A STUDY ON IMPACT OF SOMATIC CELL COUNT ON PHYSICOCHEMICAL PROPERTIES OF POOLED MILK

J. P. Anu [1], C. T. Sathian[2*], R. Geetha[3], K. Radha[4], K. Raji[5] and V.L. Gleeja [6]
Department of Dairy Science
College of Veterinary and Animal Sciences
Mannuthy-680 651, Thrissur- Kerala

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Abstract

One hundred pooled milk samples were collected from organized farms and milk cooperatives in Thrissur district. All the samples were analyzed for somatic cell count, pH, titratable acidity, chloride and electrical conductivity. Chloride content as well as Electrical conductivity of milk showed a significant positive correlation with somatic cell count in milk. There was no significant correlation between SCC and pH or titratable acidity of milk.

***Key words**: Somatic Cell Count, pH, Acidity, Chloride content, Electrical conductivity*

Somatic cells comprise of milk secreting epithelial cells that have been shed from the lining of the mammary gland and white blood cells (macrophages, lymphocytes and polymorphonuclear neutrophils) that have entered the mammary gland in response to injury or infection. The number of somatic cells in milk is expressed as Somatic Cell Count (SCC). Elevated SCC in milk will result in reduced yield and changes in composition of milk. It is also associated with altered lactose and mineral concentration, fatty acid composition, increased enzymatic activity and rise in pH of raw milk. Dairy products prepared from high SCC milk have shorter shelf life and undesirable organoleptic characteristics.

Materials and Methods

A total of 100 pooled milk samples were collected from organized farms and milk co-operatives in Thrissur district. The samples were collected in 100 ml PET bottles, kept in ice bath and immediately transported to the laboratory in an insulated container. The samples were then stored at 4 ºC until further analysis.

The somatic cell count of the milk samples were estimated by direct microscopic somatic cell count (DMSCC). Ten microliter of milk was used for preparation of smear and was stained by Newman's stain. The numbers

1. M.V.Sc. Scholar, Department of Dairy Science
2. Professor and Head, Department of Dairy Science, (Corresponding Author)*
3. Assistant Professor, Department of Dairy Science
4. Assistant Professor, Department of Dairy Science
5. Assistant Professor, Department of Veterinary Physiology
6. Assistant Professor, Department of Statistics
Email: sathian@kvasu.ac.in

of somatic cells per milliliter of the milk sample were determined. The pH of the pooled cow milk samples were analyzed by Cyber Scan 2500 digital pH meter (Eutech).

The titratable acidity and chloride content of the pooled cow milk sample were estimated as per the method described by BIS: 1981. The electrical conductivity of the pooled cow milk samples were analyzed by using the Systronics [R] Conductivity meter.

The data obtained were subjected to statistical analysis following procedure described by Snedecor and Cochran (1994) using the SPSS software version 21.0.

Results and Discussion

The results of the present study are given in Table 1. The mean SCC of the pooled milk samples was $7.3x10^5$ cells/ml. The mean pH value and the titratable acidity of the 100 pooled milk samples were 6.65±0.0068 and 0.155 ±0.0014 (percent of lactic acid), respectively. The mean Chloride content and electrical conductivity of the pooled milk samples were 0.1508 ± 0.0015 (percent) and 4.93± 0.065 (mS/cm) respectively. Statistical analysis revealed that pH and titratable acidity showed no significant correlation with the SCC (P>0.01). In the case of chloride content and electrical conductivity of milk a significant positive correlation with SCC was observed.

The pH range of the cow milk is 6.6 to 6.8 (Kitchen and Marschke, 1985). Present study also revealed that the range of the pH of milk samples fall within these limits. Ogola *et al.* (2007) found that the SCC had no significant effect on the pH values of quarter milk samples, with the mean pH values falling within the normal milk pH range. The overall correlation between pH and SCC was (-0.126) non-significant which endorse findings of above scientist. The normal acidity of the milk is 0.14 to 0.16 per cent of lactic acid (Yarabi *et al.,* 2014). In the present study the acidity of milk samples were within the normal range. It was noticed that values of acidity for all the pooled samples were within the threshold value prescribed for acceptance for processing (0.17 % lactic acid).

In the present study, it was found that correlation between the overall mean of chloride content (0.1508) and SCC was positive and was statistically significant (P<0.01). The findings of the present study was in agreement with the reports of Ogola *et al.* (2007) who reported a strong positive correlation (r= 0.85) with the SCC and the chloride content of the milk. The probable reason for increased concentration of chloride in milk with higher SCC has been explained by two causes. Batavani *et al. (*2007) observed that the concentrations of chloride were significantly higher in the milk of inflamed quarter than those in normal ones (P<0.01). Auldist and Hubble (1998) explained the reason for above finding as due to the influx of blood constituents into the milk during mammary gland infection. According to Fox *et al.* (2014) there are physiological causes for increase in chloride concentration in alveolar epithelium towards late lactation. Since we have examined only pooled milk samples the exact reason for significant correlation between SCC and chloride content at low and high SCC category may arise from both reasons cited above.

The mean SCC of 100 pooled milk

Table 1. Mean value and Correlation coefficient of parameters with SCC

Parameters	Mean value	Correlation coefficient with SCC
pH	6.65±0.0068	-0.126 [ns]
Titratable acidity (percent of lactic acid)	0.155 ±0.0014	0.146 [ns]
Chloride (percent)	0.1508 ± 0.0015	0.835**
Electrical conductivity (mS/cm)	4.93± 0.065	0.794**

**Correlation is significant at the 0.01 level ns: not significant

samples ($7.3x10^5$ cells/ml) and the mean electrical conductivity (4.925mS/cm)of those samples showed a significant positive correlation ($P<0.01$). Hamann (2002) also observed a positive correlation between SCC and electrical conductivity which agree with the findings of present study. Similar findings were reported by Janzekovic *et al*. (2009) who analysed the electrical conductivity of 102 lactating cows belonging to seven farms and found that the conductivity for healthy udders was less than 5.5 mS/cm and for subclinical udders it was greater than 6.5 mS/cm.

The conductivity of milk depend on the availability of charged ions of which chloride ions are most important. The findings of this study have already revealed that there was a significant positive correlation between SCC and chloride content in milk. Hence, the positive correlation between SCC and electrical conductivity is an indirect effect of chloride ions.

From this study, it was concluded that the chloride content and electrical conductivity are the two physicochemical parameters which are affected by the increased SCC of milk.

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