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SOMATIC CELL PATTERN AND COMPOSITION OF MILK OF HOLSTEIN FRIESIAN CROSS BRED CATTLE

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Abstract: Holstein Friesian cross bred cow milk samples of different quarters in four stages of lactation were collected from dairy farms in the Namakkal district of Tamil Nadu and analyzed for composition and somatic cell count (SCC). No significant difference in the SCC was observed between quarters within the lactation stage. Count was significant between stages of lactation after the 2nd stage. While data obtained in the last stage of lactation had the highest SCC. Significant ($P<0.001$) increase in SCC was estimated with advancing parity. The milk yield, SNF per cent tended to decrease, while the fat per cent and ash content tended to increase significantly with increase in the SCC as the lactation advances. It was concluded that the SCC can be used as a reliable indicator of udder health and milk composition for selecting the Holstein Friesian cows for milk production. When the SCC exceeds 5.69 $\log_{10}$ units per ml need for a course of antibiotic therapy should be ruled out to save the health of the udder.
Keywords: Holstein Friesian cow milk - somatic cell count - milk composition– lactation stage – parity**.**

Introduction

Holstein Friesian crossbred cattle are predominant milch animal in cooler parts of India due to their high milk yield. Somatic Cell Count (SCC), is a reliable reflector for assessing milk quality (Moon *et al*., 2007) and can be used to determine health of the udder. A study was conducted to assess the SCC of the milk of Holstein Friesian crossbred cattle in different stages of lactation and different parities to have a basic data on the SCC of milk of Holstein Friesian crossbreds reared in Namakkal region. Changes in the composition of milk in relation to SCC was also studied.

Materials and methods

Lactation period of the selected Holstein Friesian crossbred cattle raised in different villages of Namakkal District of South India was subdivided into 4 lactation stages viz. 60± 7 days, 120± 7 days 180± 7 days and 240± 7 days. Raw milk samples (about 30 mL) were taken from

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each udder quarter during the morning and evening milking at weekly intervals for four weeks during 2012- 2013. Milk samples were kept in an ice-cooled box and transported to the laboratory on the same day and analyzed on the same day. SCC of different parity groups was analysed in the 1st stage of lactation for up to 5 parities.

Direct microscopic counting method was performed to evaluate the SCC of milk (Singh and Dang 2002) using Newman's stain. Only those cells, which possess blue stained nucleus, were counted. Milk samples from each milking were analyzed for fat, protein and lactose using milk analyzer (Lactoscan Farmer). Somatic cell counts (after being transformed to $\log_{10}$), milk yield and compositions were analyzed statistically using SPSS.,22 (2013) package.

Results and Discussion

The somatic cell count (log10 cells/ml) of the Holstein Friesian crossbred cattle milk ranged from 5.01 ±0.01 to 5.17±0.03. As stage of lactation advances there was an increase in the somatic cell count of milk. The SCC did not differ significantly between quarters within a stage of the lactation. As can be seen from Table 1, $\log_{10}$ SCC values of udder quarters calculated in 3rd and 4th stage of lactation were statistically different ($P<0.001$) from those of 1st and 2nd stages. This result correlate with studies of Bielfeldt *et al*., (2004); Klaas *et al*., (2004) in which SCC tended to increase with advancing lactation stage. High SCC in the advancing stage of lactation may be due to severe stress and exposure of the udder to infectious agents. Even in the SCC level of 5.17 $\log_{10}$ there was no palpable or detectable signs of mastitis in the udder.

In parity groups, no statistical difference was found between quarters (Table 2) up to the 2nd parity. No significant ($p>0.001$) correlation in log SCC was observed between first and second parity. Hind quarter had significantly high log SCC values than fore quarters. SCC tended to elevate significantly ($p<0.001$) as parity advances after second parity. Right hind quarter had high SCC than the other quarters. In a study, Oltenacu and Ekesbo (1994) reported that deformations in the udder gland and increase in milk production capacity are the main reasons of elevated SCC. Relatively higher log SCC values were determined with advancing parity in the present study (Table 2).

