The mean value of fat and protein for different category of stage of lactation

Stage of lactation	Mean fat per cent	Mean total solid
Early lactation	3.720±0.319 ^a	11.451±0.336 ^a
Mid lactation	4.603±0.287 ^b	12.401±0.302 ^b
Late lactation	4.557±0.352 ^b	12.324±0.371 ^b

Milk Yield

Samples were grouped into four categories based on daily milk yield (<5 kg, 5-7.5 kg, 7.5-10 kg, >10 kg) (Fig. 2).

One-way ANOVA revealed that milk yield had no significant influence on fat, protein, lactose, total solids and SNF in either low-SNF or normal-SNF categories.

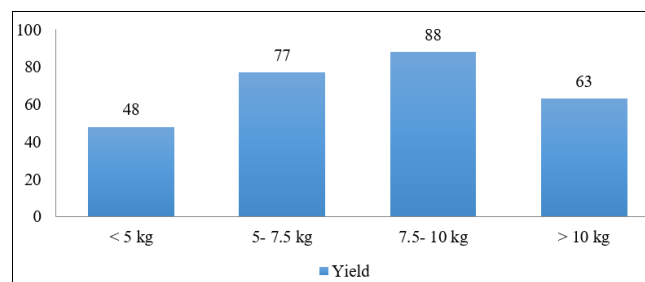


Fig 2: Percentage of cow milk samples under each category of milk yield

Parity

Samples were grouped into first, second, third and more than three parities. Parity had no significant effect on fat, protein, lactose, TS and SNF in all categories of milk samples.

Season

Samples were categorized into monsoon (June-September),

post-monsoon (October-January) and summer (February-May). In the present study, 54 samples were collected during post-monsoon and 220 during summer; no samples were collected during monsoon. Season had no significant impact on any milk constituents in low-SNF milk. In normal-SNF milk, season had no significant effect on fat and total solids, but had significant ($P<0.01$) effect on protein, lactose and SNF (Table 3).

Table 3: The mean value of protein, lactose and SNF for different category of seasons

Seasons	Mean protein	Mean lactose	Mean SNF
Post- monsoon	3.201±0.046 ^a	4.525±0.034 ^a	8.549±0.061 ^a
Summer	3.125±0.038 ^b	4.602±0.028 ^b	8.464±0.051 ^b

Type of Milking

Out of 274 samples, 135 were hand-milked and 139 machine-milked. Type of milking had no significant influence on fat, protein, lactose, TS and SNF in any category.

Discussion

The study was carried out on 274 milk samples from crossbred cows to assess the influence of five major non-genetic factors viz., stage of lactation, daily milk yield, parity, season and type of milking on milk composition.

The effect of stage of lactation on milk fat was also reported by Gurmesssa and Melaku (2012) [7] in HF crossbred cows at Gondar University, Ethiopia. Sourabh *et al.* (2016) [13] reported a highly significant ($P<0.01$) effect of stage of lactation on fat percentage and total solids, which is in agreement with the present findings. Contrary to this, Sarkar *et al.* (2006) [10] reported that stage of lactation had no influence on fat content but had significant effect on protein, SNF and lactose. Boro *et al.* (2016) [13] also found significant effect of stage of lactation on protein, SNF and lactose but not on fat in indigenous Tharparkar cows.

The results of milk yield on milk composition were reported by Sarkar *et al.* (2006) [10] who reported no significant influence of milk yield on protein, lactose and total solids, and El Zubeir *et al.* (2016) [5] who had similar observations. Bhoite and Padekar (2002) [2] reported significant influence of milk yield on all constituents, which is contradictory to the present findings.

Effect of parity on milk composition was also reported by Gurmesssa and Melaku (2012) [7] also observed no effect of parity on SNF content in HF crossbred cows. Lal and Narayanan (1984) [9] reported no significant effect of parity on fat percent, supporting our results. Sudhakar *et al.* (2013) [14] reported significant effect of parity on SNF and protein but not on fat and lactose, while Sourabh *et al.* (2016) [13] observed highly significant ($P<0.01$) effect of parity on fat, protein and total solids, but not on SNF and lactose.

Sharma *et al.* (2001) reported no significant effect of season on fat and SNF, which partially agrees with our observation in low-SNF milk. Auldish *et al.* (1998) [1] also confirmed seasonal effect on SNF in dairy cows in New Zealand. Sourabh *et al.* (2016) [13] reported highly significant effect of season on fat, SNF and total solids in a light tropical, sub-humid climate, which differs from our results, possibly due to different agro-climatic conditions.

