



## Effect of Seasonal Variation on Crossbred Cow Milk Composition in Southern Region of Tamil Nadu

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**Abstract** | The study was designed to evaluate the seasonal influences on crossbred cow milk composition in an organized cattle farm, Dindigul District, Tamil Nadu, India. One hundred (n=100) samples from each season were collected from a herd of Holstein Friesian crossbred cows during summer (March-May), rainy (June-September), autumn (October-November) and winter (December-February) and analyzed for fat, solids not fat (SNF) and total solids. Overall mean for fat, SNF and total solids of milk were 3.74, 8.258 and 11.998 per cent respectively. Fat and SNF content significantly ( $P < 0.01$ ) differed among seasons and highest in winter (3.819% and 8.348%) followed by autumn (3.771% and 8.282%), summer (3.739% and 8.246%) and lowest in rainy season (3.631% and 8.158%). The seasonal variation in this part of the southern region of Tamil Nadu influences the fat, SNF and total solids content of crossbred cow milk.

**Keywords** | Seasonal variation, Milk composition, Crossbred cow

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## INTRODUCTION

Dairy sector in India is contributing 4 per cent of the total Gross Domestic Product (GDP) and 26 per cent of the agricultural GDP (NAS, 2012) and playing a crucial role in livelihood activity for the farmers. Milk is generally composed of 87 per cent water and 13 per cent total solids and milk composition is economically important to milk producers, processors and consumers by contributing to the health, nutrition and earnings of the household (Wangdi et al., 2016). The variation in the milk composition of crossbred cows in different seasons is a universal phenomenon and is caused by variation in the breeding cycle of the animal, the environmental factors like temperature, humidity and the quantity and quality of feed and fodders supplied to the animals (Abraham and Gayathri, 2015). Hence, an attempt has been made to in-

vestigate the variation in the fat, SNF and total solids in milk of crossbred cows reared in the southern part of Tamil Nadu during different seasons.

## MATERIAL AND METHODS

Tamil Nadu located in southernmost part of India, has an area of 130,058 km<sup>2</sup>. It extends North latitude between 8° 5' to 13° 35' and East longitude between 76° 15' to 80° 20'. The climate of the Tamil Nadu ranges from dry sub-humid to semi-arid with an ambient temperature of 24-34°C, relative humidity of 70% and an annual rainfall is about 945 mm. Tamil Nadu is mostly dependent on monsoon rains and thereby is prone to droughts when the monsoon failed. It is divided into seven agro-climatic zones such as north-east, north-west, west, southern, high rainfall, high altitude hilly and Kauveri delta zone.

**Table 1:** Effect of different seasons on milk composition in southern region of Tamil Nadu (Mean±SE).

Characteristics	Seasons				Overall Mean
	Summer (Mar-May)	Rainy (Jun-Sep)	Autumn (Oct-Nov)	Winter (Dec-Feb)	
No. of Observations	100	100	100	100	400
Fat (%)	3.739 <sup>a</sup> ± 0.032	3.631 <sup>b</sup> ± 0.02	3.771 <sup>a</sup> ± 0.019	3.819 <sup>a</sup> ± 0.034	3.740 ± 0.013
SNF (%)	8.246 <sup>a</sup> ± 0.011	8.158 <sup>b</sup> ± 0.018	8.282 <sup>a</sup> ± 0.012	8.348 <sup>c</sup> ± 0.014	8.258 ± 0.008
Total Solids (%)	11.985 <sup>a</sup> ± 0.031	11.789 <sup>b</sup> ± 0.028	12.053 <sup>a</sup> ± 0.022	12.167 <sup>c</sup> ± 0.037	11.998 ± 0.037

Means bearing different superscript in the same row differ significantly (P<0.01)

The study was carried out in an organized cattle farm, KSE Limited, Dindigul, southern region of Tamil Nadu. The herd milk samples were collected within 1-2 hour of milking of Holstein Friesian crossbred cows for a period of one year from June 2016 to May 2017. One hundred (n=100) milk samples from 18 cows were collected in each season namely summer (March-May), rainy (June-September), autumn (October-November) and winter (December-February). The milk samples were collected in clean, dry and neatly labelled sample containers and transported to the laboratory as soon as possible under refrigerated conditions. The samples were analysed for fat, solids not fat (SNF) and total solids (TS) content. Fat content of the milk was analysed by Gerber’s method (ISI, 1977). SNF was calculated by Richmond’s formula as follows,

$$\text{SNF (\%)} = \text{CLR}/4 + 0.25\text{F} + 0.44$$

Where,

CLR = Corrected lactometer reading and

F = Fat per cent

Here, Zeal’s Lactometer was used to determine CLR and Specific gravity of milk at 29°C (Sharma et al., 2002). The total solids content was calculated by adding SNF and fat per cent. The data collected on milk fat, SNF and total solids content were statistically analysed as per the methods described by Snedecor and Cochran (1994).

## RESULTS AND DISCUSSION

The mean values of milk composition on different seasons are presented in Table 1. Overall mean for fat, SNF and total solids of crossbred cow milk were 3.74, 8.258 and 11.998 per cent respectively. Fat and SNF content significantly (P<0.01) differed among seasons and highest in winter (3.819% and 8.348%) followed by autumn (3.771% and 8.282%), summer (3.739% and 8.246%) and lowest in rainy season (3.631% and 8.158%). Similar results were expressed by Sharma et al. (2002), Sudhakar et al. (2013) and Wangdi et al. (2016). The total solids content of milk were significantly (P<0.01) higher in winter than other seasons (Table 1).

Sunil Kumar et al. (2011) concluded that tropical climate is

stressful for the Holstein Friesian crossbred milch animals particularly in summer season, as the ambient temperature (25°C) rises high. The animals suffer from heat stress when the thermal equilibrium is upset with increased production of body heat than its dissipation and subsequently it leads to increased water intake, reduced dry matter intake and variation in milk composition. Secondly, the green fodder availability is more in winter than summer season, which in turn increases the percentage of milk constituents (Abraham and Gayathri, 2015). The results of above workers are in accordance with our present study.

The above findings concluded that the seasonal variation in the southern part of Tamil Nadu influences the fat, SNF and total solids content of milk.

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## CONFLICT OF INTEREST

There is no conflict of interest.

## AUTHORS CONTRIBUTION

All the authors contributed significantly to the paper. The corresponding author along with M. Arulmuthumathavan carried the experimental trial and compiled the results. V.V. Raji and N. Muniyappan designed the protocol and helped in laboratory analysis of the milk samples.

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