Milk production in rear quarters is more and milk flow rate is relatively higher. These results agree with Weiss *et al*., (2004). Distances of rear teats to floor are relatively short and thus, SCC is expected to be high due to injuries and tissue damages. This result is in agreement

with the findings of Lindmark-Mansson *et al.* (2006). In this study, log SCC values in all quarter groups and also overall log SCC values reached to highest level in the 8-9th month and assessed low level in 1-2nd month. Abnormal SCC reflect inadequate managemental or hygienic applications in dairy operations (Atasever and Erdem, 2009), Decreasing milk yield might have contributed relative increase in the SCC in the advancing lactation.

The average milk yield of the Holstein Friesian cross bred cows in the first stage of lactation was12.14 ± 0.67 litres per day with the corresponding SCC of 5.01 ± 0.01. As the stage of lactation advances the SCC tended to increase significantly after 120 days of lactation with corresponding decrease in the milk yield. The fat per cent of milk increased from 3.43±0.12 per cent in the SL1 to 4.22±0.20 per cent in the SL4. As the lactation advances the SNF content of milk decreased significantly from 8.21 ± 0.12 per cent to 8.14±0.20 per cent. The increase in the ash content was significant towards the end of lactation.

It is concluded that somatic cell count in Holstein Friesian crossbred milk increases significantly ($p<0.001$) with advancing lactation after 2nd month and also with advancing parity after 2nd parity. Somatic cell count can be used as an index of udder health, production stress and also stress to udder.

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TABLES

Table 1: Quarter log SCC values by stage of lactation

Stage of Lactation	Udder Quarters								
	LF		RF		LH		RH		Overall
	n	log SCC	n	log SCC	n	log SCC	n	log SCC	Log SCC
SL1	21	5.01±0.01^{a}	21	5.03±0.02^{a}	21	5.03±0.02^{a}	21	5.04±0.02^{a}	5.03±0.02^{a}
SL 2	21	5.03±0.01^{a}	21	5.02±0.02^{a}	21	5.04±0.02^{a}	21	5.05±0.02^{a}	5.03±0.02^{a}
SL 3	21	5.12±0.02^{b}	21	5.13±0.03^{b}	21	5.12±0.03^{b}	21	5.16±0.03^{b}	5.15±0.02^{b}
SL 4	20	5.15±0.02^{c}	20	5.16±0.03^{c}	20	5.14±0.03^{c}	20	5.17±0.03^{c}	5.16±0.02^{c}

SL1: 60±14 days, SL2: 120±14 days, SL3: 180±14 days, SL3: 240±14 days

LF: Left front quarter, RF: Right front quarter, LH: Left hind quarter, RH: Right hind quarter

Table 2: Quarter log SCC values by parity groups

Parity	Udder quarter				
	LF	RF	LH	RH	Mean
1	5.19±0.03^{a}	5.21±0.02^{a}	5.21±0.02^{a}	5.21±0.02^{a}	5.21±0.02^{a}
2	5.21±0.03^{a}	5.22±0.02^{a}	5.22±0.02^{a}	5.22±0.02^{a}	5.22±0.02^{a}
3	5.33±0.03^{bA}	5.33±0.02^{bA}	5.35±0.02^{bB}	5.35±0.02^{bB}	5.34±0.02^{b}
4	5.47±0.03^{cA}	5.48±0.02^{cA}	5.51±0.02^{cB}	5.52±0.02^{cB}	5.54±0.02^{c}
5	5.49±0.03^{cA}	5.47±0.02^{cA}	5.54±0.02^{cB}	5.57±0.02^{cB}	5.53±0.02^{c}

Supercripts in upper case indicates statistical significance between quarters within the parity.
Supercripts in lower case indicates statistical significance between parities

Table 3: Milk yield and composition in relation to somatic cell count

Yield and composition	Stage of Lactation			
	Sl1	Sl2	Sl3	Sl4
log SCC	5.01±0.01[a]	5.03±0.01[a]	5.12±0.02[b]	5.15±0.02[c]
Milk yield LPD	14.12±0.67[a]	11.38±0.62[b]	9.56±.52[b]	8.43±0.71[c]
Fat %	3.43±0.12[a]	3.68±0.13[b]	4.02±0.18[c]	4.22±0.20[d]
SNF %	8.21±0.12[a]	8.16±0.13[a]	8.14±0.15[a]	8.14±0.20[b]
Total Solids %	11.64±0.12[a]	11.84±0.16[b]	12.16±0.20[c]	12.86±0.20[c]
Ash %	0.71±0.2[a]	0.71±0.2[a]	0.73±0.1[a]	0.76±0.1[b]