Filipovic and Kokaj (2009) [6] in Croatia and Sinapis (2007) [11] in ewes also reported no influence of milking method on milk composition, supporting the present findings. Hammadi *et al.* (2010) [8] reported significant effect of machine milking on fat, SNF and total solids in Maghrebi camels, but the

species and milking technology were different.

Conclusion

The present investigation was carried out on 274 milk samples from crossbred cows to assess the influence of five major non-genetic factors viz., stage of lactation, daily milk yield, parity, season and type of milking on milk composition, with special emphasis on low SNF (<8.3%), which is a major quality and pricing issue in Kerala.

Based on the analysis of 274 milk samples from crossbred cows, the stage of lactation had a significant impact on fat per cent and total solids content in case of low SNF milk samples. The mean value of fat in each category of stage of lactation was 3.720±0.319, 4.603±0.28, 4.557±0.352 respectively. The mean value of total solids in each category of stage of lactation was 11.451±0.336, 12.401±0.302, 12.324±0.371 respectively. The season had not any impact on these constituents in case of low SNF milk samples. It was observed that the constituents other than fat per cent and total solids per cent had not any significant ($P<0.01$) influence by season in high SNF milk samples. The mean value of protein in post-monsoon and summer was 3.201±0.004, 3.125±0.038 respectively. The mean value of lactose in post-monsoon and summer was 4.525±0.034, 4.602±0.028 respectively. The mean value of SNF in post-monsoon and summer was 8.549±0.061, 8.404±0.051 respectively. The impact of type of milking, parity and milk yield on fat per cent, protein per cent, lactose per cent, total solids and SNF contents were insignificant in all categories of milk samples.

Competing interests

Not available

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References

1. Auldish MJ, Walsh BJ, Thomson NA. Seasonal and lactational influences on bovine milk composition in New Zealand. *J Dairy Res.* 1998;65(3):401-411.
2. Bhoite UY, Padekar RN. Factors affecting milk yield and composition of Gir halfbreds. *Indian J Anim Res.* 2002;36(1):67-69.
3. Boro P, Naha BC, Prakash C, Madkar A, Kumar N, Kumari A, Channa GP. Genetic and non-genetic factors affecting milk composition in dairy cows. *Int J Adv Biol Res.* 2016;6(2):170-174.
4. Bureau of Indian Standards. SP: 18. Handbook of food analysis - Part XI. Dairy products. New Delhi: Bureau of Indian Standards; 1981. p. 1-66.
5. El Zubeir IE, Shuiep ES. Effect of stage of lactation and order of parity on milk composition and daily milk yield among local and crossbred cows in South Darfur State, Sudan. *J Sci Technol.* 2016;17(2):1-8.
6. Filipovic D, Kokaj M. The comparison of hand and machine milking on small family dairy farms in central Croatia. *Livest Res Rural Dev.* 2009;21(4):Art. 54.
7. Gurmesssa J, Melaku A. Effect of lactation stage, pregnancy, parity and age on yield and major components of raw milk in bred cross Holstein Friesian cows. *World J Dairy Food Sci.* 2012;7(2):146-149.

8. Hammadi M, Atigui M, Ayadi M, Barmat A, Belgacem A, Khaldi G, Khorchani T. Training period and short time effects of machine milking on milk yield and milk composition in Tunisian Maghrebi camels (*Camelus dromedarius*). J Camel Pract Res. 2010;17(1):1-7.
9. Lal D, Narayanan KM. Effect of lactation number of animal on the fat and solids-not-fat and contents of milk. Indian J Anim Sci. 1984;54(9):835-839.
10. Sarkar U, Gupta AK, Sarkar V, Mohanty TK, Raina VS, Prasad S. Factors affecting test day milk yield and milk composition in dairy animals. J Dairying Foods Home Sci. 2006;25(2):129-132.
11. Sinapis E. The effect of machine or hand milking on milk production, composition and SCC in mountainous Greek breed (Boutsiko) ewes. Small Rumin Res. 2007;69(1-3):242-246.
12. Snedecor GW, Cochran WG. Statistical methods. 8th ed. Calcutta: Oxford and IBH Publishing Company; 1994. p. 564.
13. Sourabh Y, Shankar SS, Kumar CS, Om P, Shweta J. Effect of season, lactation and parity on yield and major components of raw milk in cross bred Holstein Friesian cows. Int J Agric Sci. 2016;8(62):3536-3539.
14. Sudhakar K, Panneerselvam S, Thiruvankadan AK, Abraham J, Vinodkumar G. Factors effecting milk composition of crossbred dairy cattle in southern India. Int J Food Agric Vet Sci. 2013;3(1):159-163.

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